INDEPENDENT ORBITER ASSESSMENT

ASSESSMENT OF THE REACTION CONTROL SYSTEM Vol. 1 of 5

1 1 1

26 FEBRUARY 1988

.

.

<u>के से को रहे हैं।</u> 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -

• • • • • .

.

۰.

·

MCDONNELL DOUGLAS ASTRONAUTICS COMPANY HOUSTON DIVISION

SPACE TRANSPORTATION SYSTEM ENGINEERING AND OPERATIONS SUPPORT

WORKING PAPER NO. 1.0-WP-VA88003-12

INDEPENDENT ORBITER ASSESSMENT ASSESSMENT OF THE REACTION CONTROL SYSTEM FMEA/CIL

26 FEBRUARY 1988

This Working Paper is Submitted to NASA under Task Order No. VA88003, Contract NAS 9-17650

PREPARED BY:

Chet D. Prust RCS System Lead Independent Orbiter Assessment

Section¹ Manager-FMEA/CIL

Independent Orbiter

PREPARED BY;

Dan W. Hartman EPD&C Analyst Independent Orbiter Assessment

APPROVED BY: ANNO A.J. Matino

Assessment

APPROVED BY:

G.W. Knori Technical Manager Independent Orbiter Assessment

APPROVED BY: McPhe **J.I.** sóņ Project Manager STSEOS

· _____

CONTENTS

. . .

· • • • •

-

- ------ = ----

10 **1** 7 - - -

-

: •

2.0 INTRODUCTION 4 2.1 Purpose 4 2.2 Scope 4 2.3 Analysis Approach 4 2.4 RCS Groundrules and Assumptions 5 3.0 SUBSYSTEM DESCRIPTION 6 3.1 Functional & Hardware Description 6 3.2 Redundancy Management 33 3.3 Interfaces and Locations 39 3.4 Hierarchy 41 4.0 ASSESSMENT RESULTS 42 4.1 Forward RCS Assessment Results 68 4.1.1.A Hardware 68 4.1.2.1.A Hardware 70 4.1.2 Specific Forward RCS Issues 72 4.1.2.1.A Hardware 72 4.1.2.1.A Hardware 72 4.1.2.1.A Hardware 72 4.1.2.1.A Hardware 72 4.1.2.1.A.1 Helium Tank Isolation Valves 72 4.1.2.1.B.1 Diodes 74 4.1.2.1.B.2 Regulator Assemblies 74 4.1.2.1.B.3	1.0	EXECUTIVE SUM	MARY	1
2.1Furpose42.2Scope42.3Analysis Approach42.4RCS Groundrules and Assumptions53.0SUESYSTEM DESCRIPTION63.1Functional & Hardware Description63.2Redundarcy Management333.3Interfaces and Locations393.4Hierarchy414.0ASSESSMENT RESULTS424.1Forward RCS Assessment Results684.1.1.AGeneral Forward RCS Issues684.1.1.BEPD&C704.1.2Specific Forward RCS Issues724.1.2.1Helium Pressurization Subsystem724.1.2.1.AHardware724.1.2.1.ARegulator Xasemblies744.1.2.1.BEPD&C764.1.2.1.B.1Diodes764.1.2.1.B.3Resistors774.1.2.1.B.4Togle Switches784.1.2.1.B.5Microswitches784.1.2.1.B.6Event Indicators784.1.2.2.AHardware794.1.2.1.B.6Event Indicators784.1.2.2.A.1Propellant Tank Acquisition Assembly794.1.2.2.AHardware794.1.2.2.A.1Propellant Tank Acquisition Valves794.1.2.2.A.1Propellant Tank Acquisition Valves794.1.2.2.A.1Propellant Tank Acquisition Valves794.1.2.2.A.4Propellant Tank Acquisition Valves794.1.2.2.A.5Primary Manif	2.0	INTRODUCTION		4
2.2Scope42.3Analysis Approach42.4RCS Groundrules and Assumptions53.0SUBSYSTEM DESCRIPTION63.1Functional & Hardware Description63.2Redundancy Management333.3Interfaces and Locations393.4Hierarchy414.0ASSESSMENT RESULTS424.1Forward RCS Assessment Results684.1.1.AHardware684.1.1.BEPD&C704.1.2Specific Forward RCS Issues724.1.2.1Helium Pressurization Subsystem724.1.2.1.AHardware724.1.2.1.AHardware724.1.2.1.AQuad Check Valve Assemblies734.1.2.1.A.3Quad Check Valve Assemblies744.1.2.1.B.1Diodes764.1.2.1.B.2Hybrid Drivers774.1.2.1.B.3Resistors774.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.1.B.6Event Indicators784.1.2.2.AHardware794.1.2.2.APropellant Tank Acquisition Assembly794.1.2.2.APropellant Tank Acquisition Valves794.1.2.2.A.3Ground Manual Isolation Valves794.1.2.2.A.4Propellant Tank Isolation Valves794.1.2.2.A.5Primary Manifold Isolation Valves794.1.2.2.A.5Primary Manifold Isolation Valves79<		2.1 Purpose		4
2.3Analysis Approach 2.442.4RCS Groundrules and Assumptions53.0SUBSYSTEM DESCRIPTION63.1Functional & Hardware Description63.2Redundancy Management333.3Interfaces and Locations393.4Hierarchy414.0ASSESSMENT RESULTS424.1Forward RCS Assessment Results684.1.1.AGeneral Forward RCS Issues684.1.1.BEPD&C704.1.2Specific Forward RCS Issues724.1.2.1Helium Pressurization Subsystem724.1.2.1.AHardware724.1.2.1.AHalum Tank Isolation Valves724.1.2.1.A.1BEDb&C764.1.2.1.A.2Regulator Assemblies744.1.2.1.A.3Quad Check Valve Assemblies744.1.2.1.B.1Diodes764.1.2.1.B.2Hybrid Drivers774.1.2.1.B.3Resistors784.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.1.B.6Event Indicators794.1.2.2.AHardware794.1.2.2.AHardware794.1.2.2.APropellant Tank Acquisition Assembly794.1.2.2.A.4Propellant Tank Acquisition Valves804.1.2.2.A.5Pressure Relief Assemblies794.1.2.2.A.5Primary Manifold Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves <td></td> <td>2.2 Scope</td> <td></td> <td>4</td>		2.2 Scope		4
2.4RCS Groundrules and Assumptions53.0SUBSYSTEM DESCRIPTION63.1Functional & Hardware Description63.2Redundancy Management333.3Interfaces and Locations393.4Hierarchy414.0ASSESSMENT RESULTS424.1Forward RCS Assessment Results684.1.1General Forward RCS Issues684.1.1.BEPD&C704.1.2Specific Forward RCS Issues724.1.2.1Helium Pressurization Subsystem724.1.2.1.AHardware724.1.2.1.AHardware724.1.2.1.A.1Helium Tank Isolation Valves734.1.2.1.A.2Regulator Assemblies744.1.2.1.B.1Diodes764.1.2.1.B.1Diodes764.1.2.1.B.3Resistors774.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.2.AHardware794.1.2.1.B.5Microswitches784.1.2.1.B.6Event Indicators784.1.2.2.APropellant Storage & Distribution794.1.2.2.AHardware794.1.2.2.APropellant Tank Acquisition Assembly794.1.2.2.A.1Propellant Tank Isolation Valves804.1.2.2.A.1Propellant Tank Isolation Valves804.1.2.2.A.3Ground Manual Isolation Valves804.1.2.2.A.4Propellant Tank Isolation Valves8		2.3 Analysi	s Approach	4
3.0SUBSYSTEM DESCRIPTION63.1Functional & Hardware Description63.2Redundancy Management333.3Interfaces and Locations393.4Hierarchy414.0ASSESSMENT RESULTS424.1Forward RCS Assessment Results684.1.1General Forward RCS Issues684.1.1.8EPD&C704.1.2Specific Forward RCS Issues724.1.2.1Helium Pressurization Subsystem724.1.2.1.AHardware724.1.2.1.AHelium Tank Isolation Valves724.1.2.1.A.1Helium Tank Isolation Valves724.1.2.1.A.2Regulator Assemblies744.1.2.1.B.1Diodes764.1.2.1.B.2Hybrid Drivers774.1.2.1.B.3Resistors774.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.1.B.6Event Indicators784.1.2.2.AHardware794.1.2.2.APropellant Tank Acquisition Assembly794.1.2.2.A.4Propellant Tank Isolation Valves794.1.2.2.A.4Propellant Tank Isolation Valves804.1.2.2.A.4Propellant Tank Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves80		2.4 RCS Gro	undrules and Assumptions	5
3.1 Functional & Hardware Description63.2 Redundancy Management333.3 Interfaces and Locations393.4 Hierarchy414.0 ASSESSMENT RESULTS424.1 Forward RCS Assessment Results684.1.1 General Forward RCS Issues684.1.1.8 EPD&C704.1.2 Specific Forward RCS Issues724.1.2.1 Helium Pressurization Subsystem724.1.2.1.A Hardware724.1.2.1.A Hardware724.1.2.1.A Helium Tank Isolation Valves724.1.2.1.A.1 Helium Tank Assemblies744.1.2.1.A.2 Regulator Assemblies744.1.2.1.B EPD&C764.1.2.1.B.3 Resistors774.1.2.1.B.4 Toggle Switches784.1.2.1.B.5 Microswitches784.1.2.1.B.6 Event Indicators784.1.2.1.B.7 Propellant Tank Acquisition Assembly794.1.2.2.A Hardware794.1.2.2.B Forpellant Tank Acquisition Valves784.1.2.1.B.6 Event Indicators784.1.2.2.8 Propellant Tank Acquisition Assembly794.1.2.2.8 Propellant Tank Acquisition Valves804.1.2.2.8 Propellant Tank Isolation Valves804.1.2.2.6 Primary Manifold Isolation Valves804.1.2.2.6 Primary M	3.0	SUBSYSTEM DES	CRIPTION	6
3.2Redundancy Management333.3Interfaces and Locations393.4Hierarchy414.0ASSESSMENT RESULTS424.1Forward RCS Assessment Results684.1.1General Forward RCS Issues684.1.1.AHardware684.1.1.BEPD&C704.1.2Specific Forward RCS Issues724.1.2.1Helium Pressurization Subsystem724.1.2.1.AHardware724.1.2.1.A.1Helium Tank Isolation Valves724.1.2.1.A.2Regulator Assemblies734.1.2.1.A.3Quad Check Valve Assemblies744.1.2.1.BEPD&C764.1.2.1.B.1Diodes764.1.2.1.B.2Hybrid Drivers774.1.2.1.B.3Resistors784.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.2.APropellant Tank Acquisition Assembly794.1.2.2.A.4Propellant Tank Isolation Valves804.1.2.2.A.4Propellant Tank Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves814.1.2.2.A.6Prevent Propellant Tank Isolation Valves81		3.1 Function	al & Hardware Description	6
3.3 Interfaces and Locations393.4 Hierarchy414.0 ASSESSMENT RESULTS424.1Forward RCS Assessment Results684.1.1General Forward RCS Issues684.1.1.8EPD&C704.1.2Specific Forward RCS Issues724.1.2.1Helium Pressurization Subsystem724.1.2.1.AHardware724.1.2.1.AHelium Tank Isolation Valves724.1.2.1.A.1Helium Tank Isolation Valves724.1.2.1.A.2Regulator Assemblies734.1.2.1.A.3Quad Check Valve Assemblies744.1.2.1.BEPD&C764.1.2.1.BHordes774.1.2.1.B.1Diodes764.1.2.1.B.3Resistors774.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.2.APropellant Tank Acquisition Assembly794.1.2.2.A.1Propellant Tank Acquisition Assembly794.1.2.2.A.2Pressure Relief Assemblies794.1.2.2.A.4Propellant Tank Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves81		3.2 Redundan	cy Management	33
3.4 Hierarchy414.0 ASSESSMENT RESULTS424.1Forward RCS Assessment Results684.1.1General Forward RCS Issues684.1.1.AHardware684.1.1.BEPD&C704.1.2Specific Forward RCS Issues724.1.2.1Helium Pressurization Subsystem724.1.2.1.AHardware724.1.2.1.A.1Helium Tank Isolation Valves724.1.2.1.A.2Regulator Assemblies734.1.2.1.A.3Quad Check Valve Assemblies744.1.2.1.B.4Quick Disconnect Couplings754.1.2.1.B.1Diodes764.1.2.1.B.2Hybrid Drivers774.1.2.1.B.3Resistors784.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.1.B.6Event Indicators784.1.2.2.AHardware794.1.2.2.APropellant Storage & Distribution794.1.2.2.A.3Ground Manual Isolation Valves794.1.2.2.A.4Propellant Tank Acquisition Assembly794.1.2.2.A.5Primary Manifold Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves814.1.2.2.A.5Primary Manifold Isolation Valves81		3.3 Interfac	es and Locations	39
4.0ASSESSMENT RESULTS424.1Forward RCS Assessment Results684.1.1General Forward RCS Issues684.1.1.AHardware684.1.1.BEPD&C704.1.2Specific Forward RCS Issues724.1.2.1Helium Pressurization Subsystem724.1.2.1.AHardware724.1.2.1.A.1Helium Tank Isolation Valves724.1.2.1.A.2Regulator Assemblies734.1.2.1.A.3Quad Check Valve Assemblies744.1.2.1.B.4Quick Disconnect Couplings754.1.2.1.B.1Diodes764.1.2.1.B.2Hybrid Drivers774.1.2.1.B.3Resistors784.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.1.B.4Toggle Switches784.1.2.2.2.APropellant Storage & Distribution794.1.2.2.A.1Propellant Tank Acquisition Assembly794.1.2.2.A.3Ground Manual Isolation Valves804.1.2.2.A.4Propellant Tank Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves80		3.4 Hierarch	У	41
4.1Forward RCS Assessment Results684.1.1General Forward RCS Issues684.1.1.AHardware684.1.1.BEPD&C704.1.2Specific Forward RCS Issues724.1.2.1.AHelium Pressurization Subsystem724.1.2.1.AHardware724.1.2.1.A.1Helium Tank Isolation Valves724.1.2.1.A.2Regulator Assemblies734.1.2.1.A.3Quad Check Valve Assemblies734.1.2.1.BEPD&C764.1.2.1.BDiodes764.1.2.1.B.3Resistors774.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.1.B.6Event Indicators784.1.2.2.APropellant Storage & Distribution794.1.2.2.A.3Ground Manual Isolation Valves794.1.2.2.A.4Propellant Tank Acquisition Assembly794.1.2.2.A.5Frimary Manifold Isolation Valves804.1.2.2.A.5Frimary Manifold Isolation Valves81	4.0	ASSESSMENT RE	SULTS	42
4.1.1General Forward RCS Issues684.1.1.AHardware684.1.1.BEPD&C704.1.2Specific Forward RCS Issues724.1.2.1Helium Pressurization Subsystem724.1.2.1.AHardware724.1.2.1.A.1Helium Tank IsoTation Valves724.1.2.1.A.2Regulator Assemblies734.1.2.1.A.3Quad Check Valve Assemblies744.1.2.1.B.4Quick Disconnect Couplings754.1.2.1.B.5EPD&C764.1.2.1.B.4Toggle Switches774.1.2.1.B.5Microswitches784.1.2.1.B.6Event Indicators784.1.2.1.B.6Event Indicators784.1.2.2.AHardware794.1.2.2.A.1Propellant Storage & Distribution794.1.2.2.A.3Ground Manual Isolation Valve804.1.2.2.A.5Primary Manifold Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves81		4.1	Forward RCS Assessment Results	68
4.1.1General rowned Key Londo684.1.1.AHardware704.1.1.BEPD&C704.1.2Specific Forward RCS Issues724.1.2.1Helium Pressurization Subsystem724.1.2.1.AHardware724.1.2.1.A.1Helium Tank Isolation Valves724.1.2.1.A.2Regulator Assemblies734.1.2.1.A.3Quad Check Valve Assemblies744.1.2.1.B.4Quick Disconnect Couplings754.1.2.1.B.1Diodes764.1.2.1.B.2Hybrid Drivers774.1.2.1.B.3Resistors774.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.1.B.6Event Indicators784.1.2.2.APropellant Storage & Distribution794.1.2.2.A.1Propellant Tank Acquisition Assembly794.1.2.2.A.2Pressure Relief Assemblies794.1.2.2.A.3Ground Manual Isolation Valve804.1.2.2.A.5Primary Manifold Isolation Valves814.1.2.2.A.5Primary Manifold Isolation Valves81		4 3 3	Conoral Forward RCS Issues	68
4.1.1.AHardware704.1.1.BEPD&C704.1.2Specific Forward RCS Issues724.1.2.1Helium Pressurization Subsystem724.1.2.1.AHardware724.1.2.1.A.1Helium Tank Isolation Valves724.1.2.1.A.2Regulator Assemblies734.1.2.1.A.3Quad Check Valve Assemblies744.1.2.1.B.4Quick Disconnect Couplings754.1.2.1.B.5EPD&C764.1.2.1.B.1Diodes764.1.2.1.B.2Hybrid Drivers774.1.2.1.B.3Resistors774.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.1.B.6Event Indicators784.1.2.2Propellant Storage & Distribution794.1.2.2.A.1Propellant Tank Acquisition Assembly794.1.2.2.A.3Ground Manual Isolation Valve804.1.2.2.A.4Propellant Tank Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves814.1.2.2.A.5Primary Manifold Isolation Valves81		4.1.1.3	General rolward Reb issues	68
4.1.1.BErbac724.1.2Specific Forward RCS Issues724.1.2.1Helium Pressurization Subsystem724.1.2.1.AHardware724.1.2.1.A.1Helium Tank Isolation Valves724.1.2.1.A.2Regulator Assemblies734.1.2.1.A.3Quad Check Valve Assemblies744.1.2.1.B.4Quick Disconnect Couplings754.1.2.1.B.1Diodes764.1.2.1.B.2Hybrid Drivers774.1.2.1.B.3Resistors774.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.1.B.6Event Indicators784.1.2.2.APropellant Storage & Distribution794.1.2.2.A.1Propellant Tank Acquisition Assembly794.1.2.2.A.3Ground Manual Isolation Valve804.1.2.2.A.5Primary Manifold Isolation Valves814.1.2.2.A.5Primary Manifold Isolation Valves81		4.1.1.R		70
4.1.2Specific Forward RCS Issues724.1.2.1Helium Pressurization Subsystem724.1.2.1.AHardware724.1.2.1.A.1Helium Tank Isolation Valves724.1.2.1.A.2Regulator Assemblies734.1.2.1.A.3Quad Check Valve Assemblies734.1.2.1.A.4Quick Disconnect Couplings754.1.2.1.B.1Diodes764.1.2.1.B.2Hybrid Drivers774.1.2.1.B.3Resistors774.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.1.B.6Event Indicators784.1.2.2Propellant Storage & Distribution794.1.2.2.AHardware794.1.2.2.A.1Propellant Tank Acquisition Assembly794.1.2.2.A.3Ground Manual Isolation Valves804.1.2.2.A.4Propellant Tank Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves814.1.2.2.A.5Primary Manifold Isolation Valves81	•	4 • 1 • 1 • D	EFDac	
4.1.2.1Helium Pressurization Subsystem724.1.2.1.AHardware724.1.2.1.A.1Helium Tank Isolation Valves724.1.2.1.A.1Helium Tank Isolation Valves724.1.2.1.A.2Regulator Assemblies734.1.2.1.A.3Quad Check Valve Assemblies744.1.2.1.A.4Quick Disconnect Couplings754.1.2.1.BEPD&C764.1.2.1.B.1Diodes764.1.2.1.B.2Hybrid Drivers774.1.2.1.B.3Resistors774.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.1.B.6Event Indicators784.1.2.2Propellant Storage & Distribution794.1.2.2.AHardware794.1.2.2.A.1Propellant Tank Acquisition Assembly794.1.2.2.A.3Ground Manual Isolation Valve804.1.2.2.A.4Propellant Tank Isolation Valves814.1.2.2.A.5Primary Manifold Isolation Valves81		4.1.2	Specific Forward RCS Issues	72
4.1.2.1.AHardware724.1.2.1.A.1Helium Tank Isolation Valves724.1.2.1.A.2Regulator Assemblies734.1.2.1.A.3Quad Check Valve Assemblies744.1.2.1.A.4Quick Disconnect Couplings754.1.2.1.BDiodes764.1.2.1.B.1Diodes764.1.2.1.B.2Hybrid Drivers774.1.2.1.B.3Resistors774.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.1.B.6Event Indicators784.1.2.2.APropellant Storage & Distribution794.1.2.2.A.1Propellant Tank Acquisition Assembly794.1.2.2.A.2Pressure Relief Assemblies794.1.2.2.A.3Ground Manual Isolation Valve804.1.2.2.A.4Propellant Tank Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves814.1.2.2.A.5Primary Manifold Isolation Valves81		4.1.2.1	Helium Pressurization Subsystem	72
4.1.2.1.A.1Helium Tank Isolation Valves724.1.2.1.A.2Regulator Assemblies734.1.2.1.A.3Quad Check Valve Assemblies744.1.2.1.A.4Quick Disconnect Couplings754.1.2.1.BEPD&C764.1.2.1.B.1Diodes764.1.2.1.B.2Hybrid Drivers774.1.2.1.B.3Resistors774.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.1.B.6Event Indicators784.1.2.2.APropellant Storage & Distribution794.1.2.2.A.1Propellant Tank Acquisition Assembly794.1.2.2.A.2Pressure Relief Assemblies794.1.2.2.A.3Ground Manual Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves814.1.2.2.A.5Primary Manifold Isolation Valves81		4.1.2.1.A	Hardware	72
4.1.2.1.A.2Regulator Assemblies734.1.2.1.A.3Quad Check Valve Assemblies744.1.2.1.A.4Quick Disconnect Couplings754.1.2.1.B.1Diodes764.1.2.1.B.1Diodes764.1.2.1.B.2Hybrid Drivers774.1.2.1.B.3Resistors774.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.1.B.6Event Indicators784.1.2.2Propellant Storage & Distribution794.1.2.2.AHardware794.1.2.2.A.1Propellant Tank Acquisition Assembly794.1.2.2.A.2Pressure Relief Assemblies794.1.2.2.A.3Ground Manual Isolation Valve804.1.2.2.A.4Propellant Tank Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves814.1.2.2.A.5Primary Manifold Isolation Valves81		4.1.2.1.A.1	Helium Tank Isolation Valves	72
4.1.2.1.A.3Quad Check Valve Assemblies744.1.2.1.A.4Quick Disconnect Couplings754.1.2.1.B.1Diodes764.1.2.1.B.2Hybrid Drivers774.1.2.1.B.3Resistors774.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.1.B.6Event Indicators784.1.2.1.B.6Event Indicators784.1.2.2Propellant Storage & Distribution794.1.2.2.AHardware794.1.2.2.A.1Propellant Tank Acquisition Assembly794.1.2.2.A.2Pressure Relief Assemblies794.1.2.2.A.3Ground Manual Isolation Valves804.1.2.2.A.4Propellant Tank Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves814.1.2.2.A.5Primary Manifold Isolation Valves81		4.1.2.1.A.2	Regulator Assemblies	73
4.1.2.1.A.4Quick Disconnect Couplings754.1.2.1.BEPD&C764.1.2.1.B.1Diodes764.1.2.1.B.2Hybrid Drivers774.1.2.1.B.3Resistors774.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.1.B.6Event Indicators784.1.2.2Propellant Storage & Distribution794.1.2.2.A.1Propellant Tank Acquisition Assembly794.1.2.2.A.2Pressure Relief Assemblies794.1.2.2.A.3Ground Manual Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves814.1.2.2.A.5Primary Manifold Isolation Valves81		4.1.2.1.A.3	Quad Check Valve Assemblies	74
4.1.2.1.BEPD&C764.1.2.1.B.1Diodes764.1.2.1.B.2Hybrid Drivers774.1.2.1.B.3Resistors774.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.1.B.6Event Indicators784.1.2.2Propellant Storage & Distribution79Subsystem794.1.2.2.A.1Propellant Tank Acquisition Assembly794.1.2.2.A.2Pressure Relief Assemblies794.1.2.2.A.3Ground Manual Isolation Valve804.1.2.2.A.5Primary Manifold Isolation Valves814.1.2.2.A.5Vernier Manifold Isolation Valves81		4.1.2.1.A.4	Quick Disconnect Couplings	75
4.1.2.1.B.1Diodes764.1.2.1.B.2Hybrid Drivers774.1.2.1.B.3Resistors774.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.1.B.6Event Indicators784.1.2.2Propellant Storage & Distribution794.1.2.2.AHardware794.1.2.2.A.1Propellant Tank Acquisition Assembly794.1.2.2.A.2Pressure Relief Assemblies794.1.2.2.A.3Ground Manual Isolation Valve804.1.2.2.A.4Propellant Tank Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves814.1.2.2.A.5Primary Manifold Isolation Valves81		4.1.2.1.B	EPD&C	76
4.1.2.1.B.2Hybrid Drivers774.1.2.1.B.3Resistors774.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.1.B.6Event Indicators784.1.2.2Propellant Storage & Distribution794.1.2.2.AHardware794.1.2.2.A.1Propellant Tank Acquisition Assembly794.1.2.2.A.2Pressure Relief Assemblies794.1.2.2.A.3Ground Manual Isolation Valve804.1.2.2.A.4Propellant Tank Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves814.1.2.2.A.5Vernier Manifold Isolation Valves81		4.1.2.1.B.1	Diodes	76
4.1.2.1.B.3Resistors774.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.1.B.6Event Indicators784.1.2.2Propellant Storage & Distribution794.1.2.2.AHardware794.1.2.2.A.1Propellant Tank Acquisition Assembly794.1.2.2.A.2Pressure Relief Assemblies794.1.2.2.A.3Ground Manual Isolation Valve804.1.2.2.A.4Propellant Tank Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves814.1.2.2.A.5Primary Manifold Isolation Valves81		4.1.2.1.B.2	Hybrid Drivers	77
4.1.2.1.B.4Toggle Switches784.1.2.1.B.5Microswitches784.1.2.1.B.6Event Indicators784.1.2.2Propellant Storage & Distribution794.1.2.2.AHardware794.1.2.2.A.1Propellant Tank Acquisition Assembly794.1.2.2.A.2Pressure Relief Assemblies794.1.2.2.A.3Ground Manual Isolation Valve804.1.2.2.A.4Propellant Tank Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves814.1.2.2.A.5Primary Manifold Isolation Valves81		4.1.2.1.B.3	Resistors	77
4.1.2.1.B.5Microswitches784.1.2.1.B.6Event Indicators784.1.2.2Propellant Storage & Distribution794.1.2.2.AHardware794.1.2.2.A.1Propellant Tank Acquisition Assembly794.1.2.2.A.2Pressure Relief Assemblies794.1.2.2.A.3Ground Manual Isolation Valve804.1.2.2.A.4Propellant Tank Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves814.1.2.2.A.5Primary Manifold Isolation Valves81		4.1.2.1.B.4	Toggle Switches	78
4.1.2.1.B.6Event Indicators784.1.2.2Propellant Storage & Distribution79Subsystem794.1.2.2.AHardware794.1.2.2.A.1Propellant Tank Acquisition Assembly794.1.2.2.A.2Pressure Relief Assemblies794.1.2.2.A.3Ground Manual Isolation Valve804.1.2.2.A.4Propellant Tank Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves814.1.2.2.A.5Primary Manifold Isolation Valves81		4.1.2.1.B.5	Microswitches	78
4.1.2.2Propellant Storage & Distribution794.1.2.2.AHardware794.1.2.2.A.1Propellant Tank Acquisition Assembly794.1.2.2.A.2Pressure Relief Assemblies794.1.2.2.A.3Ground Manual Isolation Valve804.1.2.2.A.4Propellant Tank Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves814.1.2.2.A.5Primary Manifold Isolation Valves81	£	4.1.2.1.B.6	Event Indicators	78
4.1.2.2.AHardware794.1.2.2.A.1Propellant Tank Acquisition Assembly794.1.2.2.A.2Pressure Relief Assemblies794.1.2.2.A.3Ground Manual Isolation Valve804.1.2.2.A.4Propellant Tank Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves814.1.2.2.A.6Vernier Manifold Isolation Valves81		4.1.2.2	Propellant Storage & Distribution Subsystem	79
4.1.2.2.A.1Propellant Tank Acquisition Assembly794.1.2.2.A.2Pressure Relief Assemblies794.1.2.2.A.3Ground Manual Isolation Valve804.1.2.2.A.4Propellant Tank Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves814.1.2.2.A.5Vernier Manifold Isolation Valves81		4.1.2.2.A	Hardware	79
4.1.2.2.A.2Pressure Relief Assemblies794.1.2.2.A.3Ground Manual Isolation Valve804.1.2.2.A.4Propellant Tank Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves814.1.2.2.A.5Vernier Manifold Isolation Valves81		4.1.2.2.A.1	Propellant Tank Acquisition Assembly	79
4.1.2.2.A.3Ground Manual Isolation Valve804.1.2.2.A.4Propellant Tank Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves814.1.2.2.A.5Vernier Manifold Isolation Valves82		4.1.2.2.A.2	Pressure Relief Assemblies	79
4.1.2.2.A.4Propellant Tank Isolation Valves804.1.2.2.A.5Primary Manifold Isolation Valves814.1.2.2.A.6Vernier Manifold Isolation Valves82		4.1.2.2.A.3	Ground Manual Isolation Valve	80
4.1.2.2.A.5 Primary Manifold Isolation Valves 81 A 1 2 2 A 6 Vernier Manifold Isolation Valves 82		4.1.2.2.A.4	Propellant Tank Isolation Valves	80
A 1 2 2 A 6 Vernier Manifold Isolation Valves 82		4 1.2.2 λ Γ	Primary Manifold Isolation Valves	81
		4.1.2.2.A.6	Vernier Manifold Isolation Valves	82

Page

4.1.2.2.A.7 4.1.2.2.A.8	Jet Alignment Bellows Quick Disconnect Couplings	83 84
4.1.2.2.B 4.1.2.2.B.1 4.1.2.2.B.2 4.1.2.2.B.3 4.1.2.2.B.3 4.1.2.2.B.4 4.1.2.2.B.5 4.1.2.2.B.5 4.1.2.2.B.6 4.1.2.2.B.7 4.1.2.2.B.7 4.1.2.2.B.9 4.1.2.2.B.10 4.1.2.2.B.11	EPD&C Remote Power Controllers Diodes Hybrid Drivers Fuses Relays Resistors Toggle Switches Microswitches Circuit Breaker Meters/Rotary Switch Event Indicators	84 84 90 94 95 97 99 100 101 101
4.1.2.3	Thruster Subsystem	103
4.1.2.3.A 4.1.2.3.A.1	Hardware Primary Thruster Bipropellant Solenoid Valves	103 103
4.1.2.3.A.2	Primary Thruster Injector Head Assembly	105
4.1.2.3.A.3	Vernier Thruster Assembly	105
4.1.2.3.B 4.1.2.3.B.1 4.1.2.3.B.2 4.1.2.3.B.3 4.1.2.3.B.3 4.1.2.3.B.5 4.1.2.3.B.5 4.1.2.3.B.6 4.1.2.3.B.7 4.1.2.3.B.8 4.1.2.3.B.9 4.1.2.3.B.10	EPD&C Remote Power Controllers Diodes Hybrid Drivers Fuses Relays Resistors Toggle Switches Signal Conditioners Pressure Sensors Temperature Sensors	106 106 107 108 109 109 110 110 111 112 112
4.1.2.4	Thermal Control Subsystem	113
4.1.2.4.A	Hardware	113
4.1.2.4.B 4.1.2.4.B.1 4.1.2.4.B.2	EPD&C Thermal Switches Hybrid Drivers	113 113 113
4.2	Aft RCS Assessment Results	114
4.2.1 4.2.1.A 4.2.1.B	General Aft RCS Issues Hardware EPD&C	114 114 116
4.2.2	Specific Aft RCS Issues	118
4.2.2.1	Helium Pressurization Subsystem	. 118

_

4.2.2.1.A 4.2.2.1.A.1 4.2.2.1.A.2 4.2.2.1.A.3 4.2.2.1.A.4	Hardware Helium Tank Isolation Valves Regulator Assemblies Quad Check Valve Assemblies Quick Disconnect Couplings	118 118 119 120 120
4.2.2.1.B 4.2.2.1.B.1 4.2.2.1.B.2 4.2.2.1.B.3 4.2.2.1.B.4 4.2.2.1.B.5	EPD&C Diodes Hybrid Drivers Resistors Microswitches Event Indicators	121 121 122 122 122 123
4.2.2.2	Propellant Storage & Distribution Subsystem	124
4.2.2.2.A 4.2.2.2.A.1 4.2.2.2.A.2 4.2.2.2.A.3 4.2.2.2.A.4 4.2.2.2.A.5 4.2.2.2.A.6 4.2.2.2.A.7 4.2.2.2.A.8	Hardware Propellant Tank Acquisition Assembly Pressure Relief Assemblies Ground Manual Isolation Valve Propellant Tank Isolation Valves Crossfeed Valves Primary Manifold Isolation Valves Vernier Manifold Isolation Valves Quick Disconnect Couplings	124 124 125 125 127 128 129 129
4.2.2.2.B 4.2.2.2.B.1 4.2.2.2.B.2 4.2.2.2.B.3 4.2.2.2.B.4 4.2.2.2.B.5 4.2.2.2.B.5 4.2.2.2.B.6 4.2.2.2.B.7 4.2.2.2.B.8 4.2.2.2.B.9	EPD&C Remote Power Controllers Diodes Hybrid Drivers Relays Resistors Toggle Switches Microswitches Circuit Breaker Event Indicators	130 130 137 141 144 146 147 149 149
4.2.2.3	Thruster Subsystem	151
4.2.2.3.A 4.2.2.3.A.1	Hardware Primary Thruster Bipropellant Solenoid Valves	151 151
4.2.2.3.A.2	Primary Thruster Injector Head Assembly	153
4.2.2.3.A.3	Vernier Thruster Assembly	153
4.2.2.3.B 4.2.2.3.B.1 4.2.2.3.B.2 4.2.2.3.B.3 4.2.2.3.B.3 4.2.2.3.B.4 4.2.2.3.B.5 4.2.2.3.B.5	EPD&C Remote Power Controllers Hybrid Drivers Relays Toggle Switches Pressure Sensors Temperature Sensors	154 154 155 155 156 156 156

: ____

-

: ____

-

iii

.

4.2.2.4	Thermal Control Subsystem	157	
4.2.2.4.	A Hardware	157	
4.2.2.4. 4.2.2.4.	B EPD&C B.1 Thermal Switches	157 157	
4.3	Additional Comments and Concerns	158	
4.3.A	Hardware Comments and Concerns	158	
4.3.B	EPD&C Comments and Concerns	160	
5.0 REFERENC	ES	161	
APPENDIX A	ACRONYMS	A-1	
APPENDIX B	DEFINITIONS, GROUND RULES, AND ASSUMPTIONS	B-1	
B.1 B.2	Definitions Project Level Ground Rules and Assumptions		
B.3	RCS-Specific Ground Rules and Assumptions		
B.3.A B.3.B	Hardware EPD&C		
APPENDIX C	ASSESSMENT WORKSHEETS	C-1	
APPENDIX D	IOA CRITICAL ITEMS	D-1	
APPENDIX E	ANALYSIS WORKSHEETS	E-1	
APPENDIX F	NASA FMEA TO IOA WORKSHEET CROSS REFERENCE/RECOMMENDATION	F-1	
APPENDIX G	SUPERSEDED ANALYSIS WORKSHEET SUMMARY	G-1	

List of Figures

- -

1 . 5 . 5 .

£.3

Ξ.

22-24 10:27 10:27

Page

Figure	1	-	RCS HARDWARE OVERVIEW	2
Figure	2	-	RCS EPD&C OVERVIEW	3
Figure	3	-	REACTION CONTROL SYSTEM (RCS)	7
Figure	4	_	FORWARD RCS HARDWARE BREAKDOWN HIERARCHY	8
Figure	5	-	AFT RCS HARDWARE BREAKDOWN HIERARCHY	9
Figure	6	_	FORWARD RCS EPD&C BREAKDOWN HIERARCHY	10
Figure	7	-	AFT RCS EPD&C BREAKDOWN HIERARCHY	11
Figure	8	-	FORWARD RCS SCHEMATIC	12
Figure	9	-	AFT RCS SCHEMATIC	13
Figure	10	_	HELIUM ISOLATION VALVE	15
Figure	11	-	HELIUM PRESSURE REGULATOR ASSEMBLY	18
Figure	12	-	OUAD CHECK VALVE ASSEMBLY	19
Figure	13	_	AFT & FORWARD RCS PROPELLANT TANKS	20
Figure	14	_	PRESSURE RELIEF VALVE ASSEMBLY	21
Figure	15	-	AC MOTOR VALVE	23
Figure	16	-	VERNIER MANIFOLD ISOLATION VALVE	26
Figure	17	-	MANIFOLD 5 ELECTRICAL SCHEMATIC	27
Figure	18	-	PRIMARY & VERNIER THRUSTERS	29
Figure	19	-	PRIMARY & VERNIER THRUSTERS VALVES	30
Figure	20	-	INJECTOR HEAD ASSEMBLY	32

List of Tables

Table	I-A.1	-	SUMMARY OF IOA FMEA ASSESSMENT - FRCS HARDWARE	44
Table	T-B.1	-	SUMMARY OF IOA FMEA ASSESSMENT - FRCS EPD&C	45
Table	T-A.2	_	SUMMARY OF IOA FMEA ASSESSMENT - ARCS HARDWARE	47
Table	I-B.2	-	SUMMARY OF IOA FMEA ASSESSMENT - ARCS EPD&C	48
Table	II-A.1	-	SUMMARY OF IOA CIL ASSESSMENT - FRCS HARDWARE	50
Table	II-B.1	-	SUMMARY OF IOA CIL ASSESSMENT - FRCS EPD&C	51
Table	II-A.2	-	SUMMARY OF IOA CIL ASSESSMENT - ARCS HARDWARE	53
Table	II-B.2	-	SUMMARY OF IOA CIL ASSESSMENT - ARCS EPD&C	54
Table	III-A.1	-	IOA RECOMMENDED CRITICALITIES - FRCS HARDWARE	56
Table	III-B.1	-	IOA RECOMMENDED CRITICALITIES - FRCS EPD&C	57
Table	III-A.2	-	IOA RECOMMENDED CRITICALITIES - ARCS HARDWARE	59
Table	III-B.2	-	IOA RECOMMENDED CRITICALITIES - ARCS EPD&C	60
Table	IV-A.1	-	IOA RECOMMENDED CRITICAL ITEMS - FRCS HARDWARE	62
Table	IV-B.1	-	IOA RECOMMENDED CRITICAL ITEMS - FRCS EPD&C	63
Table	IV-A.2	-	IOA RECOMMENDED CRITICAL ITEMS - ARCS HARDWARE	65
Table	IV-B.2	-	IOA RECOMMENDED CRITICAL ITEMS - ARCS EPD&C	66

v

a su de de la companya de la company A su de la companya de A su de la companya de

Independent Orbiter Assessment Assessment of the Reaction Control System

1.0 EXECUTIVE SUMMARY

The McDonnell Douglas Astronautics Company (MDAC) was selected in June 1986 to perform an Independent Orbiter Assessment (IOA) of the Failure Modes and Effects Analysis (FMEA) and Critical Items List (CIL). Direction was given by the STS Orbiter and GFE Projects Office to perform the hardware analysis using the instructions and ground rules defined in <u>NSTS 22206</u>, <u>Instructions</u> for Preparation of FMEA and CIL, 10 October 1986.

The IOA effort first completed an analysis of the aft and forward Reaction Control System (RCS) hardware and electrical power distribution and control (EPD&C), generating draft failure modes and potential critical items. To preserve independence, this analysis was accomplished without reliance upon the results contained within the NASA FMEA/CIL documentation. The IOA results were then compared to the proposed post 51-L NASA FMEA/CIL baseline. This report documents the results of that comparison for the Orbiter RCS hardware and EPD&C systems.

The IOA product for the RCS analysis consisted of two hundred eight (208) hardware and two thousand sixty-four (2064) EPD&C failure mode worksheets that resulted in one hundred forty-one (141) hardware and four hundred forty-nine (449) EPD&C potential critical items (PCIs) being identified. A comparison was made of the IOA product to the NASA FMEA/CIL baseline as of 23 December 1987 which consisted of ninety-nine (99) hardware and five hundred twenty-four (524) EPD&C FMEAS, and sixty-two (62) hardware and one hundred forty-four (144) EPD&C CIL items. In order to facilitate comparison, additional IOA analysis worksheets were generated as IOA mapped one hundred sixty-six (166) hardware and required. five hundred ninety-seven (597) EPD&C FMEAs, and one hundred thirty-three (133) hardware and one hundred sixteen (116) EPD&C CILS and PCIS into the NASA FMEAS and CILS. After comparison of the IOA baseline to the NASA FMEA/CIL baseline and discussions with the NASA subsystem manager, ninety-six (96) hardware issues, eighty-three (83) of which concern CIL items or PCIs, and two hundred eighty (280) EPD&C issues, one hundred fifty-eight (158) of which concern CIL items or PCIs, remain unresolved. These three hundred seventy-six (376) issues can be grouped into three categories: NSTS 22206 interpretation differences, IOA failure modes not currently addressed on the NASA FMEA/CIL, and RCS subsystem analysis differences.

One hundred seven (107) of the unresolved EPD&C issues result because of differences in interpretation of NSTS 22206. The NASA/RI definition of redundancy allowed the selection of specific unrelated failures which were required to cause known problems, e.g., failures required to cause continuous power to a valve. The IQA redundancy string included only items that were also capable of performing the specific function of the item

being analyzed. IOA considers many NASA/RI redundancy strings to include multiple unrelated failures, thus making criticalities too severe or masking other critical failures found by IOA.

One hundred twenty-eight (128) of the unresolved hardware and EPD&C issues involve failure modes identified by IOA which are not currently addressed on the NASA FMEA/CIL baseline. IOA considers each of these failure modes to be credible, and recommends that they be added.

The remaining unresolved RCS issues result because of differences between the IOA and NASA/RI analyses of the RCS subsystem. Many of these issues are linked to a few general differences in the analyses performed by IOA and NASA/RI. For example, seventeen (17) of the FRCS hardware issues are linked to the fact that IOA considered the inability to deplete (dump) FRCS propellant to be critical for entry. NASA/RI considered it critical only for ET Six (6) of the ARCS hardware issues result because separation. IOA considered any failure which resulted in the loss of primary thrusters to be a crit 1 during RTLS and TAL aborts due to the resulting reduced OMS and RCS propellant dump rates. Several of the RCS hardware issues are related to failures which result in propellant leakage. Per NSTS 22206, IOA considered any leakage of propellant to be critical, regardless of where it occurred. NASA/RI did not apply this philosophy to all propellant leakage failues. Fifty (50) of the unresolved EPD&C issues result because IOA considered the inability to determine the actual position of a valve to be a 3/2R. Loss of all redundancy could lead to falsely failing the valve closed, thus affecting mission operations. NASA/RI classified such failures as 3/3's. The remainder of the unresolved analysis-difference issues exist independently and cannot, for the most part, be linked to any general differences.

IOA recommends that the unresolved issues presented in this report be considered for incorporation into the NASA FMEA/CIL baseline.

Figures 1 and 2 present comparisons of the proposed post 51-L NASA hardware and EPD&C baselines with the IOA recommended hardware and EPD&C baselines, respectively, and associated issues.

1A

____

RCS HARDWARE OVERVIEW

SSMENT		ISSUES	96	83
RE ASSE	AMARY	NASA	66	6 2
ARDWA	SUN	, IOA	166	133
RCS H			FMEA	CIL



IDA AND NASA TOTALS DO NOT INCLUDE ACS INSTRUMENTATION AND THERMAL CONTROL ITEMS.

1. MASA BASELINE AS OF 23 DECEMBER 1987.

IOA ANALYZED AND ASSESSED THESE ITEMS AS EPDAC ITEMS.

Figure 1 - RCS HARDWARE OVERVIEW

-----15. -..... ---.

ISSUES ISSUES ISSUES NASA ISSUES 13 HELIUM PRESSURIZATION 112 89 10 PROPELLANT STORAGE THERMAL CONTROL & DISTRIBUTION NASA **THRUSTERS** NASA NASA 176 5 5 51 20 27 e IOA 196 196 Ø 2 23 Ξ 90 90 90 15 61 \sim AFT RCS FMEA FMEA FMEA FMEA СL СL Ч ы RCS EPD&C OVERVIEW ISSUES 280 158 RCS EPD&C ASSESSMENT 1. NASA BASELINE AS OF 21 DECEMBER 1987 NASA^{1.} I ····· SUMMARY 524 144 IOA 597 116 FMEA СF ISSUES ISSUES ISSUES ISSUES HELIUM PRESSURIZATION 31 26 9 9 PROPELLANT STORAGE THERMAL CONTROL DISTRIBUTION NASA NASA NASA THRUSTERS NASA -146 33 18 12 27 28 IOA 159 10A IOA FORWARD RCS 10A 31 21 69 28 34 ŝ c ٠IJ FMEA FMEA FMEA FMEA СĽ СL З СГ

IDA AND NASA TOTALS INCLUDE ACS INSTRUMENTATION AND THERMAL CONTROL ITEMS.

IOA ANALYZED AND ASSESSED THESE ITEMS AS EPD&C ITEMS.

Figure 2 - RCS EPD&C OVERVIEW

2.0 INTRODUCTION

2.1 Purpose

The 51-L Challenger accident prompted the NASA to readdress safety policies, concepts, and rationale being used in the National Space Transportation System (NSTS). The NSTS Office has undertaken the task of reevaluating the FMEA/CIL for the Space Shuttle design. The MDAC is providing an independent assessment of the Orbiter FMEA/CIL reevaluation results for completeness and technical accuracy.

in the state of th

2.2 Scope

The scope of the independent FMEA/CIL assessment activity encompasses those Shuttle Orbiter subsystems and GFE hardware identified in the Space Shuttle Independent FMEA/CIL Assessment Contractor Statement of Work. Each subsystem analysis addresses hardware, EPD&C, functions, internal and external interfaces, and operational requirements for all mission phases.

2.3 Analysis Approach

The independent analysis approach is a top-down analysis utilizing as-built drawings to divide the respective subsystem into components and low-level hardware items. Hardware and EPD&C items are evaluated for failure mode, effects, and criticality. These data are documented in the respective subsystem analysis report, and are used to assess the NASA and Prime Contractor FMEA/CIL reevaluation results. The IOA analysis approach is summarized in the following Steps 1.0 through 3.0. Step 4.0 summarizes the assessment of the NASA and Prime Contractor FMEA/CILs which is documented in this report.

Step 1.0 Subsystem familiarization

- 1.1 Define subsystem functions
- 1.2 Define subsystem components
- 1.3 Define subsystem specific ground rules and assumptions

Step 2.0 Define subsystem analysis diagram

- 2.1 Define subsystem
- 2.2 Define major assemblies
- 2.3 Develop detailed subsystem representations

Step 3.0 Failure events definition

3.1 Construct matrix of failure modes

3.2 Document IOA analysis results

Step 4.0 Compare IOA analysis data to NASA FMEA/CIL

- 4.1 Resolve differences
- 4.2 Review in-house
- 4.3 Document assessment issues

4.4 Forward findings to Project Manager

2.4 RCS Ground Rules and Assumptions

N 10

 The RCS specific ground rules and assumptions used in the IOA analysis are presented in Appendix B.

in a start the second start press mean

3.0 SUBSYSTEM DESCRIPTION

3.1 Functional and Hardware Description

The Shuttle Orbiter includes three RCS packages, one forward and two aft, one in each of the left and right OMS/RCS pods (Figure 3). Each RCS package consists of the following subsystems:

- o Helium Pressurization
- o Propellant Storage and Distribution
- o Thruster
- o Electrical Power Distribution and Control

Figures 4 through 7 present an overview of the RCS breakdown hierarchy utilized in this analysis and assessment.

During a typical Shuttle mission, the RCS jets are used during External Tank (ET) separation, orbit insertion, orbital operations, deorbit maneuver, and entry. The Aft RCS (ARCS) is active from prelaunch through the transition to aerosurface control during entry. The Forward RCS (FRCS) is active from prelaunch through the post-deorbit propellant dump and is disabled for entry. Figures 8 and 9 are hardware schematics of the FRCS and ARCS, respectively.

The RCS jets are first used in the mission after Main Engine Cutoff (MECO) to maintain vehicle attitude until ET separation. The RCS provides a translation maneuver during ET separation to ensure Orbiter separation from the ET. The RCS is also used to control roll in the event of the failure of two main engines during ascent.

After OMS-1 burn cutoff, the vehicle goes into attitude hold. The crew uses the Translational Hand Controller (THC) to command RCS translational maneuvers to null any residual velocity. Attitude hold is maintained until the maneuver to OMS-2 burn attitude which is performed manually by the crew using the Rotational Hand Controller (RHC). The RCS +X jets can be used to complete either the OMS-1 or OMS-2 burns or to perform the OMS-2 burn entirely in the case of OMS engine failures. In this case, the OMS-to-RCS interconnect capability will be used to feed OMS propellant to the four +X RCS thrusters.

Once in orbit, after the OMS-2 burn is completed, RCS maneuvers are performed to control the vehicle attitude according to the flight plan. For onorbit attitude control the crew may select either primary or vernier jets.

During deorbit, the RCS is used to maneuver to the OMS deorbit burn attitude, null any residual velocity, dump excess propellant for center-of-gravity control, and maneuver to the Entry Interface (EI) attitude. In case both OMS engines malfunction, the RCS can be used to perform or complete the deorbit burn. In this case, the OMS-to-RCS interconnect will be selected to feed OMS propellant to the four +X RCS thrusters.



-



=

_

Ţ

-

_

Figure 4 - FORWARD RCS HARDWARE BREAKDOWN HIERARCHY

.... --------E 7 ē.



Figure 5 - AFT RCS HARDWARE BREAKDOWN HIERARCHY



-

_

_

Figure 6 - FORWARD RCS EPD&C BREAKDOWN HIERARCHY



Figure 7 - AFT RCS EPD&C BREAKDOWN HIERARCHY

-

•



Figure 8 - FORWARD RCS SCHEMATIC

.



Figure 9 - AFT RCS SCHEMATIC

Once the deorbit burn is completed, the vehicle is maneuvered to the EI attitude.

From EI (400,000 ft) to approximately 262,000 ft, the vehicle is controlled in roll, pitch, and yaw with the ARCS jets. The GPCs disable the roll thrusters below this altitude, since the vehicle is captured and stable in the roll axis. Shortly after entering blackout, the pitch thrusters are disabled. From this time on, the elevons are used to control pitch and banking. The yaw thrusters are still used to assist the rudder. This mode of control will be used until the vehicle slows to Mach 1 where the yaw thrusters are disabled. Total vehicle control is then accomplished by the aerodynamic control surfaces through landing.

3.1.1 Helium Pressurization Subsystem

The pressurization subsystem regulates and distributes helium to the propellant tanks. This subsystem consists of two helium storage tanks, isolation valves, pressure regulators, check valves, and the lines necessary for filling, draining, and distributing the helium.

3.1.1.a Helium Storage Tanks

The high pressure helium supply is contained in two 1.761 cubic ft spherical storage tanks in each module. The tanks are made of a titanium liner overwrapped with fiberglass. One tank supplies helium pressure to the fuel propellant tank while the other helium tank supplies pressure to the oxidizer propellant tank. The helium tank's maximum operating pressure is 4000 psig and is proof-pressure tested to 4480 psig.

3.1.1.b Helium Isolation Valve

For each propellant there are two helium isolation valves in parallel between the helium tanks and the pressure regulators which are used to isolate the highpressure gaseous helium from the remainder of the pressurization subsystem (Figure 10).

The helium isolation values are operated by two solenoids, one of which is momentarily energized to magnetically latch the value open. The second solenoid magnetically unlatches the value, allowing spring and helium pressure to force the value closed.

The switching logic for the helium isolation values is contained in the Forward and Aft Load Control Assemblies (FLCA and ALCA). Solenoid and power logic is provided by the Power Control Assemblies (PCA), which are located within the LCAs. The LCAs and PCAs must be powered up in order to operate the helium isolation values.



The helium isolation valves are controlled by the FWD RCS, AFT LEFT RCS, and AFT RIGHT RCS HE PRESS A/B switches on panels 07 and 08. These are permanent position switches (OPEN, GPC, CLOSE), but only apply momentary power to the solenoid due to the logic in the LCA. Each switch controls two isolation valves, one in the helium oxidizer line and one in the helium fuel line.

These valves contain microswitches which are activated when the valves are fully open or closed. When commanded, the switch logic allows a one-second delay for the valves to reach the command position before sending a position indication signal to the GPCs, telemetry, and a position indicator (talkback) above each switch. Power is then removed from the solenoids. The talkback logic displays barberpole when the valves are in motion or when there is a position mismatch between the fuel and oxidizer helium valves. Otherwise, the talkback shows OP for open valves and CL for closed valves.

The GPC can command the isolation valve to open and close to maintain the system pressurization and to prevent overpressurization when the isolation valve switch is in the GPC position. In the event of a switch failure in the GPC position, the crew can open or close the valves using the GPC memory read/write procedures.

The valve's nominal operating pressure is 200 to 4000 psig and limits the flow to 81 scfm.

3.1.1.c Pressure Regulator Assembly

Helium pressure regulation is accomplished by two regulator assemblies connected in parallel and located downstream of each helium isolation valve (Figure 11). Each assembly contains two regulators, primary and secondary, connected in series so that if the primary regulator fails open, the secondary regulator can regulate the pressure within acceptable limits. The regulators cannot be controlled manually or by the GPC.

The primary and secondary regulators regulate the tank pressure to 245 psig and 256 psig, respectively. The flow rate is limited to 81 scfm for 500 to 1400 psig inlet pressure, and 150 scfm for 1400 to 4000 psig inlet pressure.

3.1.1.d Check Valve Assembly

A check valve assembly, located between the pressure regulator assemblies and each relief valve, is used to preclude backflow of helium or propellant vapors or

liquids (Figure 12). Each assembly contains four independent check valves connected in series-parallel. The check valves cannot be controlled manually or by the GPC.

The valve's normal operating pressure is 355 psig, with a maximum of 370 psig.

3.1.2 Propellant Storage and Distribution Subsystem

The propellant subsystem distributes the fuel and oxidizer to the thrusters. This subsystem consists of propellant tanks, pressure relief valves, tank isolation valves, crossfeed valves, manifold isolation valves, and the lines and couplings necessary for filling, draining, and distributing the propellant.

3.1.2.a Propellant Tanks

 Each RCS module contains two titanium 39.2-inch spherical propellant tanks, one for fuel and one for oxidizer (Figure 13). Each tank contains an internally-mounted surface-tension screen Propellant Acquisition Device (PAD) which acquires and delivers the propellant to the RCS thrusters on demand. The surfacetension device also prevents the helium pressurant gas from entering the propellant or the propellant distribution lines prior to propellant depletion. The forward propellant tanks have PADs which are designed to operate primarily in a low-g environment. The aft propellant tanks are designed to operate in both high and low-g regimes.

3.1.2.b Pressure Relief Valve Assembly

The helium pressure relief valve assembly is located between each check valve assembly and the propellant tank, and will vent excess pressure overboard before it can over pressurize the propellant tanks (Figure 14). The assembly consists of a burst diaphragm, filter, and relief valve. The burst diaphragm is of the nonfragmentation type, but the filter is further insurance that fragmentation or particles will not reach the relief valve seat. The relief valve cannot be controlled manually or by the GPC.

The burst disk ruptures at 332 psig. The relief valve reseats at 310 psig.

3.1.2.c Tank Isolation, Crossfeed, and Manifold 1/2/3/4 Isolation Valves

The RCS propellant tank isolation, crossfeed, and manifold 1/2/3/4 isolation values are all AC motor values. Once a value reaches the open or closed



Figure 11 - HELIUM PRESSURE REGULATOR ASSEMBLY



Figure 12 - QUAD CHECK VALVE ASSEMBLY

19



Figure 13 - AFT AND FORWARD RCS PROPELLANT TANKS

ORIGINAL PAGE IS OF POOR QUALITY



ł

-

Figure 14 - PRESSURE RELIEF VALVE ASSEMBLY

position, an open or close microswitch is automatically activated to remove AC power from the valve motor. A signal is also sent to the GPC, to the ground, and to the valve position indicator (talkback), located above each switch. The talkback logic displays barberpole when the valves are in motion or when there is a position mismatch between the fuel and the oxidizer valves. Otherwise, the talkback shows "OP" for open valves and "CL" for closed valves.

The tank isolation values are located between the propellant tanks and the manifold isolation values, and are used to isolate the propellant tanks from the remainder of the subsystem (Figure 15).

The tank isolation values are AC motor-operated and contain a lift-off ball-flow control device. For each module, one value isolates each propellant tank from the 1/2 manifold. Two values in parallel isolate each propellant tank from the 3/4/5 manifold line in the aft modules, and one value isolates each propellant tank from the 3/4/5 manifold line in the forward module.

The tank isolation valves are controlled by the FWD RCS, AFT LEFT RCS, and AFT RIGHT RCS TANK ISOLATION 1/2 and 3/4/5 switches on panels 07 and 08. These are permanent position switches (OPEN, GPC, CLOSE). Switch logic, relay logic, and motor logic for the isolation valves are contained in the Forward and Aft Motor Control Assemblies (FMCA and AMCA). Therefore, it is necessary to have the MCAs powered up to operate the tank isolation valves.

=

The FRCS tank isolation valves are normally maintained open throughout the mission with the switch in the open position. The ARCS tank isolation valves are in the GPC position. With the switch in the GPC position, the logic in the MCA is designed to receive computer commands to control the valves. The GPC reconfigures the aft tank isolation valves and the RCS and OMS crossfeed valves in case of OMS-to-RCS interconnect, or for RCS/RCS crossfeed operations. Manual configuration is required in the case of manual RCS/RCS crossfeed and on orbit/deorbit OMS-to-RCS interconnect. In the event of a switch failure in the GPC position, the crew can open or close the valves using GPC memory read/write procedures.

The RCS crossfeed values are contained only in the ARCS pods, and are used to isolate the RCS propellant cross-feed lines from the OMS interconnect lines (Figure 15). They are located between the tank isolation values and the manifold isolation values.

ORIGINAL PAGE IS OF POOR QUALITY



-

573

i≓i

Figure 15 - AC MOTOR VALVE

The RCS crossfeed values are AC motor-operated and contain a lift-off ball-flow control device. One pair of values, one fuel and one oxidizer value, isolate the RCS crossfeed lines from the 1/2 propellant lines. One pair of values isolate the RCS crossfeed lines from the 3/4/5 propellant lines. The RCS crossfeed values are

controlled by the LEFT, RIGHT RCS CROSSFEED 1/2 and 3/4/5 switches on panel 09. These are permanent position switches (OPEN, GPC, CLOSE). Switch logic, relay logic, and motor logic for the isolation valves are contained in the AMCA. Therefore, it is necessary to have the MCAs powered up to operate the RCS crossfeed valves.

The RCS crossfeed valves are normally maintained closed throughout the mission, with the switch in the GPC position. With the switch in the GPC position, the logic in the MCA is designed to receive computer commands to control the valves. The GPC reconfigures these valves, the OMS crossfeed valves, and the tank isolation valves in case of OMS-to-RCS interconnect during aborts, or for RCS/RCS crossfeed operations. Manual configuration is required in the case of manual RCS/RCS crossfeed and on orbit/deorbit OMS-to-RCS interconnect. In the event of a switch failure in the GPC position, the crew can open or close the valves using GPC memory read/write procedures.

The primary manifold isolation values are located between the tank isolation values, downstream of the RCS crossfeed values, and the primary thrusters (Figure 15). They are used to isolate the primary thrusters from the propellant subsystem.

The primary manifold isolation valves are AC motoroperated and contain a lift-off ball flow control device. For each module, one valve isolates each manifold from each propellant. The primary manifold isolation valves are controlled by the FWD RCS, AFT LEFT RCS, and AFT RIGHT RCS MANIFOLD ISOLATION 1, 2, 3, and 4 switches on panels 07 and 08. These are permanent position switches (OPEN, GPC, CLOSE). Switch logic, relay logic, and motor logic for the isolation valves are contained in the FMCA and AMCA. Therefore, it is necessary to have the MCAs powered up to operate the manifold isolation valves.

Redundancy Management (RM) is used to monitor the microswitches in these valves, and can cause the valves to be declared closed, and the jets on that manifold to be removed from the Jet Available Table. The crew can override the RM by CRT keyboard entries and reselect the manifold and its jets.
The primary manifold isolation valves are normally maintained open throughout ascent and entry, with the switch in the GPC position. With the switch in the GPC position, the logic in the MCA is designed to receive computer commands to control the valves. These valves are controlled by the GPC during aborts and are controlled by RM at all times. In the event of a switch failure in the GPC position, the crew can open or close the valves using GPC memory read/write procedures.

3.1.2.d Vernier Manifold Isolation Valves

The vernier manifold isolation valves are located between the tank isolation valves, downstream of the RCS crossfeed valves, and the vernier thrusters (Figure 16). They are used to isolate the thrusters from the propellant subsystem.

The vernier manifold isolation valves are DC solenoid operated. One valve isolates each vernier manifold from each propellant. The manifold isolation valves are controlled by the FWD RCS, AFT LEFT RCS, and AFT RIGHT RCS MANIFOLD 5 ISOLATION switches on panels 07 and 08. These are momentary position switches (OPEN, GPC, CLOSE). Switch logic for the vernier manifold valves is contained in the FLCA and ALCA. Solenoid logic and power logic is provided by the Power Control Assemblies (PCAs). Therefore, it is necessary to have the LCAs powered up to operate the manifold isolation valves.

The circuitry to control the valve has been changed since 51-L (Figure 17). The switches have been changed from permanent position switches to momentary switches. To prevent effects of an internal short in the switch, diodes have been added to direct the current to ground (thus blowing the associated fuse). A circuit breaker and a Type IV hybrid driver have been added for additional circuit control. The driver can receive commands from either the switch panel or the GPC. These changes have been implemented to prevent continuous power from being applied to the solenoids. Continuous power to these solenoids have been found to cause valve overheating thus fuel decomposition leading to valve rupture and propellant release.

Once a valve reaches the open or closed position, a microswitch is automatically closed to remove DC power from the valve solenoid. A signal is also sent to the GPC, to the ground, and to the valve position indicator (talkback) located above each switch. The talkback logic displays barberpole when the valves are in motion or when there is a position mismatch between the fuel and the oxidizer valves. Otherwise, the talk-

ORIGINAL PAGE IS OF POOR QUALITY



Figure 16 - VERNIER MANIFOLD ISOLATION VALVE



. .



back shows "OP" for open valves and "CL" for closed valves. Redundancy Management (RM) is used to monitor the microswitches in these valves, and can cause the valves to be declared closed, and the vernier jets to be deselected. The crew can override the RM by CRT keyboard entries and reselect the vernier jets.

The vernier manifold isolation valves are normally maintained open throughout orbit and closed during ascent and entry, with the switch in the GPC position. With the switch in the GPC position, the logic in the LCAs and PCAs is set up to receive computer commands to control the valves. The GPC controls these valves by RM at all times. In the event of a switch failure in the GPC position, the crew can open or close the valves using the GPC memory read/write procedures.

3.1.3 Thruster Subsystem

The RCS jet thrusters are pressure-fed, bipropellant, hypergolic engines. There are two types of thrusters in the Shuttle: the primary thrusters, and the vernier thrusters (Figure 18). Both types of thrusters contain a fuel and oxidizer bipropellant solenoid valve, injector head assembly, combustion chamber, expansion nozzle, and an electrical junction box and can be operated in either pulse mode or steady-state mode.

_

3.1.3.a Bipropellant Valves

The bipropellant control valves control the flow of propellants to the thrusters by opening and closing in response to electrical fire commands (Figure 19). Each primary jet engine assembly contains two injector solenoid pilot poppet valves, one for fuel and one for oxidizer. They are operated by coaxially-wound coils which are energized open by a fire command, and are spring-loaded closed. When the pilot valves open, the propellant's hydraulic pressure opens the main poppet valves to allow the propellants into the injector. The vernier jets use single-stage, solenoid-operated poppet valves.

The fuel and oxidizer values on the primary jet thrusters are mechanically linked. The pilot value is activated by a 80 msec pulse sent from the Reaction Jet

Driver. Commands are issued every 80 msec, so the minimum on or off time is 80 msec. The vernier bipropellant valves are operated similarly by a mechanically linked torque motor.

During normal operations, if the isolation and manifold valves are properly configured, a fire command to a jet



Figure 18 - VERNIER AND PRIMARY THRUSTERS



Figure 19 - PRIMARY AND VERNIER THRUSTER VALVES

will cause that jet's bipropellant values to open. Removal of the fire command will cause the bipropellant values to close.

3.1.3.b Injector Head Assembly

Each RCS jet contains an injector head assembly which directs the propellant flow from the bipropellant control valves to the combustion chamber (Figure 20). The injector is welded to the combustion chamber.

For the primary jets, injector holes are arranged in two concentric rings (outer fuel, inner oxidizer) which are canted to cause impingement of the hypergolic propellants within the combustion chamber. Separate fuel holes near the outer edge of the injector plate provide cooling for the combustion chamber wall. Spaced between these fuel inlet holes are acoustic cavities which are of varied depth to prevent acoustic resonance when the jet is fired.

For the vernier jets, fuel and oxidizer enter the combustion chamber through a single pair of injector holes which are also canted to provide impingement of the fuel and oxidizer streams for combustion. The combustion chamber wall is cooled by making the fuel stream more divergent than the oxidizer stream.

Unlike stream impingement is used to improve propellant mixing in the combustion chamber with a mixture ratio of 1.6 lbs oxidizer to 1.0 lbs fuel for both the primary and vernier jets.

The primary jets operate at 152 psia, produce 870 lbs (vacuum) thrust, and have a specific impulse of 280 seconds. The vernier jets operate at 106 psia, produce 25 lbs (vacuum) thrust, and have a specific impulse of 265 seconds.

3.1.3.c Combustion Chamber and Nozzle

The combustion chamber and nozzle are made of columbium C-103 with a R512A Disilicide coating 0.003-inches thick. Behind the columbium is Dynaflex molded insulation covered with 0.02-inch thick titanium on the outside.

3.1.4 Electrical Power Distribution and Control Subsystem

3.1.4.a Electrical Junction Box

The electrical junction box on each RCS thruster contains an electric heater and thermostat, a chamber pressure transducer, a propellant leak detection



Figure 20 - INJECTOR HEAD ASSEMBLY

device, and the electrical connections to the bipropellant valves. The electrical heater contains one heating element and is thermostatically controlled.

The thermostat is set to a predetermined range, and will regulate the on and off cycles of the heater as

long as voltage is present. The heaters are controlled by the RCS/OMS HEATERS switches on panel A14. These are two-position switches, OFF and AUTO, and the heater is controlled by the thermostat when this switch is in the AUTO position.

3.2 Redundancy Management

The RCS Redundancy Management (RM) monitors the RCS jets' chamber pressures, temperatures, reaction jet driver output discretes and jet fire commands, and manifold valves status. It also provides a limited amount of automatic jet deselection and alerts the crew when a fault is detected.

The Data Processing System (DPS) software provides status information on I/O errors to the RCS RM software, referred to as commfaults (communications faults). Commfault indicators are set as the result of bus masking, Bus Control Element (BCE) bypasses, and Bus Terminal Unit (BTU) bypasses. When an I/O error is detected on a BCE chain by any GPC, the data on the entire chain is flagged as invalid (commfaulted) for the applications software. On subsequent transactions, if the problem is isolated, only the faulty element is flagged as invalid. In a similar way, if a bus mask is set all BCEs and data associated with that bus is indicated via commfault as being in error. In any case, the commfault will be set or latched when it is present for two consecutive passes.

Commfaults are included in the RCS RM requirements to help prevent the redundant GPCs from moding to dissimilar software, to optimize the number of jets available for use, and to prevent the RCS RM from generating additional alerts to the Flight Control Operational Software (FCOS) generated alerts associated with commfaults. The RCS RM uses the MDM and Line Replaceable Unit (LRU) commfaults (where LRU is defined to be either one RCS jet or one RCS manifold), and will reconfigure for commfaults, regardless of whether the commfault is permanent, permanent and subsequently removed, or transient. The MDM and LRU commfaults are set in the FCOS software when a commfault is present for two cycles. There are 44 jet LRU commfaults and 15 manifold LRU commfaults.

All input signals associated with any one LRU (where LRU is defined as either one RCS jet or one RCS manifold) will be within the same BCE, and the FCOS will set a BCE flag for a BCE if it determines an I/O problem at the BCE level. This flag will be used by the manifold status monitor in determining the commfault state of the RCS LRU, and/or input signals for the LRU. A jet

with an LRU commfault will not have any of its status flags or counters modified as long as the fault exists, except by subsequent crew action. An MDM commfault will set all LRU commfaults for each BCE associated with the MDM commfault, thus suspending the operation of the RCS RM failure monitors. An I/O reset on a CRT keyboard will reset any latched commfaults. LRU commfaults or transducer failures will cause the quantity monitor to use substitute measurements or constants, and the CRTs will shown on "M" to indicate missing data. If a substitute is not available or a constant is used, the calculations are suspended, a down arrow appears on the CRT, and a class 3 alarm is output.

All input signals associated with an LRU are required to be within the same BCE. The input signals associated with each RCS jet are a chamber pressure discrete, fuel and oxidizer injector temperatures, and reaction jet driver output discrete. The input signals associated with each manifold are the open and close discretes for the fuel and oxidizer manifold isolation valves.

3.2.1 Jet Failed-On Monitor

The Jet Failed Monitor uses the Reaction Jet Driver (RJD) output discretes and the jet fire command discretes provided by the RCS CMD SOP to detect jets failed on.

The Jet Failed-On Monitor uses the jet fire command A discretes, the reaction jet driver output discretes, the jet RM inhibit discretes, and the jet LRU commfault discretes as inputs, and outputs the jet failed-on indicator discretes and the jet failed on counter discretes. There are 44 of each of these discretes.

The Jet Failed-On Monitor's logic ANDs the reaction jet driver output discrete with the complement of the jet firecommand A discrete, and declares the jet failed-on if this calculation is true for three consecutive cycles. Consecutive passes are not affected by commfaults or by cycles in which there are fire commands for the affected jets. The three consecutive cycle logic will be reset; however, if the noncommanded jet has its reaction jet driver output discrete reset to indicate the jet is not firing. A jet failed-on declaration will not cause automatic deselection of the jet by RM, nor will the Digital Autopilot (DAP) reconfigure the Jet Priority Table.

A jet failed-on determination will set the jet failed-on indicator discrete and the jet failed-on counter discrete. These discretes will be reset when the associated jet's RM inhibit discrete is reset. The Jet Failed-On Monitor outputs the jet failed-on indicators to displays and controls and to the Jet Fault Limit Module.

È 📕

The Jet Failed-On Monitor's design is valid for a minimum jet fire command pulse of 80 msec on and 80 msec off. The crew will be alerted by a class 2 alarm, the backup C&W

lights and RCS jet light on the C&W matrix on panel F7, a fault message on the CRT fault message line, and jet-on indications on the RCS SPEC display and the GNC SYS SUM 1 and 2 displays.

The Jet Failed-On Monitor is active in OPS 1, 2, 3, 6, and 8 in the PASS, and 1, 3, and 6 for the BFS, but only if BFS is engaged.

3.2.2 Jet Failed-Off Monitor

-

.

14.11

The Jet Failed-Off Monitor uses the jet fire command discretes provided by the RCS Command SOP, and the jet chamber pressure feedback discretes provided by the RJDs to detect jets failed off.

The Jet Failed-Off Monitor uses the jet fire command A discretes, the jet chamber pressure discretes, the jet RM inhibit discretes, and the jet LRU commfault discretes as inputs, and outputs the jet failed-off indicator discretes and the jet failed-off counter discretes. There are 44 of each of these discretes.

The Jet Failed-Off Monitor's logic ANDs the jet fire command A discrete with the complement of the jet chamber pressure discrete, and declares the jet failed off if this calculation is true for three consecutive cycles. Consecutive passes are not affected by commfaults or by cycles in which there are no fire commands for the affected jets. However, consecutive passes leading to a failed-off indication must begin anew if, prior to reaching the third consecutive cycle, the fire command and its associated pressure discrete indicates that the jet has fired. The RCS RM will automatically deselect a jet which has failed off, and the DAP will reconfigure jet selection accordingly. (See section 3.6.1 for the DAP Jet Select Logic description.)

A failed-off jet determination will set the associated jet failed-off indicator and the jet failed-off counter discretes. These discretes will be reset when the associated jet's RM inhibit discrete is reset. The Jet Failed-Off Monitor outputs these jet failed-off indicator discretes to the Jet Fault Limit Module and to displays and controls. The Jet Failed-Off Monitor will be inhibited for the jet which has failed off until the crew resets the RM inhibit discrete.

The Jet Failed-Off Monitor design is valid for a minimum jet fire command pulse mode of 80 msec on and 80 msec off. The crew is alerted to a failure by a class 2 alarm, the backup C&W light and RCS jet light on the C&W matrix on panel F7, a fault message on the CRT fault message line, and a jet-off indication on the RCS SPEC display and the GNC SYS SUM 1 and 2 displays. The Jet Failed Off Monitor is active in OPS 2, 3, 6, and 8 in the PASS, and 1, 3, and 6 for the BFS, but only if BFS is engaged.

3.2.3 Jet Leak Monitor

The Jet Leak Monitor uses the jet fuel and oxidizer injector temperature transducer outputs of each jet to detect a leaking jet.

The Jet Leak Monitor uses the jet fuel and oxidizer injector temperatures, the jet RM inhibit discretes, and the jet LRU commfault discretes as inputs, and outputs the jet failed leak indicator discretes and the jet failed leak counter discretes. There are 44 of each of these discretes.

The Jet Leak Monitor's Logic compares the jet fuel and oxidizer injector temperatures with the specified temperature limit of 30 degrees F, and declares the Jet Failed Leak if either of the temperatures are less than 30 degrees F for three consecutive cycles. Consecutive passes leading to a Jet Failed Leak indication will begin anew if the fuel and oxidizer temperatures are both greater than 30 degrees F before the jet leak counter reaches three. The RCS RM will automatically deselect a jet which is declared leaking and the DAP will reconfigure jet selection accordingly.

A Jet Failed Leak determination will set the associated jet failed leak indicator and jet failed leak counter discretes. These discretes will be reset when the associated jets RM inhibit discrete is reset. The Jet Leak Monitor outputs the Jet Failed Leak indicator discretes to the Jet Fault Limit Module and to crew displays.

The crew is alerted to a failure by a class 2 alarm, the backup C&W light and the RCS jet light on the C&W matrix on panel F7, a fault message on the CRT fault message line, and a Jet Failed Leak indication on the RCS SPEC display and the GNC SYS SUM 1 and 2 displays.

The Jet Leak Monitor is active in OPS 2, 3, and 8 for the PASS, and 1, 3, and 6 for the BFS, but only if BFS is engaged.

.

3.2.4 Jet Fault Limit Module

The Jet Fault Limit module limits the number of jets which can be automatically deselected in response to failures detected by RCS RM. The limits are modifiable by crew input on the RCS SPEC display (RCS F, L, R Jet Fail Limit integers - one integer per pod). This module also reconfigures a jet's availability status (jet deselect output discretes (44)) in response to crew inputs on the RCS SPEC display (jet RM inhibit discretes (44) and jet deselect input discretes (44)). An automatic deselection of a jet occurs if all of the following are satisfied:

- Jet Failed-Off or Jet Failed Leak (Jet Failed-On failures do not result in automatic deselection)
- o Jet select/deselect status is "SELECT"
- o Jet's manifold status is "OPEN"
- o RM is not inhibited for this jet
- o Jet failure has not been overridden
- The number of automatic deselections of primary jets on this pod is less than the associated Jet Fail Limit (no limit on vernier jets)

All jet failures detected will be announced to the crew even if they do not cause automatic jet deselection. If multiple failures occur on a jet, only the last failure will be annunciated. Failure indicators are the same as in the Jet Failed Off and Jet Failed Leak Monitors.

The jet fail limit counter is incremented by the number of jets which have been automatically deselected for that pod by the RCS RM and is decremented by one for each automatically deselected jet that is reselected. The vernier jets do not increment or decrement the jet fail limit The Jet Fail Limit valves are individually counter. changeable in major modes 2 and 3 on the RCS SPEC display. An increase in the Jet Fail Limit allows previously failed jets to be deselected, providing the above requirements are A decrease in the Jet Fail Limit will not cause a met. change in the status of any jet. Note that setting the Jet Fail Limit equal to or less than the number of jets which have been automatically deselected will effectively inhibit the RCS RM for that pod.

A jet's status can be changed from deselect to select only by item entry on the RCS SPEC page. Failure resets or reductions in the Jet Fail Limit will not cause the status to be reset to select. The select item entries cause the override to be invoked if there is a declared failure for that jet, and will make those failures inoperative in the Jet Fault Limit module. An overridden failure will remain overridden until the applicable failure is reset.

k....

Automatic deselection of a jet can be prevented by the use of the Inhibit item entries on the RCS SPEC page. Changing the Inhibit to Not Inhibited will reset a jet's failures, but will not cause the Jet Fail Limit to be incremented or decremented. Reset by use of the RM Inhibit of a failure which has been overridden will reset the override. Jet failures are unordered; that is, if there are more candidates for automatic deselection than is permitted by the Jet Fail Limit, there is no preference as to which of the candidates will be deselected.

3.2.5 Manifold Status Monitor

The Manifold Status Monitor uses the open and close discretes of the oxidizer and fuel manifold isolation valves (provided by the monitor control assemblies) to determine the open/close status for each jet manifold.

The Manifold Status Monitor uses the fuel and oxidizer manifold valve open discretes (15 of each discrete), the fuel and oxidizer close discretes (15 of each), the manifold status discrete (15 discretes), the manifold LRU commfault discretes (15 discretes), the MDM commfault discretes (8 discretes), and the manifold status override discrete (one discrete) as inputs, and outputs the manifold open/close status discretes (15 discretes), the RCS manifold RM dilemma discretes (15 discretes), and the RM power fail discrete (one discrete).

The Manifold Status Monitor monitors the open and close discretes for each manifold for any changes of state. A change of state in any one or more of these discretes will cause a redetermination of that manifold's open/close status, independent of status changes made by the crew. This redetermination also contains logic which will determine if a power failure has occurred and will determine whether a dilemma exists on a manifold (tables 3-I and 3-II). A power failure condition exists when all of the open and close discretes on a manifold are false for three consecutive cycles, and will cause the RM Power Fail Flag to be set. The manifold sets identified in Table 3-II are the only manifolds which require power failure determination. This flag will remain set until the GNC FDA module honors it, when it will then be reset. There is only one RM Power Fail Flag and all manifolds are capable of setting it, but each can set the flag only once. Whenever a dilemma exists for three consecutive passes, the RCS manifold RM Dilemma Flag for that manifold will be set. MDM or LRU commfaults will not modify the dilemma pass counter or the RM Dilemma The flag will be reset, however, if any of the four Flag. manifold open/close discretes change state.

The transition of an MDM commfault discrete from false to true will cause the status of all affected manifolds to be set to close in all major modes. In major mode 1, the same is true of an LRU commfault. In major modes 2 and 3, the transition of an LRU commfault will cause no change in manifold statuses.

The crew is able to override the status of all manifolds on an individual basis by item entries on the RCS SPEC display via the Manifold Status Override. The setting of this discrete for a manifold will change the manifold's status to its complementary state and will then reset the discrete. The use of the Manifold Status Override feature will not inhibit or modify any of the other functions of the manifold

status monitor. The module will continue to honor subsequent changes in the affected manifold's input signals (open/close discretes, commfaults, override discrete) as specified in this section.

The Manifold Close Status Override is used in Major Modes 1 and 3 open all manifolds whose status is closed and whose open/close discretes are in dilemma. This discrete can be set by item entry on the Override page, and will be reset to false after the reconfiguration is complete. The use of the Manifold Close Status Override feature will not inhibit or modify any of the other functions of the Manifold Status Monitor.

3.2.6 Available Jet Status Table

The Available Jet Status table module provides a list of jets available for use to the Jet Select Logic Module in the Flight Control System software.

The Available Jet Status Table uses the manifold open/close discretes (15 discretes) from the Manifold Status Monitor, and the jet deselect output discretes (44 discretes) from the Jet Fault Limit Module as inputs, and outputs the jet available discretes (44 discretes) and the jet status change discrete (one discrete).

The Available Jet Status Table's logic "AND"s the jet deselect output discrete with the manifold open/close status discrete and statuses a jet as available to the Flight Control System if the discretes indicate select and open, respectively. The Available Jet Status Table will be computed each time that the jet status change discrete is true.

In the BFS, jet failures are detected only when BFS is engaged. The Jet Failed Leaking and Jets Failed-Off detection in the BFS is the same as in the PASS, but the jet chamber pressure feedback discrete is used for Jet Fail-On detection in the BFS rather than the RJD output discrete which is used in the PASS.

3.3 Interfaces and Locations

The RCS interfaces with the following systems: Data Processing System, Displays and Controls, Caution and Warning, Orbital Maneuvering System, Electrical Power Distribution and Control, and the Pulse Code Modulator. In addition, the RCS interfaces with the crew.

3.3.1 Data Processing System

The RCS sends data consisting of pressures, temperatures, and valve positions to the Data Processing System (DPS) through the flight-critical Multiplexer Demultiplexers (MDMs) to have the data processed by the GPCs. The GPCs use this data to monitor and display the configuration and status of the RCS. The GPCs also provide valve configuration commands to the RCS and jet on/off commands to the RCS via the Reaction Jet Drivers Aft and Forward (RJDA and RJDF).

The Flight Control software uses the RCS Digital Automatic Pilot (DAP) to hold attitude or to accomplish an attitude maneuver by virtue of an error correction method. The State Estimator takes IMU data from the Attitude Processor software (ATT PROC), filters it, and sends it to a module called RCS Errors Phase Plane. In the RCS Errors module, attitude commands coming from the hand controller or from the Universal Pointing software (which runs the display by the same name) are compared with the actual attitude as computed by the State Estimator. The result is an attitude error and rate error which are passed on to the Phase Plane module. The Phase Plane Module generates positive or negative rate commands for each axis. These commands are sent to the RCS Activity Lights and to the Jet Select module.

The Jet Select Module uses a look-up table to determine how many jets are needed from each directional cluster. (A "directional cluster" is a group of jets located within the same pod, forward, left, or right, which provide thrust in the same axis and direction.) There are several such tables which take into account jet failures, propellant feed constraints, and usage of OMS propellant. A Jet Priority Table is used to determine the particular jets to be fired. Each jet in a directional cluster is assigned a priority permission. If RCS RM removes a jet from the Available Jet Status Table, the jet will be removed from the Jet Priority Thus, the Jet Select Module logic will automatically Table. select the next highest priority jet in that directional cluster. The crew has the capability to change a jet's priority on the Jet Priority Table or to override RM deselection of a jet from the Available Jet Status Table.

3.3.2 Displays and Controls

RCS data is sent to the Displays and Controls (D&C) to be displayed on dedicated displays. Switches and circuit breakers in the D&C panels are used for manual valve configuration and power routing to the RCS.

3.3.3 Caution and Warning

A selected portion of the RCS parameters are sent to the Caution and Warning (C&W) unit, where they are limit sensed to determine if RCS anomalies exist. If system anomalies are found, the C&W issues signals that illuminate the proper light on the C&W panel, the master alarm pushbutton indicators (pbis), and turn on the C&W tone.

3.3.4 Orbital Maneuvering System

The ARCS modules are connected with each other and with the OMS by propellant interconnect lines so that either or both OMS module's propellants can be fed to either or both of the ARCS modules.

3.3.5 Electrical Power Distribution and Control System

The Electrical Power Distribution and Control System (EPD&C) provides both AC and DC power to the RCS.

3.3.6 Pulse Code Modulator

Data from the RCS is routed through the Input/Output (I/O) MDMs to the Pulse Code Modulator (PCM) for incorporation in the telemetry downlink to be sent to the ground and to the onboard recorders.

3.3.7 Crew

The crew monitors and controls the RCS performance through CRT displays, fault messages, keyboard item entries, C&W indications, and associated switches and indicators.

3.4 Hierarchy

-

Figures 4 through 7 illustrate the hierarchy of the RCS hardware components. Figures 8 through 20 depict the functional details of the RCS subsystem components.

4.0 ASSESSMENT RESULTS

The IOA analysis of the RCS hardware initially generated two hundred eight (208) failure mode worksheets and identified one hundred forty-one (141) potential critical items (PCIs) before starting the assessment process. The EPD&C subsystem analysis initially generated two thousand sixty-four (2064) worksheets with four hundred forty-nine (449) PCIs. These analysis results along with additional analysis results generated during the assessment (Appendix E) were compared to the proposed NASA baseline of ninety-nine (99) hardware and five hundred twenty-four (524) EPD&C FMEAs, and sixty-two (62) hardware and one hundred forty-four (144) EPD&C CIL items. IOA mapped one hundred sixty-six (166) hardware and five hundred ninety-seven (597) EPD&C FMEAs, and one hundred thirty-three (133) hardware and one hundred sixteen (116) EPD&C CILs and PCIs into the NASA FMEAS and CILs. Upon completion of the assessment, and after discussions with the NASA subsystem manager, ninety-six (96) hardware issues, eighty-three (83) of which concern CIL items or PCIs, and two hundred eighty (280) EPD&C issues, one hundred fifty-eight (158) of which concern CIL items or PCIs, remain unresolved. Each of these unresolved issues are presented in subsequent section 4 paragraphs as well as in the detailed assessment worksheets (Appendix C). Any IOA issues which were resolved with the NASA subsystem manager are documented as such on the detailed assessment worksheets, but are not discussed in section 4.

Appendix C presents detailed assessment worksheets for each failure mode identified and assessed. These worksheets detail the assessments of each failure mode and document unresolved issues, resolved issues, plus any additional non-issue recommendations and comments. Appendix D highlights the IOA recommended critical items list and corresponding IOA worksheet ID. Appendix E contains IOA analysis worksheets supplementing previous analysis results reported in Space Transportation System Engineering and Operations Support (STSEOS) Working Paper No. 1.0-WP-VA86001-27, Analysis of the Reaction Control System, January 19, 1987. Appendix F provides a cross reference between the NASA FMEAs and corresponding IOA worksheet(s) along with IOA recommendations and an issues "flag" to denote the FMEAs with which IOA has unresolved Appendix G identifies IOA analysis worksheets that have issues. been superseded by the re-analysis shown in Appendix E.

=

Ξ

Following the hierarchy breakdown shown in Figures 4-7, the RCS assessment results are summarized in the tables below.

Tables I-A.1, I-B.1, I-A.2, and I-B.2 present summaries of the IOA FMEA assessments for the forward RCS hardware, forward RCS EPD&C, aft RCS hardware, and aft RCS EPD&C, respectively. The IOA INTL column is the initial number of IOA failure modes for each RCS component. The recommended IOA FMEA baseline (IOA MAP) versus the NASA FMEA baseline, and resulting unresolved issues are presented in the subsequent columns. The unresolved failure mode issues for each RCS component are discussed in the associated section 4 paragraph referenced in the final column. Tables II-A.1, II-B.1, II-A.2, and II-B.2 present summaries of the IOA CIL assessments for the forward RCS hardware, forward RCS EPD&C, aft RCS hardware, and aft RCS EPD&C, respectively. The IOA INTL column is the initial number of IOA PCIs for each RCS component. The recommended IOA CIL baseline (IOA MAP) versus the NASA CIL baseline, and resulting unresolved issues are presented in the subsequent columns. Again, the unresolved failure mode issues for each RCS component are discussed in the associated section 4 paragraph referenced in the final column.

Tables III-A.1, III-B.1, III-A.2, and III-B.2 present summaries of the recommended IOA FMEA baselines for the forward RCS hardware, forward RCS EPD&C, aft RCS hardware, and aft RCS EPD&C, respectively.

Tables IV-A.1, IV-B.1, IV-A.2, and IV-B.2 present summaries of the recommended IOA CIL baselines for the forward RCS hardware, forward RCS EPD&C, aft RCS hardware, and aft RCS EPD&C, respectively.

.

TABLE I-A.1 Summary of IOA FME	A Asses	sment ·	- FRCS	Hardwar	e .	
Components	IOA INTL	IOA MAP	NASA FMEAS	ISSUES	PARAGRAPHS FOR ISSUES	
HE PRESS SUBSYSTEM STORAGE TANK TANK ISOLATION VALVES REGULATOR ASSEMBLIES QUAD CHECK VALVE ASSEMBLY COUPLINGS (SINGLE SEAL) COUPLINGS (DOUBLE SEAL) LINES AND FITTINGS	1 2 6 2 6 2 4	1 5 4 5 4 1	1 2 3 4 2 1	0 5 4 1 2 0	4.1.2.1.A 4.1.2.1.A.1 4.1.2.1.A.2 4.1.2.1.A.3 4.1.2.1.A.4 4.1.2.1.A.4	
PROP STOR & DIST SUBSYSTEM PROPELLANT TANKS PROPELLANT CHANNEL SCREENS PROPELLANT FEEDOUT TUBES PRESSURE RELIEF ASSEMBLIES GROUND MANUAL ISOL VALVES GIMBAL BELLOWS TANK ISOL VALVES MANIFOLD ISOL VLVS, PRIMARY MANIFOLD ISOL VLVS, VERNIER JET ALIGNMENT BELLOWS, PRIMARY JET ALIGNMENT BELLOWS, VERNIER COUPLINGS (SINGLE SEAL) COUPLINGS (DOUBLE SEAL) LINES AND FITTINGS	1 1 2 3 2 6 10 2 2 2 2 2 2 2 4 2 2	1 0 8 2 1 6 5 5 1 0 4 4 1	1 1 0 5 1 1 4 3 1 0 2 2 1	0 1 0 3 1 0 5 4 4 1 0 2 2 0	4.1.2.2.A 4.1.2.2.A.1 4.1.2.2.A.2 4.1.2.2.A.3 4.1.2.2.A.3 4.1.2.2.A.4 4.1.2.2.A.5 4.1.2.2.A.6 4.1.2.2.A.7 4.1.2.2.A.8 4.1.2.2.A.8 4.1.2.2.A.8	
THRUSTER SUBSYSTEM PRIMARY JETS BIPROP SOLENOID VALVES INJECTOR HEAD COMBUSTION CHAMBER OR NOZZLE VERNIER JETS BIPROP SOLENOID VALVES COMBUSTION CHAMBER OR NOZZLE	9 0 1 5 1	6 2 2 3 1	3 0 2 2 1	6 2 0 2 0	4.1.2.3.A 4.1.2.3.A.1 4.1.2.3.A.2 4.1.2.3.A.3	
TOTAL	99	78	49	49		

TABLE I-B.1 Summary of IOA FMEA Assessment - FRCS EPD&C								
Components	IOA INTL	IOA MAP	NASA FMEAS	ISSUES	PARAGRAPHS FOR ISSUES			
HE PRESS SUBSYSTEM					4.1.2.1.B			
CONTROLS								
VALVES								
CONTROLLER	8	4	4	0				
DIODE	16	9	7	5	4.1.2.1.B.1			
DRIVER	12	8	8	2	4.1.2.1.B.2			
FUSE	2	1	1	0				
RESISTOR	16	3	3	2	4.1.2.1.B.3			
SWITCH, TOGGLE	5	2	2	1	4.1.2.1.B.4			
MICROSWITCH	1	1	0	1	4.1.2.1.B.5			
INSTRUMENTATION								
INDICATOR, POSITION	1	1	1	1	4.1.2.1.B.6			
SENSOR, PRESSURE	8	1	1	0				
SENSOR, TEMPERATURE	4	1	1	0				
PROP STOR & DIST SUBSYSTEM					4.1.2.2.B			
CONTROLS								
VALVES								
CONTROLLER	4	4	4	4	4.1.2.2.B.1			
DIODE	197	71	67	27	4.1.2.2.B.2			
DRIVER	38	20	20	20	4.1.2.2.B.3			
FUSE	10	4	4	1	4.1.2.2.B.4			
RELAY	40	12	12	9	4.1.2.2.B.5			
RESISTOR	100	16	16	10	4.1.2.2.B.6			
SWITCH, TOGGLE	35	8	8	3	4.1.2.2.B.7			
MICROSWITCH	8	8	0	8	4.1.2.2.B.8			
CIRCUIT BREAKER	2	2	2	1	4.1.2.2.B.9			
METERS/ROTARY SWITCH	5	4	4	2	4.1.2.2.B.1			
INSTRUMENTATION								
INDICATOR, POSITION	12	6	6	6	4.1.2.2.B.1			
SENSOR, PRESSURE	24	2	2	0				
SENSOR, TEMPERATURE	14	1	1	0				
THRUSTER SUBSYSTEM					4.1.2.3.B			
CONTROLS								
VALVES								
CONTROLLER	24	10	10	5	4.1.2.3.B.1			
DIODE	46	17	12	7	4.1.2.3.B.2			
DRIVER	12	4	4	3	4.1.2.3.B.3			
FUSE	13	4	4	3	4.1.2.3.B.4			
RELAY	6	2	2	2	4.1.2.3.B.			
RESISTOR	80	11	10	1	4.1.2.3.B.			
SWITCH, TOGGLE	42	6	6	5	4.1.2.3.B.7			
SIGNAL CONDITIONER	3	3	2	1	4.1.2.3.B.8			
INSTRUMENTATION								
SENSOR, CONTINUITY	4	4	0	0				
SENSOR, PRESSURE	10	4	2	2	4.1.2.3.B.9			
GENCOD MENDEDAMUDE	1 10	1 4	2	2	4.1.2.3.B.1			

. .

. : : -----

: 🚆

: . . - . . .

45

•

TABLE I-B.1 Summary of IOA FMEA Assessment - FRCS EPD&C (cont'd)								
Components	IOA INTL	IOA MAP	NASA FMEAS	ISSUES	PARAGRAPHS FOR ISSUES			
THERMAL CONTROL SUBSYSTEM THRUSTERS					4.1.2.4.B			
FUSE	5	3	3	0				
HEATER	8	4	4	0				
RESISTOR	10	1	1	0				
SWITCH, THERMAL	12	4	3	2	4.1.2.4.B.1			
SWITCH, TOGGLE	25	4	4	0				
	24	~		-				
FUSE	24	2	2		4.1.2.4.B.2			
LEYLED	12	2	2	0				
PFLAV	12	1 1	1	0				
DESTSTOD	16	2	2	0				
SWITCH TOGGLE	+0	2	2	0				
Carron, rodding	5	4	2	U				
TOTAL	945	287	254	137				

.

TABLE I-A.2 Summary of TOA FW					
	TA ASSes	sment	- ARCS	Hardwa	are
Components	IOA INTL	IOA MAP	NASA FMEAS	ISSUES	PARAGRAPHS FOR ISSUES
HE PRESS SUBSYSTEM STORAGE TANK TANK ISOLATION VALVES REGULATOR ASSEMBLIES QUAD CHECK VALVE ASSEMBLY COUPLINGS (SINGLE SEAL) COUPLINGS (DOUBLE SEAL) LINES AND FITTINGS	1 2 6 2 4 4 4 4	1 5 4 4 7 4 1	1 2 2 3 4 2 1	0 4 3 2 3 2 0	4.2.2.1.A 4.2.2.1.A.1 4.2.2.1.A.2 4.2.2.1.A.3 4.2.2.1.A.4 4.2.2.1.A.4
PROP STOR & DIST SUBSYSTEM PROPELLANT TANKS PROPELLANT CHANNEL SCREENS PROPELLANT FEEDOUT TUBES PRESSURE RELIEF ASSEMBLIES GROUND MANUAL ISOL VALVES GIMBAL BELLOWS TANK ISOL VALVES CROSSFEED VALVES MANIFOLD ISOL VLVS, PRIMARY MANIFOLD ISOL VLVS, VERNIER JET ALIGNMENT BELLOWS, PRIMARY JET ALIGNMENT BELLOWS, VERNIER COUPLINGS (SINGLE SEAL) COUPLINGS (DOUBLE SEAL) LINES AND FITTINGS	1 1 2 3 2 6 6 10 2 2 2 20 8 4	1 0 8 2 1 8 6 5 1 0 4 4 1	1 0 5 1 1 4 4 4 3 1 0 2 2 1	0 1 0 3 1 0 5 3 4 2 0 0 2 2 0	4.2.2.2.A 4.2.2.2.A.1 4.2.2.2.A.2 4.2.2.2.A.2 4.2.2.2.A.3 4.2.2.2.A.3 4.2.2.2.A.4 4.2.2.2.A.5 4.2.2.2.A.6 4.2.2.2.A.7 4.2.2.2.A.8 4.2.2.2.A.8
THRUSTER SUBSYSTEM PRIMARY JETS BIPROP SOLENOID VALVES INJECTOR HEAD COMBUSTION CHAMBER OR NOZZLE VERNIER JETS BIPROP SOLENOID VALVES COMBUSTION CHAMBER OR NOZZLE	9 0. 1 5 1	6 2 2 3 1	3 0 2 2 1	6 2 0 2 0	4.2.2.3.A 4.2.2.3.A.1 4.2.2.3.A.2 4.2.2.3.A.3
TOTAL	109	88	53	47	

47

- ----

Γ

TABLE I-B.2 Summary of IOA FME	A Assess	ment -	- ARCS	EPD&C	
Components	IOA INTL	IOA MAP	NASA FMEAS	ISSUES	PARAGRAPHS FOR ISSUES
HE PRESS SUBSYSTEM					4.2.2.1.B
CONTROLS					
VALVES	16	4	4	0	
CONTROLLER	25	9	7	4	4.2.2.1.B.1
DIODE	24	7	7	2	4.2.2.1.B.2
DRIVER	4	1	1	0	
FUSE	32	3	3	2	4.2.2.1.B.3
RESISTOR	5	2	2	0	
SWITCH, TOGGLE	1	1	0	1 1	4.2.2.1.B.4
				_	
INSTRUMENTATION	1	1	1	1	4.2.2.1.B.J
INDICATOR, POSITION	8	1	1	0	
CENSOR, FRESSOR	4	1	1	0	
SENSOR, This management					4.2.2.2.B
PROP STOR & DIST SUBSYSTEM					
CONTROLS					
VALVES			1	3	4.2.2.2.B.1
CONTROLLER	4	07	93	35	4.2.2.2.B.2
DIODE		0/	25	21	4.2.2.2.B.3
DRIVER	54	25	6	ō	
FUSE		16	16	11	4.2.2.2.B.4
RELAY	40	25	19	19	4.2.2.2.B.5
RESISTOR	139	12	12	4	4.2.2.2.B.6
SWITCH, TOGGLE		9	0	9	4.2.2.2.B.7
MICROSWITCH	2	2	2	2	4.2.2.2.B.8
CIRCUIT BREAKER					
INSTRUMENTATION	8	8	8	8	4.2.2.2.B.9
INDICATOR, POSITION	8	1	1	0	
SENSOR, PRESSURE	4	1	1	0	
SENSOR, TEMPERATORE			-	-	4.2.2.3.B
CONTROLS					
VALVES				2	A 2 2 3 B.1
CONTROLLER	36	6	6		4.2.2.3.5.4
DIODE	90			2	4.2.2.3.B.2
DRIVER	24	6	2		••••
FUSE	19	2	2	l ĭ	4.2.2.3.B.3
RELAY	6		10	Ō	
RESISTOR	122		4	2	4.2.2.3.B.4
SWITCH, TOGGLE		2	2	ō	
SIGNAL CONDITIONER	4				
INSTRUMENTATION	5	5	0	0	
SENSOR, CONTINUITY	20	6	3	3	4.2.2.3.B.5
SENSOR, PRESSURE	12	5	3	2	4.2.2.3.B.6
SENSOR, TEMPERATURE					

_

TABLE I-B.2 Summary of IOA FMEA Assessment - ARCS EPD&C (cont'd)								
Components	IOA INTL	IOA MAP	NASA FMEAS	ISSUES	PARAGRAPHS FOR ISSUES			
THERMAL CONTROL SUBSYSTEM THRUSTERS FUSE HEATER RESISTOR	5 8 10	2 4 1	2 4 1	000	4.2.2.4.B			
SWITCH, THERMAL SWITCH, TOGGLE DRIVER	8 25 10	8 4 4	0 4 4	8 0 0	4.2.2.4.8.1			
TOTAL	1083	310	270	143				

.

•

-

-

.

•

•

.)

TABLE II-A.1 Summary of IOA CIL Assessment - FRCS Hardware								
Components	IOA INTL	IOA MAP	NASA CILS	ISSUES	PARAGRAPHS FOR ISSUES			
HE PRESS SUBSYSTEM STORAGE TANK TANK ISOLATION VALVES REGULATOR ASSEMBLIES QUAD CHECK VALVE ASSEMBLY COUPLINGS (SINGLE SEAL) COUPLINGS (DOUBLE SEAL) LINES AND FITTINGS	1 1 5 2 3 0 4	1 5 5 4 2 2 1	1 0 1 2 2 1 1	0 5 4 4 0 1 0	4.1.2.1.A 4.1.2.1.A.1 4.1.2.1.A.2 4.1.2.1.A.3 4.1.2.1.A.4			
PROP STOR & DIST SUBSYSTEM PROPELLANT TANKS PROPELLANT CHANNEL SCREENS PROPELLANT FEEDOUT TUBES PRESSURE RELIEF ASSEMBLIES GROUND MANUAL ISOL VALVES GIMBAL BELLOWS TANK ISOL VALVES MANIFOLD ISOL VLVS, PRIMARY MANIFOLD ISOL VLVS, VERNIER JET ALIGNMENT BELLOWS, PRIMARY JET ALIGNMENT BELLOWS, VERNIER COUPLINGS (SINGLE SEAL) COUPLINGS (DOUBLE SEAL) LINES AND FITTINGS	1 1 2 2 2 4 6 1 2 2 12 0 2	1 0 7 1 1 3 4 4 1 0 2 2 1	1 0 4 0 1 1 2 1 0 1 1	0 1 0 3 1 0 3 4 3 1 0 1 1 0	4.1.2.2.A 4.1.2.2.A.1 4.1.2.2.A.2 4.1.2.2.A.3 4.1.2.2.A.3 4.1.2.2.A.4 4.1.2.2.A.5 4.1.2.2.A.6 4.1.2.2.A.7 4.1.2.2.A.8 4.1.2.2.A.8			
THRUSTER SUBSYSTEM PRIMARY JETS BIPROP SOLENOID VALVES INJECTOR HEAD COMBUSTION CHAMBER OR NOZZLE VERNIER JETS BIPROP SOLENOID VALVES COMBUSTION CHAMBER OR NOZZLE	7 0 1 5 1	6 2 2 3 1	2 0 2 2 1	6 2 0 2 0	4.1.2.3.A 4.1.2.3.A.1 4.1.2.3.A.2 4.1.2.3.A.3			
TOTAL	68	62	30	42				

50

TABLE II-B.1 Summary of IOA CIL Assessment - FRCS EPD&C								
Components	IOA INTL	IOA MAP	NASA CILS	ISSUES	PARAGRAPHS FOR ISSUES			
HE PRESS SUBSYSTEM CONTROLS					4.1.2.1.B			
VALVES CONTROLLER DIODE DRIVER	0 3 0	0 2 0	0 2 0	0 3 0	4.1.2.1.B.1			
FUSE RESISTOR SWITCH, TOGGLE MICROSWITCH	0 2 0	0 0 1 0	0 0 0	0 0 1 0	4.1.2.1. B.4			
INSTRUMENTATION INDICATOR, POSITION SENSOR, PRESSURE SENSOR, TEMPERATURE	0 0 0	0 0 0	0 0 0	0 0 0				
PROP STOR & DIST SUBSYSTEM CONTROLS					4.1.2.2.B			
VALVES CONTROLLER DIODE DRIVER FUSE RELAY RESISTOR SWITCH, TOGGLE MICROSWITCH CIRCUIT BREAKER	1 10 8 0 20 0 10 2 0	1 5 0 7 0 2 2 0	2 9 8 0 6 4 1 0 1	3 11 12 0 9 4 2 2 1	4.1.2.2.B.1 4.1.2.2.B.2 4.1.2.2.B.3 4.1.2.2.B.5 4.1.2.2.B.5 4.1.2.2.B.6 4.1.2.2.B.7 4.1.2.2.B.7 4.1.2.2.B.8 4.1.2.2.B.9			
INSTRUMENTATION INDICATOR, POSITION SENSOR, PRESSURE SENSOR, TEMPERATURE	0 0 0	00000	2 0 0	2 0 0	4.1.2.2.B.11			
THRUSTER SUBSYSTEM CONTROLS					4.1.2.3.B			
VALVES CONTROLLER DIODE DRIVER FUSE RELAY RESISTOR SWITCH, TOGGLE SIGNAL CONDITIONER	9 23 4 12 3 6 17 2	3 11 2 5 1 2 3 2	3 7 3 1 0 2 1 1	4 8 3 1 0 2 1	4.1.2.3.B.1 4.1.2.3.B.2 4.1.2.3.B.3 4.1.2.3.B.4 4.1.2.3.B.5 4.1.2.3.B.5			
INSTRUMENTATION SENSOR, CONTINUITY SENSOR, PRESSURE SENSOR, TEMPERATURE	0 2 2	0 2 2	0 0 0	0 2 2	4.1.2.3.B.9 4.1.2.3.B.10			

===

T 3

.

TABLE II-B.1 Summary of IOA CIL Assessment - FRCS EPD&C (cont'd)								
Components	IOA INTL	IOA MAP	NASA CILS	ISSUES	PARAGRAPHS FOR ISSUES			
THERMAL CONTROL SUBSYSTEM THRUSTERS					4.1.2.4.B			
FUSE	1	1	1	0				
HEATER	1	1	1	0				
RESISTOR	0	0	0	0				
SWITCH, THERMAL	1	1	0	1	4.1.2.4.B.1			
SWITCH, TOGGLE	3	1	1	0				
POD								
DRIVER	0	0	0	0				
FUSE	0	0	0	0				
HEATER	0	0	0	0				
RELAY	0	0	0	0				
RESISTOR	0	0	0	0				
SWITCH, TOGGLE	3	1	1	0				
TOTAL	145	62	57	77				

•

_

٠

52

TABLE II-A.2 Summary of IOA CIL Assessment - ARCS Hardware						
Components	IOA INTL	IOA MAP	NASA CILS	ISSUES	PARAGRAPHS FOR ISSUES	
HE PRESS SUBSYSTEM STORAGE TANK TANK ISOLATION VALVES REGULATOR ASSEMBLIES QUAD CHECK VALVE ASSEMBLY COUPLINGS (SINGLE SEAL) COUPLINGS (DOUBLE SEAL) LINES AND FITTINGS	1 1 5 2 2 0 4	1 5 4 3 2 1	1 1 2 2 2 1 1	0 4 3 2 1 1 0	4.2.2.1.A 4.2.2.1.A.1 4.2.2.1.A.2 4.2.2.1.A.3 4.2.2.1.A.4 4.2.2.1.A.4	
PROP STOR & DIST SUBSYSTEM PROPELLANT TANKS PROPELLANT CHANNEL SCREENS PROPELLANT FEEDOUT TUBES PRESSURE RELIEF ASSEMBLIES GROUND MANUAL ISOL VALVES GIMBAL BELLOWS TANK ISOL VALVES CROSSFEED VALVES MANIFOLD ISOL VLVS, PRIMARY MANIFOLD ISOL VLVS, VERNIER JET ALIGNMENT BELLOWS, VERNIER COUPLINGS (SINGLE SEAL) COUPLINGS (DOUBLE SEAL) LINES AND FITTINGS	1 1 2 2 5 6 6 1 2 2 10 0 4	1 0 7 1 7 4 5 4 1 0 2 2 1	1 0 4 0 1 2 2 1 2 1 0 1 1 1	0 1 0 3 1 0 5 2 4 2 0 0 1 1 0	4.2.2.2.A 4.2.2.2.A.1 4.2.2.2.A.2 4.2.2.2.A.3 4.2.2.2.A.3 4.2.2.2.A.4 4.2.2.2.A.5 4.2.2.2.A.6 4.2.2.2.A.6 4.2.2.2.A.7 4.2.2.2.A.8 4.2.2.2.A.8	
THRUSTER SUBSYSTEM PRIMARY JETS BIPROP SOLENOID VALVES INJECTOR HEAD COMBUSTION CHAMBER OR NOZZLE VERNIER JETS BIPROP SOLENOID VALVES COMBUSTION CHAMBER OR NOZZLE	6 0 1 5 1	6 2 2 3 1	2 0 2 2 1	6 2 0 2 0	4.2.2.3.A 4.2.2.3.A.1 4.2.2.3.A.2 4.2.2.3.A.3	
TOTAL	73	71	35	41		

. 1

ч. Так

-

TABLE II-B.2 Summary of IOA CII	Assess	ment -	ARCS	EPD&C	
Components	IOA INTL	IOA MAP	NASA CILS	ISSUES	PARAGRAPHS FOR ISSUES
HE PRESS SUBSYSTEM					4.2.2.1.B
CONTROLS					
VALVES					
CONTROLLER	0	0	0	0	
DIODE	4	2	2	2	4.2.2.1.B.1
DRIVER	0	0	0	0	
FUSE	0	0	0	0	
RESISTOR	0	0	0	0	
SWITCH, TOGGLE	4	1	1	0	
MICROSWITCH	0	0	0	0	
INSTRUMENTATION					
INDICATOR, POSITION	0	0	0	0	
SENSOR, PRESSURE	0	0	0	0	
SENSOR, TEMPERATURE	0	0	0	0	
PROP STOR & DIST SUBSYSTEM					4.2.2.2.B
CONTROLS					
VALVES					
CONTROLLER	0	0	3	3	4.2.2.2.B.1
DIODE	15	9	22	25	4.2.2.2.B.2
DRIVER	5	5	13	15	4.2.2.2.B.3
FUSE	0	0	0	0	
RELAY	10	5	9	10	4.2.2.2.B.4
RESISTOR	0	0	5	5	4.2.2.2.B.5
SWITCH, TOGGLE	10	3	2	4	4.2.2.2.B.6
MICROSWITCH	1	1	0	1 1	4.2.2.2.B.7
CIRCUIT BREAKER	1	1	1	2	4.2.2.2.B.8
INSTRUMENTATION					
INDICATOR, POSITION	0	0	3	3	4.2.2.2.B.9
SENSOR, PRESSURE	0	0	0	0	
SENSOR, TEMPERATURE	0	0	0	0	
					4 2 2 3 B
CONTROLS					4.2.2.5.0
VALVES					
CONTROLLER	2	1	3	2	4.2.2.3.B.1
DIODE	62	6	6	l õ l	1.2.2.3.0.1
DRIVER	4	2	5	3	4.2.2.3.B.2
FIICE	R R	1	l ĭ		
DELAV			Ō	l õ l	
PESTSTOR	à	2	2	l õ l	
RESISTOR TOCCLY		1	1 1		4.2.2.3.B.4
STILL, IUGUL STANAL CONDITIONED	2		2	l õ l	1.2.2.3.0.7
TNEMDIMENTATIONER		_	6		
CENCOD CONMINUITOV					
SENSOR, CONTINUITI				ŏ.	
CENCOD TRADEDATIDE					
SENSOR, IEMPERATURE					

Ţ

_ _

TABLE II-B.2 Summary of IOA CIL Assessment - ARCS EPD&C (cont'd)								
Components	IOA INTL	IOA MAP	NASA CILS	ISSUES	PARAGRAPHS FOR ISSUES			
THERMAL CONTROL SUBSYSTEM					4.2.2.4.B			
FUSE	5	2	2	0				
HEATER	1	1	1	0				
RESISTOR	0	0	0	0				
SWITCH, THERMAL	4	4	0	4	4.2.2.4.B.1			
SWITCH, TOGGLE	15	2	2	0				
DRIVER	5	2	2 ·	0				
TOTAL	171	54	87	81				

1.1.77

•

55

÷

-

·

- -

-

•

•

.

.

TABLE III-A.1 IOA Recommended Criticalities - FRCS Hardware							
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	3/3	TOTAL
HE PRESS SUBSYSTEM STORAGE TANK TANK ISOLATION VALVES REGULATOR ASSEMBLIES QUAD CHECK VALVE ASSEMBLY COUPLINGS (SINGLE SEAL) COUPLINGS (DOUBLE SEAL) LINES AND FITTINGS	1 1 2 0 0 1	0 2 2 2 2 0 0	0 0 0 0 0 0 0	0 2 1 0 2 0	0 0 1 0 0 0	0 0 0 3 2 0	1 5 5 4 5 4 1
PROP STOR & DIST SUBSYSTEM PROPELLANT TANKS PROPELLANT CHANNEL SCREENS PRESSURE RELIEF ASSEMBLIES GROUND MANUAL ISOL VALVES GIMBAL BELLOWS TANK ISOL VALVES MANIFOLD ISOL VLVS, PRIMARY MANIFOLD ISOL VLVS, VERNIER JET ALIGNMENT BELLOWS, PRIMARY COUPLINGS (SINGLE SEAL) COUPLINGS (DOUBLE SEAL) LINES AND FITTINGS	1 1 1 1 2 2 1 0 0	0 3 0 2 2 1 0 2 0 0	0 0 0 0 0 0 0 0 0 0 0	0 0 3 0 3 1 1 0 0 2 0	000000000000000000000000000000000000000	0 0 1 0 0 0 0 2 2 0	1 1 8 2 1 6 5 5 1 4 4 1
THRUSTER SUBSYSTEM PRIMARY JETS BIPROP SOLENOID VALVES INJECTOR HEAD COMBUSTION CHAMBER OR NOZZLE VERNIER JETS BIPROP SOLENOID VALVES COMBUSTION CHAMBER OR NOZZLE	4 2 2 2 1	2 0 0 0	0 0 0 1 0	0 0 0 0	0 0 0 0	0 0 0 0	6 2 2 3 1
TOTAL	30	20	2	15	1	10	78

₩.

_

ي الأنبية

TABLE III-B.1 IOA Recommended	Critic	calit	les -	FRCS	EPD&C	2	
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	3/3	TOTAL
HE PRESS SUBSYSTEM CONTROLS VALVES							
CONTROLLER	0	0	0	3	0	1	4
DIODE	0	1	0	3	1	4	9
DRIVER	0	0	0	5	2	1	8
FUSE	0	0	0		0	0	
RESISTOR	0		0	0	2		2
SWITCH, TOGGLE			0				2
	0		U		- -	0	_ <u></u>
INSTRUMENTATION INDICATOR DOSTTION	0	0	0	0	1	o	1
SENSOR PRESSURE	Ő	ŏ	ŏ	Ō	1	ŏ	1
SENSOR, TEMPERATURE	ŏ	ō	Ō	Ō	ō	1	1
PROP STOR & DIST SUBSYSTEM CONTROLS VALVES CONTROLLER DIODE DRIVER FUSE RELAY RESISTOR SWITCH, TOGGLE MICROSWITCH CIRCUIT BREAKER METERS/ROTARY SWITCH INSTRUMENTATION		0 2 1 0 6 0 1 2 0 0	1 2 4 0 0 0 0 0 0 0	1 12 4 6 0 7 0 1 0	0 11 7 0 0 10 0 6 0 2	2 44 4 0 0 6 0 0 1 2	4 71 20 4 12 16 8 8 2 4
INDICATOR, POSITION SENSOR, PRESSURE SENSOR TEMPERATURE			0		6 2 1		2
THRUSTER SUBSYSTEM CONTROLS VALVES CONTROLLER DIODE DRIVER FUSE RELAY RESISTOR SWITCH, TOGGLE SIGNAL CONDITIONER INSTRUMENTATION SENSOR, CONTINUITY SENSOR, PRESSURE SENSOR, TEMPERATURE	0 0 0 0 0 0 0 0 0 0 0 0	2 5 1 3 1 0 2 0 0 0 0	1 1 1 0 0 1 1 0 0 0	2 5 0 0 1 0 1 0 0 0 0	0 0 0 0 2 0 1 0 4 4	5 6 2 0 1 8 3 0 4 0	10 17 4 4 2 11 6 3 4 4 4

1

- -

-

TABLE III-B.1 IOA Recommended C	ritica	alitie	ès - 1	FRCS I	EPD&C	(cont	c'd)
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	3/3	TOTAL
THERMAL CONTROL SUBSYSTEM THRUSTERS FUSE	0	0	1	0	2	0	3
HEATER RESISTOR SWITCH, THERMAL SWITCH TOGGLE	0000	000	1 0 1 1	0000	1 3 1	2 0 0 2	4 1 4 4
POD DRIVER	0	0	0	0	2	0	2
HEATER RELAY	000	000	0	000	2 1 1	0	1 2
RESISTOR SWITCH, TOGGLE	0	0	1	0	1 0	3	4 2
TOTAL	0	28	18	56	79	106	287

•

-

.

•

·

1/1 1 1 2 0 0 1	2/1R 0 2 1 2 3 0	2/2 0 0 0 0 0	3/1R 0 2 1 0	3/2R 0 0 1	3/3 0 0	TOTA 1
1 1 2 0 0 1	0 2 1 2 3 0		0 2 1 0	0 0 1	0	1
1 1 2 0 0 1	0 2 1 2 3 0	0 0 0 0	0 2 1 0	0 0 1	0	1
1 1 2 0 0 1	2 1 2 3 0	0 0 0 0	2 1 0	0 1	0	
1 2 0 0 1	1 2 3 0	0 0 0	1 0	1	-	5
2 0 0 1	2 3 0	0 0	0	_	0	4
0 0 1	3	0		0	0	4
0 1	0	Ο	0	0	4	7
1		~	2	0	2	4
	U U	0	0	0	0	1
1	0	0	0	0	0	1
1	0	0	0	0	0	1
2	3	0	3	0	0	8
1	0	0	0	0	1	2
1	0	0	0	0	0	1
2	1	1	4	0	0	8
2	0	2	2	0	0	6
2	1	0	3	0	0	6
3	0	1	1	0	0	5
1	0	0	0	0	0	1
0	2	0	0	0	2	4
0	0	0	2	0	2	4
1	0	0	0	0	0	1
4	0	0	2	0	0	6
2	0	0	0	0	0	2
2	0	0	0	0	0	2
2	0	1	0	0	0	3
1	· 0	0	0	0	0	1
1						L
_	2 2 3 1 0 0 1 4 2 2 2 1	2 0 2 1 3 0 1 0 0 2 0 0 1 0 2 0 1 0 2 0 2 0 2 0 1 0	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$

•

59

.

TABLE III-B.2 IOA Recommended	Criticalities - ARCS EPD&C						
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	3/3	TOTAL
HE PRESS SUBSYSTEM							
CONTROLS							
VALVES				2		₁	
CONTROLLER				2	1		4
DIODE				ン 5	2		7
DRIVER		0		1			1
FUSE		Ö			2		
RESISTOR CWIMCH MOCCLE		1		1			2
SWITCH, TOGGLE							1
	U V	Ŭ	v	v	-	Ŭ	-
INSTRUMENTATION INDICATOR DOSTUTON		0	0	0	1	0	1 1
CENCOD DEFECTION		0 0	õ	õ	1	ŏ	1
SENSOR, FRESSORE SENSOD TEMDERATURE		0 0	ŏ	Ő	Ō	ı 1	1
SENSOR, TEMEERATORE							-
PROP STOR & DIST SUBSYSTEM							
CONTROLS							
VALVES				_		_	
CONTROLLER	0	0	1		0	2	
DIODE	0	0	4	22	12	49	87
DRIVER	0	0	4	4	10		25
FUSE		0	0	5			
RELAY	0	L	2	10		2	10
RESISTOR		0	0		13	12	25
SWITCH, TOGGLE		0	3			2	
MICROSWITCH		0	1	3 0	5	1	9
THEOREM AND THE		0	1		U	1	2
INSTRUMENTATION INDIGNOOD DOSTUTON		0	0	0	Q	0	g
CENCOD DESCUE					1		1
CENCOD TEMDEDATUDE		Ő		0 0	1	õ	
SENSOR, TEMPERATURE	ļ			0	-		
THRUSTER SUBSYSTEM							
CONTROLS							
VALVES							
CONTROLLER	0	0	1	2	0	3	6
DIODE	0	0	1	5	0	6	12
DRIVER	0	0	2	1	0	3	6
FUSE	0	0	0	3	0	0	3
RELAY	0	0	0	1	0	1	2
RESISTOR	0	0	0	2	0	8	10
SWITCH, TOGGLE	0	0	1	1	0	2	4
SIGNAL CONDITIONER	0	2	0	0	0	0	2
INSTRUMENTATION						_	
SENSOR, CONTINUITY	0	0	0	0	0	5	5
SENSOR, PRESSURE	0	0	0	2	4	0	6
SENSOR, TEMPERATURE	0	0	0	2	1	2	5

60

-

_

薵

_
TABLE III-B.2 IOA Recommended (Critic	caliti	les -	ARCS	EPD&	C (coi	nt'd)
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	3/3	TOTAL
THERMAL CONTROL SUBSYSTEM THRUSTERS FUSE HEATER RESISTOR SWITCH, THERMAL SWITCH, TOGGLE DRIVER	0 0 0 0 0	0 0 0 0 0	2 1 0 1 2 2	0 0 0 0 0	0 1 0 3 0 0	0 2 1 4 2 2	2 4 1 8 4 4
TOTAL	0	5	29	84	68	124	310

TABLE IV-A.1 IOA Recommended C	ritica	al Ite	ems -	FRCS	Hardy	ware
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	TOTAL
HE PRESS SUBSYSTEM STORAGE TANK TANK ISOLATION VALVES REGULATOR ASSEMBLIES QUAD CHECK VALVE ASSEMBLY COUPLINGS (SINGLE SEAL) COUPLINGS (DOUBLE SEAL) LINES AND FITTINGS	1 1 2 0 0 1	0 2 2 2 2 2 0 0	0 0 0 0 0 0 0	0 2 1 0 0 2 0	0 0 1 0 0 0 0	1 5 5 4 2 2 1
PROP STOR & DIST SUBSYSTEM PROPELLANT TANKS PROPELLANT CHANNEL SCREENS PRESSURE RELIEF ASSEMBLIES GROUND MANUAL ISOL VALVES GIMBAL BELLOWS TANK ISOL VALVES MANIFOLD ISOL VLVS, PRIMARY MANIFOLD ISOL VLVS, VERNIER JET ALIGNMENT BELLOWS, PRIMARY COUPLINGS (SINGLE SEAL) COUPLINGS (DOUBLE SEAL) LINES AND FITTINGS	1 1 1 1 2 1 1 2 1 0 0 1	003002210200	00000010000	0 0 2 0 0 0 0 0 0 0 0 0 0 0 0	000000000000000000000000000000000000000	1 7 1 3 4 4 1 2 2 1
THRUSTER SUBSYSTEM PRIMARY JETS BIPROP SOLENOID VALVES INJECTOR HEAD COMBUSTION CHAMBER OR NOZZLE VERNIER JETS BIPROP SOLENOID VALVES COMBUSTION CHAMBER OR NOZZLE	4 2 2 2 1	2 0 0 0	0 0 0 1 0	0 0 0 0	0 0 0 0	6 2 2 3 1
TOTAL	30	20	2	9	1	62

TABLE IV-B.1 IOA Recommended C	ritica	al Ite	ems -	FRCS	EPD&C	2
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	TOTAL
HE PRESS SUBSYSTEM CONTROLS						
CONTROLLER	o	0	0	0	0	о
DIODE	0	1	0	1	0	2
FUSE	ŏ	ŏ	Ő	ŏ	ŏ	ŏ
RESISTOR	0	0	0	0	0	0
SWITCH, TOGGLE	0		0	0	0	1
MICROSWITCH INSTRIMENTATION	0		U	U	U	U
INDICATOR, POSITION	0	0	0	0	0	0
SENSOR, PRESSURE	0	0	0	0	0	0
SENSOR, TEMPERATURE	0	0	0	0	0	0
PROP STOR & DIST SUBSYSTEM						
CONTROLS						
CONTROLLER	0	0	1	0	0	1
DIODE	ŏ	2	2	ō	Ō	4
DRIVER	0	1	4	0	0	5
FUSE	0	0	0	0	0	0
RELAY	0	6	0	1	0	7
RESISTOR	0	0	0		0	
SWITCH, TOGGLE						2
CIRCUIT BREAKER	ŏ	õ	ŏ	ŏ	ŏ	0
METERS/ROTARY SWITCH		-	-		-	_
INSTRUMENTATION						
INDICATOR, POSITION	0	0	0	0	0	0
SENSOR, PRESSURE		0	0	0	0	0
SENSOR, TEMPERATURE	0	<u> </u>	0	0	U	0
THRUSTER SUBSYSTEM						
VALVES						
CONTROLLER	lo	2	1	o	0	3
DIODE	0	5	1	5	0	11
DRIVER	0	1	1	0	0	2
FUSE	0	3	2	0	0	5
RELAY			0			
RESISTOR SWITCH TOCCLE			1			23
SIGNAL CONDITIONER	ŏ	Ő		ŏ	Ĭ	2
INSTRUMENTATION			_			-
SENSOR, CONTINUITY	0	0	0	0	0	0
SENSOR, PRESSURE	0	0	0	0	2	2
SENSOR, TEMPERATURE	0	U	U	0	2	2

H

: 6

63

۰.

TABLE IV-B.1 IOA Recommended C	IL Ite	ems -	FRCS	EPD&	C (COI	nt'd)
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	TOTAL
THERMAL CONTROL SUBSYSTEM THRUSTERS FUSE HEATER RESISTOR SWITCH, THERMAL SWITCH, TOGGLE POD DRIVER FUSE HEATER RELAY RESISTOR			1 0 1 1 0 0 0 0	0 0 0 0 0 0 0 0 0		1 0 1 1 0 0 0 0
SWITCH, TOGGLE	0	0	1	0	0	1
TOTAL	0	28	19	9	6	62

64

Ŧ

۰.

.

TABLE IV-A.2 IOA Recommended C	ritica	al Ite	ems -	ARCS	Hardy	vare
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	TOTAL
HE PRESS SUBSYSTEM						
STORAGE TANK	1	0	0	0	0	1
TANK ISOLATION VALVES	1	2	0	2	0	5
REGULATOR ASSEMBLIES	1	1	0	1	1	4
QUAD CHECK VALVE ASSEMBLY	2	2	0	0	0	4
COUPLINGS (SINGLE SEAL)	0	3	0	0	0	3
COUPLINGS (DOUBLE SEAL)	0	0	0	2	0	2
LINES AND FITTINGS	1	0	0	0	0	1
PROP STOR & DIST SUBSYSTEM						
PROPELLANT TANKS	1	0	0	0	0	1
PROPELLANT CHANNEL SCREENS	1	0	0	0	0	1
PRESSURE RELIEF ASSEMBLIES	2	3	0	2	0	7
GROUND MANUAL ISOL VALVES	1	0	0	0	0	1
GIMBAL BELLOWS	1	0	0	0	0	1
TANK ISOL VALVES	2	1	1	3	0	7
CROSSFEED VALVES	2	0	2	0	0	4
MANIFOLD ISOL VLVS, PRIMARY	2	1	0	2	0	5
MANIFOLD ISOL VLVS, VERNIER	3	0	1	0	0	4
JET ALIGNMENT BELLOWS, PRIMARY	1	0	0	0	0	1
COUPLINGS (SINGLE SEAL)	0	2	0	0	0	2
COUPLINGS (DOUBLE SEAL)	0	0	0	2	0	2
LINES AND FITTINGS	1	0	0	0	0	1
THRUSTER SUBSYSTEM						
PRIMARY JETS						
BIPROP SOLENOID VALVES	4	0	0	2	0	6
INJECTOR HEAD	2	0	0	0	0	2
COMBUSTION CHAMBER OR NOZZLE	2	0	0	0	0	2
VERNIER JETS						
BIPROP SOLENOID VALVES	2	0	1	0	0	3
COMBUSTION CHAMBER OR NOZZLE	1	· 0	0	0	0	1
TOTAL	34	15	5	16	1	71

-

-

•

··· •• ···

.

TABLE IV-B.2 IOA Recommended C	ritica	al Ite	ems -	ARCS	EPD&	2
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	TOTAL
HE PRESS SUBSYSTEM CONTROLS						
CONTROLLER	0	0	.0	0	0	о
DIODE	0	1	0	1	0	2
					0	0
RESISTOR	Ö	ŏ	ŏ	ŏ	ŏ	ŏ
SWITCH, TOGGLE	Ō	1	Ō	Ō	Ō	1
MICROSWITCH	0	0	0	0	0	0
INSTRUMENTATION						
INDICATOR, POSITION	0	0	0	0	0	0
SENSOR, PRESSURE	0	0	0	0	0	0
SENSOR, TEMPERATURE	0	0	0		0	0
PROP STOR & DIST SUBSYSTEM CONTROLS						
CONTROLLER	0	0	1	0	0	1
DIODE	ŏ	ŏ	4	4	1	9
DRIVER	Ō	Ō	4	1	0	5
FUSE	Ö	0	0	0	0	0
RELAY	0	1	2	2	0	5
RESISTOR	0	0	0	0	0	0
SWITCH, TOGGLE	0	0	3	0	0	3
MICROSWITCH	0	0	1	0	0	1
CIRCUIT BREAKER	0	0	T	0	0	T
INSTRUMENTATION INDICATOR DOSTITION	0	0	0	0	0	0
SENCOD DESCUEF	0	0	0	Ő	0	ň
SENSOR, TEMPERATURE	0 0	ŏ	ŏ	ŏ	ŏ	ŏ
THRUSTER SUBSYSTEM						
CONTROLS						
			1		_	7
DIODE	Ö		1	5	0	5
	0	0	2	0	ň	2
FUSE	ŏ	0 0	0	1	õ	1
RELAY	ŏ	ŏ	ŏ	ō	ŏ	ō
RESISTOR	Ō	Ō	Ō	2	Ō	2
SWITCH, TOGGLE	0	0	1	0	0	1
SIGNAL CONDITIONER	0	2	0	0	0	2
INSTRUMENTATION						
SENSOR, CONTINUITY	0	0	0	0	0	0
SENSOR, PRESSURE	0	0	0	0	0	0
SENSOR, TEMPERATURE	0	0	0	0	0	0

TABLE IV-B.2 IOA Recommended C	IL Ite	ems -	ARCS	EPD&	C (COI	nt'd)
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	TOTAL
THERMAL CONTROL SUBSYSTEM THRUSTERS FUSE HEATER RESISTOR SWITCH, THERMAL SWITCH, TOGGLE DRIVER	0 0 0 0 0 0	0 0 0 0 0 0	2 1 0 1 2 2	0 0 0 0 0 0	0 0 3 0 0	2 1 0 4 2 2
TOTAL	0	5	29	16	4	54

in the second second

i i chia

Ē

4.1 Forward RCS Assessment Results

The unresolved forward RCS hardware and EPD&C issues are presented in the following sections. Several general issues are first presented (section 4.1.1), followed by the specific unresolved issues (section 4.1.2).

4.1.1 General Forward RCS Issues

Many of the unresolved issues which exist on individual FMEAs and CILs are linked to several "general" issues identified by IOA during the RCS FMEA/CIL assessment. These general issues concern either the groundrules used by NASA/RI to perform the FMEA/CIL analysis, or the NASA/RI analysis of the RCS subsystem. Each of the general IOA issues results in numerous FMEA and CIL issues.

The general issues identified by IOA in the FRCS hardware and EPD&C assessments are discussed in the following sections.

4.1.1.A Hardware

Four general areas of difference between the IOA and NASA/RI forward RCS subsystem analyses are responsible for many of the unresolved FRCS hardware issues.

4.1.1.A.1 Inability to Deplete FRCS Propellant

IOA considers the inability to deplete FRCS prop to be potentially life and vehicle threatening during entry. Many flights include a nominal FRCS propellant dump after the OMS deorbit burn to achieve an improved X axis center-of-gravity (cg) condition for entry. On flights which would require a postdeorbit FRCS prop dump to meet the forward cg limit (1076.7 inches), inability to complete the dump could result in possible loss of entry control.

Failures which result in loss of propellant tank repressurization capability (loss of helium flow paths, loss of helium due to leakage) or loss of propellant flow paths are the types of failures which result in the inability to deplete FRCS propellant.

The current NASA/RI criticalities assigned to these types of failures are based only on loss of ET sep capability and do not consider possible entry effects. The criticalities assigned based only on ET sep correctly include tank ullage in the redundancy string. IOA agrees with the criticalities assigned by NASA/RI based only on ET sep effects, and agrees that ullage is sufficient to perform ET sep. However, IOA's more severe criticalities on these types of failures are driven by the possible entry effects discussed above. In this case, ullage may not be sufficient to deplete FRCS prop and, therefore, is not included in the redundancy string.

IOA would concur with the current NASA/RI criticalities on failures which result in the inability to use or deplete FRCS propellant if it could be determined that no flights would be launched which required a nominal post-deorbit FRCS dump to meet the forward cg limit. However, IOA was unable to verify that this is the case. IOA recommends a documented flight rule which prohibits dependence on a nominal post-deorbit burn FRCS prop dump to meet the forward X cg limit.

Seventeen (17) of the FRCS hardware issues are related to this general issue.

4.1.1.A.2 Propellant Leakage

IOA considers any leakage of RCS propellant (MMH or NTO) to be potentially life and vehicle threatening, regardless of where the leakage occurs. NSTS 22206 states that "A single failure resulting in leakage of LO2, LH2, N2H4, or MMH shall be classified as a Criticality 1" (p. 2-11, item h). Therefore, IOA classifies any single failure which results in prop leakage as a 1/1. If redundant items must fail before leakage occurs, IOA classifies the failure as a functional criticality 1R. Propellant leakage can result in contamination and corrosion of other components, fire, explosion, or exposure of EVA and ground crews to propellant or propellant vapors.

Thirteen (13) of the FRCS hardware issues are related to this general issue.

4.1.1.A.3 Isolation Valve Internal Relief Device Failure

The propellant tank isolation valves, primary manifold isolation valves, and vernier manifold isolation valves each have an internal pressure relief device which would relieve a downstream overpressurization condition if the valve was closed. NASA/RI assigns 3/3 criticalities to the FMEAs which address the failure of this device to relieve downstream pressure. IOA contends that it is possible that a failed closed relief device could allow a downstream pressure build-up sufficient to cause a prop line leak. This is supported by the fact that the prop line structural failure FMEA (03-2F-102108-1) lists this failure as a cause. Since this failure could result in line failure and prop leakage, IOA recommends that the current 3/3 FMEAs for the relief device failures be upgraded accordingly.

Three (3) of the FRCS hardware issues are related to this general issue.

4.1.1.A.4 Additional Items and Failure Modes

A number of RCS subsystem items and failure modes identified by IOA during the analysis phase are not covered in the current NASA FMEA/CIL. IOA recommends that these items and failure modes be incorporated into the FMEA/CIL. These issues are identified in Appendix F by issue codes HDW 4 and HDW 5.

Thirty-one (31) of the FRCS hardware issues are related to this general issue.

4.1.1.B EPD&C

IOA has several general EPD&C issues that tend to inflate the number of issues shown in the assessment tables. The following general issues remain unresolved.

4.1.1.B.1 Loss of Talkback Data

IOA considers the loss of data to determine the actual position of a valve to be a 3/2R PPP. Valve position data is provided by the GPC/MDM discretes and the event indicators, which provide redundancy for each other. Loss of all redundancy may lead to falsely failing the valve closed which could effect mission operations. NASA FMEAs have a 3/3 criticality for these failures.

This type of failure mode accounts for 25 open issues shown in the assessment tables for the forward RCS EPD&C (6 issues in the helium pressurization subsystem and 19 in the propellant storage and distribution subsystem). They are identified by issue code EPD&C 1 in Appendix F.

4.1.1.B.2 FMEA Downgrades to 3/3 or 3/2R PPP - NSTS 22206 Interpretations

Numerous issues remain open due to different interpretations of NSTS 22206. All these issues concern the definition of the redundancy string. IOA did not consider multiple or unrelated failures in determining the criticality. IOA considers these FMEAs warrant a 3/2R PPP or 3/3 for the failure mode. -----

== :

- -

•

This type of failure mode accounts for 35 open issues shown in the assessment tables for the forward RCS EPD&C (1 issue in the helium pressurization subsystem, 27 issues in the propellant storage and distribution subsystem, and 7 issues in the thruster subsystem). They are identified by issue code EPD&C 2 in Appendix F.

4.1.1.B.3 FMEA Failure Scenario Upgrades - NSTS 22206 Interpretations

These issues also remain open due to the different interpretations of NSTS 22206. All these issues concern the definition of the redundancy string. IOA did not consider multiple or unrelated failures in determining criticality, however, IOA did consider the functional redundancy for the item in question. Based on this, IOA failure scenarios create a 1R or CIL item condition, without using multiple or unrelated failures. IOA recommends these failure scenarios and criticality upgrades be included in the NASA FMEA/CIL.

These failure modes account for 9 open issues in the propellant storage and distribution subsystem as shown in the forward RCS EPD&C assessment tables. They are identified by issue code EPD&C 3 in Appendix F.

4.1.1.B.4 EPD&C Issues Tied to Open IOA Hardware Issues

- -

These issues are directly related to the open IOA hardware issues. These failure modes account for 33 open issues as shown in the assessment tables (1 issue in the helium pressurization subsystem, 21 issues in the propellant storage and distribution subsystem, and 11 in the thruster subsystem). They are identified by issue code EPD&C 4 in Appendix F.

4.1.1.B.5 Additional EPD&C Failure Modes Recommended by IOA

These failure modes are not currently addressed by the NASA FMEA/CIL. IOA recommends these failure modes be incorporated into the FMEA/CIL.

These failures account for 31 open issues shown in the assessment tables for the forward RCS EPD&C (3 issues in the helium pressurization subsystem, 12 issues in the propellant storage and distribution subsystem, 15 issues in the thruster subsystem, and 1 issue in the thermal control subsystem). They are identified by issue code EPD&C 5 in Appendix F.

4.1.2 Specific Forward RCS Issues

The specific forward RCS hardware and EPD&C unresolved issues are presented in the following sections and paragraphs which were referenced in tables I and II. The organization of the sections and paragraphs follow the RCS hierarchy shown in Figures 4-7, and used in tables I and II.

Unresolved issues which are related to general issues discussed in section 4.1.1 contain a reference to the applicable general issue. Each issue is presented in a standard format which gives the failure mode, applicable FMEA number and IOA assessment ID, the NASA and IOA criticality and screen assignments, and the rationale behind the IOA issue. Refer to the detailed assessment sheets in Appendix C for further information on each issue.

4.1.2.1 Helium Pressurization Subsystem (28 issues)

4.1.2.1.A Hardware (16 issues)

4.1.2.1.A.1 Helium Tank Isolation Valves (5 issues)

1) FAILURE: FAILS OPEN

03-2F-101020-3 3/1R PPP RCS-103 3/1R PFP, CIL

ISSUE: IOA recommends that this failure mode be upgraded to a 3/1R PFP. A failure of the redundant secondary regulator would not be detectable in flight (fail B screen). No way to tell that one level of redundancy has been lost.

2) FAILURE: FAILS CLOSED

03-2F-101020-4 3/1R PPP RCS-104 2/1R PPP, CIL

<u>ISSUE:</u> IOA considers this failure to be a 2/1R. Failure of both valves results in inability to repress prop tank and deplete FRCS propellant. See 4.1.1.A.1.

3) FAILURE: INTERNAL LEAKAGE

NO FMEA RCS-103A 3/1R PFP, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers internal leakage to be a credible failure mode and recommends that it be addressed on the FMEA/CIL. Effects same as "fails open". See issue on 03-2F-101020-3, above.

4) FAILURE: RESTRICTED FLOW

NO FMEA RCS-10002X 2/1R PFF, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers restricted flow to be a credible failure mode and recommends that a 2/1R PFF FMEA and CIL be added. Effects same as "failed closed". See issue on 03-2F-101020-4, above, and 4.1.1.A.1. Failure not detectable during dual leg operation (fail B screen). Contamination can affect both valves simultaneously (fail C screen).

5) FAILURE: STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE

NO FMEA RCS-10003X 1/1 ---, CIL

ISSUE: This failure mode is not currently covered on the NASA FMEA/CIL. IOA considers external leakage of the He isol valve due to a housing failure to be a credible failure (ref. NSTS 22206, p. 2-14, item 2.3.7.a), and recommends that it be addressed on the FMEA/CIL. Failure results in loss of helium pressure. See 4.1.1.A.1.

and a state of the

4.1.2.1.A.2 Regulator Assemblies (4 issues)

1) FAILURE: FAILS CLOSED

12:2

_

03-2F-101030-2 3/1R PPP RCS-112 2/1R PFP, CIL

ISSUE: IOA considers this failure to be a 2/1R PFP. Failure of parallel regulators results in inability to repress prop tank and deplete FRCS propellant. See 4.1.1.A.1. Failure not detectable during dual leg operation (fail B screen).

2) FAILURE: RESTRICTED FLOW

NO FMEA RCS-113 2/1R PFP, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. IOA recommends that restricted flow be addressed as a failure mode for the He regulator. IOA contends that restricted flow is a credible failure mode which should be addressed for components with integral filters and/or orifices. Effects same as "fails closed". See issue on 03-2F-101030-2, above, and section 4.1.1.A. FMEA 03-2F-101030-2 currently lists "partial blockage of pilot screen/sense line" as a cause for a failed closed regulator, however this does not address restricted flow through the regulator. 3) FAILURE: STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE

NO FMEA RCS-114 1/1 ---, CIL

<u>ISSUE:</u> This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers external leakage of the He regulator due to a housing failure to be a credible failure mode (ref. NSTS 22206, p. 2-14, item 2.3.7.a), and recommends that it be addressed on the FMEA/CIL. Failure results in loss of helium pressure. See 4.1.1.A.1.

- :

-

i i

= :

.

4) FAILURE: SENSING PORT LEAKAGE

NO FMEA RCS-115 3/2R PFP, CIL

ISSUE: This failure mode is not currently addressed on the NASA RCS FMEA/CIL, but is addressed on the NASA OMS FMEA/CIL (03-3-1004-3, sensing port leakage, 3/2R PFP). IOA recommends that this failure mode also be addressed for the RCS regulators, with the same rationale used in the OMS subsystem.

4.1.2.1.A.3 Quad Check Valve Assemblies (4 issues)

and the second second

1) FAILURE: FAILS OPEN, INTERNAL LEAKAGE

03-2F-101095-1 3/3 ---RCS-119 2/1R PFP, CIL

ISSUE: IOA recommends that this FMEA be upgraded to a 2/1R PFP. IOA contends that, with series check valve poppets failed open or leaking, the contamination of upstream components by prop or prop vapors during a mission could result in loss of prop tank repressurization capability and subsequent inability to use or deplete FRCS prop. See section 4.1.1.A.1. Contamination by prop could cause parallel regulators to fail closed.

2) FAILURE: FAILS CLOSED

03-2F-101095-2 3/1R PFP, CIL RCS-120 2/1R PFP, CIL

ISSUE: IOA considers this failure to be a 2/1R PFP. Failed closed parallel check valve poppets results in inability to repress prop tank and deplete FRCS propellant. See 4.1.1.A.1.

3) FAILURE: BLOCKAGE OF SINGLE INLET FILTER

03-2F-101095-3 2/1R PPP, CIL RCS-10005X 1/1 ---, CIL

<u>ISSUE:</u> This failure mode was added to the FMEA/CIL as a result of an IOA recommendation. However, IOA considers this failure to be a 1/1 since it results in inability to repress prop tank and deplete FRCS prop. See 4.1.1.A.1.

4) FAILURE: STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE

NO FMEA RCS-10006X 1/1 ---, CIL

=

<u>ISSUE:</u> This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers external leakage of the quad check valve assembly due to a housing failure to be a credible failure mode (ref. NSTS 22206, p. 2-14, item 2.3.7.a), and recommends that it be addressed on the FMEA/CIL. Failure results in loss of helium pressurant (see 4.1.1.A.1), and leakage of prop and/or prop vapors (see 4.1.1.A.2).

4.1.2.1.A.4 Quick Disconnect Couplings (3 issues)

1) FAILURE: EXTERNAL LEAKAGE

03-2F-101091-1 3/1R FFP, CIL RCS-109, 117, 121, 142 3/1R FFP, CIL

<u>ISSUE:</u> IOA recommends that "poppet fails open" be added as a failure mode on this FMEA. This is a credible failure mode and is addressed on other QD coupling FMEAs.

2,3) FAILURE: FAILS TO COUPLE

 03-2F-101091-2
 3/3
 --

 03-2F-102150-2
 3/3
 --

 RCS-110, 118, 122, 127, 133, 135, 137, 143, 154, 156
 3/3
 --

<u>ISSUE:</u> IOA recommends that "restricted flow" be added as a failure mode on the FMEAs listed. This is a credible failure and is addressed on other QD coupling FMEAs.

4.1.2.1.B EPD&C (12 issues)

4.1.2.1.B.1 Diodes (5 issues)

1) FAILURE: FAILS OPEN

NO FMEA FRCS-11202

2/1R PFP, CIL

<u>ISSUE:</u> The helium isolation valves have two diodes, one in series with each of the open and close solenoid circuits. Diode failing open prevents further valve movement associated with that circuit (open or close). Redundancy provided by other isolation valve. Loss of this, coupled with the loss of all hardware redundancy causes loss of jets required to expel propellants in efforts to meet C.G. limits. Note: Issue above is directly related to the schematics. They may be drawn incorrectly. Manifold isolation valve diodes are in parallel.

2) FAILURE: FAILS SHORT

NO FMEA FRCS-11203

3/3

ISSUE: The helium isolation valves have two diodes, one in series with each of the open and close solenoid circuits. Diode failing high has no effect. IOA-RCS recommends this failure be included in the FMEAs.

-

3) FAILURE: FAILS SHORT

05-6KF-2252-2 3/1R PFP, CIL FRCS-321,323 3/3

<u>ISSUE:</u> NASA FMEA considers unrelated failures. IOA-RCS claims this failed short diode alone has no effect. (see 4.1.1.B.2)

4) FAILURE: FAILS OPEN

05-6KF-2267-1 3/3 FRCS-324,326 3/2R PPP

<u>ISSUE:</u> This failure may lead to falsely failing the valve closed. (see 4.1.1.B.1)

5) FAILURE: FAILS SHORT TO GROUND

05-6KF-2252-3 3/1R PFP, CIL FRCS-11211,11212 3/1R PFP, CIL

<u>ISSUE:</u> NASA FMEA considers unrelated failures. IOA-RCS claims this failed short to ground diode causes inability to open the valve manually. Redundancy provided by the GPC/MDM. Loss of all redundancy causes inability to expel propellants to meet CG limits. (see 4.1.1.B.3)

4.1.2.1.B.2 Hybrid Drivers (2 issues)

1) FAILURE: LOSS OF OUTPUT

- -

i d

E......

05-6KF-2201-1 3/3 FRCS-336 3/2R PPP

2) FAILURE: LOSS OF OUTPUT

05-6KF-2201A-1 3/3 FRCS-334 3/2R PPP

<u>ISSUE:</u> Both of these issues concern falsely failing the valve closed. (see 4.1.1.B.1)

4.1.2.1.B.3 Resistor (2 issues)

1) FAILURE: FAILS OPEN

05-6KF-2077-1 3/3 FRCS-348,350,352,354 3/2R PPP

2) FAILURE: FAILS OPEN

05-6KF-2078-1 3/3 FRCS-356 3/2R PPP

<u>ISSUE:</u> Both of these issues concern falsely failing the valve closed. (see 4.1.1.B.1)

4.1.2.1.B.4 Toggle Switches (1 issue)

1) FAILURE: INADVERTENT OPERATION

05-6KF-2026-2	3/1R P	PP	
FRCS-11081,11082	2/1R P	PP	(fails short), CIL
11083	3/3		(inadvertent operation)

ISSUE: IOA-RCS claims a short across contacts 5,6 causes inability to open one leg of the isolation valve. Redundancy provided by the other leg. Loss of all redundancy causes inability to expel propellants in efforts to meet C.G. limits. Inadvertent operation (switch movement) has no effect.

4.1.2.1.B.5 Microswitches (1 issue)

1) FAILURE: ERRONEOUS OUTPUT

NO FMEA FRCS-11204 3/2R PPP

<u>ISSUE:</u> The helium isolation value A & B solenoid microswitch provides power to the talkback circuitry. A microswitch failure across the either contact will provide an inaccurate talkback. This may lead to falsely failing the value closed.

Ξ

 \equiv

≣∃

4.1.2.1.B.6 Event Indicators (1 issue)

1) FAILURE: FAILS SHORT TO GROUND OR OPEN

05-6KF-2151-1,2 3/3 FRCS-387 3/2R PPP

<u>ISSUE:</u> This issue concerns falsely failing the valve closed. (see 4.1.1.B.1)

VER AN CONTRACTOR STREET

4.1.2.2 Propellant Storage and Distribution Subsystem (114 issues)

4.1.2.2.A Hardware (23 issues)

4.1.2.2.A.1 Propellant Tank Acquisition Assembly (1 issue)

1) FAILURE: STRUCTURAL FAILURE, HELIUM PASSAGE, SCREEN DRY-OUT

03-2F-111110-3 1/1 ---, CIL RCS-128 1/1 ---, CIL

1.5

•====

<u>ISSUE:</u> IOA recommends that the propellant tank acquisition device components be itemized in the item list or functional description sections to show specifically what is covered by this FMEA (e.g.: upper compartment channels/screens, lower compartment channels/screens, feedout tubes, plenum, bulkhead, etc.). IOA also recommends that the "high G" discussion be removed from the functional description for this FRCS prop tank. The FRCS prop tanks are not designed for high G propellant acquisition.

4.1.2.2.A.2 Pressure Relief Assemblies (3 issues)

1) FAILURE: BURST DISK LEAKAGE

NO FMEA RCS-140 2/1R PFP, CIL

ISSUE: Internal leakage of the burst disk is a credible failure mode and is not currently addressed on the NASA FMEA/CIL. IOA recommends that this failure mode be added to 03-2F-101060-5 (pressure relief valve assembly, burst disk ruptures prematurely, 2/1R PFP). The failure history of the burst disk includes internal leakage.

2) FAILURE: RESTRICTED FLOW

NO FMEA RCS-10008X 3/1R FNP, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers restricted flow to be a credible failure mode for components with integral filters and/or orifices, and recommends that it be addressed for the pressure relief valve. Failure mode can be added to 03-2F-101060-3 (pressure relief valve assembly, burst disk fails to rupture, 3/1R FNP).

and a second second

3) FAILURE: STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE

NO FMEA RCS-10009X 1/1 ---, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. FMEA 03-2F-101060-1 addresses only a bellows failure. IOA considers external leakage of the relief assembly due to a housing failure to be a credible failure mode (ref. NSTS 22206, p. 2-14, item 2.3.7.a), and recommends that it be addressed on the FMEA/CIL. Failure results in loss of helium pressurant (see 4.1.1.A.1), and leakage of prop or prop vapors (see 4.1.1.A.2).

4.1.2.2.A.3 Ground Manual Isolation Valve (1 issue)

1) FAILURE: STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE

NO FMEA RCS-146 1/1 ---, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers external leakage of the ground manual isolation valve due to a housing failure to be a credible failure (ref. NSTS 22206, p. 2-14, item 2.3.7.a), and recommends that it be addressed on the FMEA/CIL. Failure results in loss of helium pressurant (see 4.1.1.A.1), and leakage of prop and/or prop vapors (see 4.1.1.A.2).

-

-

_

4.1.2.2.A.4 Propellant Tank Isolation Valves (5 issues)

1) FAILURE: RESTRICTED FLOW

03-2F-102120-1 3/1R PPP RCS-148 2/1R PPF, CIL

<u>ISSUE:</u> IOA recommends that this failure mode be upgraded to a 2/1R PPF and placed on a new FMEA, separate from the "fails closed" FMEA. Loss of prop flow through both tank isolation valves would result in inability to perform ET sep and inability to deplete FRCS prop. See 4.1.1.A.1. Contamination could affect both valves simultaneously (fail C screen).

2) FAILURE: FAILS CLOSED

03-2F-102120-1 3/1R PPP RCS-150, 152 2/1R PPP, CIL

<u>ISSUE:</u> IOA recommends that this failure mode be upgraded to a 2/1R. Failure of both FRCS prop tank isol valves results in inability to perform ET sep and inability to deplete FRCS propellant. See 4.1.1.A.1.

3) FAILURE: RELIEF DEVICE FAILS CLOSED

03-2F-102120-3 3/3 ---RCS-10010X 2/1R PNP, CIL

ISSUE: These values are nominally open during all phases, and will not be closed unless a downstream failure occurs which requires isolation. Therefore, this failure mode is not applicable until another failure occurs. IOA recommends that the FMEA for this failure mode be upgraded to a 2/1R PNP (not a 1/1, since a previous failure is required for the value to be closed). See 4.1.1.A.3.

4) FAILURE: INTERNAL LEAKAGE

NO FMEA RCS-149A, 151A 3/1R PNP

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers "internal leakage" to be a credible failure mode and recommends that it be added as a failure mode on 03-2F-102120-2 (prop tank isol valves, fails open, 3/1R PNP).

5) FAILURE: STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE

NO FMEA RCS-147 1/1 ---, CIL

-

 ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. FMEA 03-2F-102112-1 addresses only a bellows failure. IOA considers external leakage of a prop tank isolation valve housing to be a credible failure (ref. NSTS 22206, p. 2-14, item 2.3.7.a), and recommends that it be addressed on the FMEA/CIL. This failure would result in leakage of propellant. See 4.1.1.A.2.

4.1.2.2.A.5 Primary Manifold Isolation Valves (4 issues)

1) FAILURE: FAILS CLOSED

03-2F-102110-1 3/1R PPP RCS-158, 162, 166, 170 2/1R PPP, CIL

ISSUE: IOA recommends that this failure mode be upgraded to a 2/1R. Certain combinations of two manifold isolation valves failed closed (#1 & #3, or #2 & #4) would result in loss of yaw jet (null jet) dumping capability and possible inability to deplete FRCS prop. See 4.1.1.A.1.

2) FAILURE: RELIEF DEVICE FAILS CLOSED

03-2F-102110-3 3/3 ---RCS-10012X 1/1 ---, CIL

ISSUE: These values are nominally closed during entry. IOA recommends that the FMEA for this failure mode be upgraded to a 1/1. See 4.1.1.A.3

3) FAILURE: STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE

NO FMEA RCS-177 1/1 ---, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. FMEA 03-2F-102112-1 addresses only a bellows failure. IOA considers external leakage of a primary manifold isolation valve housing to be a credible failure (ref. NSTS 22206, p. 2-14, item 2.3.7.a), and recommends that it be addressed on the FMEA/CIL. This failure would result in leakage of propellant. See 4.1.1.A.2.

_____:

== :

4) FAILURE: RESTRICTED FLOW

NO FMEA RCS-178 2/1R PPP, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers restricted flow to be a credible failure mode for components with integral filters, and recommends that it be addressed for the primary manifold isolation valves. Effects same as "fails closed". See issue on 03-2F-102110-1, above, and 4.1.1.A.1.

4.1.2.2.A.6 Vernier Manifold Isolation Valves (4 issues)

1) FAILURE: FAILS OPEN, INTERNAL LEAKAGE

03-2F-102170-2 3/2R PPP RCS-173 3/1R PNP

<u>ISSUE:</u> IOA recommends that these failure modes be upgraded to 3/1R PNP. Loss of all redundancy (tank isol valve and thruster valve) results in leakage of propellant. See 4.1.1.A.2.

2) FAILURE: STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE

NO FMEA RCS-177A 1/1 ---, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. FMEA 03-2F-102170-3 addresses only a bellows failure. IOA considers external leakage of a vernier manifold isolation valve housing to be a credible failure (ref. NSTS 22206, p. 2-14, item 2.3.7.a), and recommends that it be addressed on the FMEA/CIL. This failure would result in leakage of propellant. See 4.1.1.A.2.

3) FAILURE: RESTRICTED FLOW

NO FMEA RCS-178 2/2 ---, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers restricted flow to be a credible failure mode for components with integral filters, and recommends that it be addressed for the vernier manifold isolation valves. Effects same as "fails closed". This failure mode can be added to 03-2F-102170-1 (vernier manifold valve, fails closed, 2/2).

4) FAILURE: RELIEF DEVICE FAILS CLOSED

NO FMEA RCS-10014X 2/1R PNP, CIL

.

.

-

<u>ISSUE:</u> This failure mode is not currently addressed for the FRCS vernier manifold isolation valves, however it is addressed for the ARCS vernier manifold valves. This valve is nominally open during all phases, and will not be closed unless a downstream failure occurs which requires isolation. Therefore, this failure mode is not applicable until another failure occurs. IOA recommends that the FMEA for this failure mode be upgraded to a 2/1R PNP (not a 1/1, since a previous failure is required for the valve to be closed). See 4.1.1.A.3.

4.1.2.2.A.7 Jet Alignment Bellows (1 issue)

1) FAILURE: STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE

03-2F-121308-1 1/1 ---, CIL RCS-179 1/1 ---, CIL

ISSUE: IOA recommends that the "effects" on this FMEA be revised. The current effects state that this failure is "no effect after ET separation". IOA considers leakage of prop to be critical during all phases. See 4.1.1.A.2. 4.1.2.2.A.8 Quick Disconnect Couplings (4 issues)

1) FAILURE: EXTERNAL LEAKAGE

03-2F-101080-1 2/1R FFP, CIL RCS-159, 163, 167, 171, 175 2/1R FFP, CIL

ISSUE: IOA recommends that "poppet fails open" be added as a failure mode on this FMEA. This is a credible failure mode and is addressed on other QD coupling FMEAs.

2) FAILURE: EXTERNAL LEAKAGE

03-2F-101090-1 3/1R FFP, CIL RCS-130 3/1R FFP, CIL

<u>ISSUE:</u> IOA recommends that "poppet fails open" be added as a failure mode on this FMEA. This is a credible failure mode and is addressed on other QD coupling FMEAs.

_

3,4) FAILURE: FAILS TO COUPLE

03-2F-101	1080-2	2				3/3	
03-2F-101	1090-2	2				3/3	
RCS-160,	164,	168,	172,	176,	131	3/3	

<u>ISSUE:</u> IOA recommends that "restricted flow" be added as a failure mode on the FMEAs listed. This is a credible failure and is addressed on other QD coupling FMEAs.

4.1.2.2.B EPD&C (91 issues)

4.1.2.2.B.1 Remote Power Controllers (4 issues)

1) FAILURE: INADVERTENT OPERATION

05-6KF-2177-2 3/1R PFP, CIL FRCS-11019 3/3

ISSUE: NASA FMEA considers multiple failures (close driver failed on, ground driver failed on causing continuous power to the solenoid). IOA-RCS claims this RPC inadvertently operating alone has no effect. (see 4.1.1.B.2)

2) FAILURE: INADVERTENT OPERATION

05-6KF-2178-2 3/1R PFP, CIL FRCS-11021 3/3

ISSUE: NASA FMEA considers multiple failures (open driver failed on, ground driver failed on causing continuous power to the solenoid). IOA-RCS claims this RPC inadvertently operating alone has no effect. (see 4.1.1.B.2)

3) FAILURE: LOSS OF OUTPUT

05-6KF-2177-1	3/2R	РР	Ρ	
FRCS-11018	3/1R	P NA	Ρ	

<u>ISSUE:</u> This RPC failed open (loss of output) causes inability to close manifold 5 isolation valve. Loss of this, coupled with the loss of all hardware redundancy prevents isolation of a thruster leak. (see 4.1.1.B.4)

4) FAILURE: LOSS OF OUTPUT

05-6KF-2178-1	3/2R	PPP
FRCS-11020	2/2,	CIL

<u>ISSUE:</u> IOA-RCS claims this RPC failed open (loss of output) causes inability to open the valve. This causes loss of vernier jets required for mission operations. (see 4.1.1.B.4)

4.1.2.2.B.2 Diodes (27 issues)

1) FAILURE: FAILS SHORT

05-6KF-2255-2	3/3	
FRCS-573,579,595,601	3/2R	PPP
617,623,639,645		

2) FAILURE: FAILS OPEN

05-6KF-2268-1	3/3	
FRCS-580,582,602,604	3/2R	PPP
624.626.646.648		

3) FAILURE: FAILS SHORT

05-6KF-2257-2	3/3	
FRCS-11037	3/2R	PPP

4) FAILURE: FAILS SHORT

05-6KF-2257A-2 3/3 FRCS-11039 3/2R PPP

5) FAILURE: FAILS OPEN

05-6KF-2269-1 3/3 FRCS-11056,11058 3/2R PPP

<u>ISSUE:</u> The first five issues concern falsely failing the value closed. (see 4.1.1.B.1)

6) FAILURE: FAILS OPEN

05-6KF-2253-1 2/1R PFP, CIL FRCS-388,406,410,420 3/3

<u>ISSUE:</u> NASA FMEA considers multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failed open diode alone (causing continuous power to the motor) has no effect. (see 4.1.1.B.2)

7) FAILURE: FAILS OPEN

05-6KF-2253E-1 3/1R PFP, CIL FRCS-408,418 - 3/3

<u>ISSUE:</u> NASA FMEA considers multiple failures (continuous power to the motor and a bellows leak). <u>IOA-RCS</u> claims this failed open diode alone (causing continuous power to the motor) has no effect. (see 4.1.1.B.2)

8) FAILURE: FAILS OPEN

05-6KF-2254-1 2/1R PFP, CIL FRCS-424,442,446,456 3/3

<u>ISSUE:</u> NASA FMEA considers multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failed open diode alone (causing continuous power to the motor) has no effect. (see 4.1.1.B.2) 9) FAILURE: FAILS OPEN

05-6KF-2255-1 2/1R PFP, CIL FRCS-572,578,594,600 3/3 616,622,638,644

<u>ISSUE:</u> NASA FMEA considers multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failed open diode alone (causing continuous power to the motor) has no effect. (see 4.1.1.B.2)

10) FAILURE: FAILS OPEN

05-6KF-2255E-1 3/1R PFP, CIL FRCS-576,598,620,642 3/3

ISSUE: NASA FMEA considers multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failed open diode alone (causing continuous power to the motor) has no effect. (see 4.1.1.B.2)

11) FAILURE: FAILS OPEN

05-6KF-2255F-1 3/1R PFP, CIL FRCS-568,590,612,634 3/3

<u>ISSUE:</u> NASA FMEA considers multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failed open diode alone (causing continuous power to the motor) has no effect. (see 4.1.1.B.2)

12) FAILURE: FAILS OPEN

05-6KF-2257-1 3/1R PFP, CIL FRCS-11036 3/3

ISSUE: NASA FMEA considers multiple failures (switch internal short, open driver failed on causing continuous power to the solenoid). IOA-RCS claims this diode failed open alone has no effect. (see 4.1.1.B.2)

13) FAILURE: FAILS OPEN

05-6KF-2257A-1 3/1R PFP, CIL FRCS-11038 3/3

<u>ISSUE:</u> NASA FMEA considers multiple failures (switch internal short, close driver failed on causing continuous power to the solenoid). IOA-RCS claims this diode failed open alone has no effect. (see 4.1.1.B.2)

14) FAILURE: FAILS SHORT

05-6KF-2257F-2 3/2R PPP FRCS-11065 3/3

ISSUE: NASA FMEA considers multiple failures (switch fails short, circuit breaker failed on causing continuous power to the solenoid). IOA-RCS claims this diode failed short has no effect. (see 4.1.1.B.2)

15) FAILURE: FAILS SHORT

05-6KF-2255E-2 3/1R PFP, CIL FRCS-577,599,621,643 2/1R PFP, CIL

ISSUE: NASA FMEA considers multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failed short diode causes excessive motor operation (continuous power that opens the valve slightly (3 degrees) then closes it, constantly repeating itself). Motor damage would likely cause the valve to close, causing loss of jets on associated manifold. Redundancy provided by jets on another manifold. Loss of all redundancy causes the inability to expel propellants in efforts to meet C.G. limits. (see 4.1.1.B.3, 4.1.1.B.4)

16) FAILURE: FAILS SHORT

05-6KF-2255F-2- 3/1R PFP, CIL FRCS-569,591,613,635 2/1R PFP, CIL

<u>ISSUE:</u> NASA FMEA considers multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failed short diode causes excessive motor operation (continuous power that opens the valve slightly (3 degrees) then closes it, constantly repeating itself). Motor damage would likely cause the valve to close, causing loss of jets on associated manifold. Redundancy provided by jets on another manifold. Loss of all redundancy causes the inability to expel propellants in efforts to meet C.G. limits. (see 4.1.1.B.3, 4.1.1.B.4)

17) FAILURE: FAILS OPEN

05-6KF-2253B-1	3/2R	PP P
FRCS-398,400	3/1R	P NA P

ISSUE: IOA-RCS claims this failed open diode causes inability to open the valve with the GPC/MDM. Manual commanding provides redundancy. Loss of this, coupled with the loss of all hardware redundancy causes inability to expel propellants in efforts to meet C.G. limits.

18) FAILURE: FAILS OPEN

 05-6KF-2254B-1
 3/2R
 P
 P

 FRCS-434,436
 3/1R
 P
 NA
 P

ISSUE: IOA-RCS claims this failed open diode causes inability to open the valve with the GPC/MDM. Manual commanding provides redundancy. Loss of this, coupled with the loss of all hardware redundancy causes inability to expel propellants in efforts to meet C.G. limits.

19) FAILURE: FAILS OPEN

05-6KF-2255B-13/2RPPFRCS-574,596,618,6403/1RPNAP

<u>ISSUE:</u> This diode failed open causes inability to open the valve with the GPC/MDM. Redundancy provided by manual commanding. Loss of this causes loss of jets on associated manifold. Redundancy provided by jets on another manifold. Loss of all redundancy causes loss of jets required to expel propellants in efforts to meet C.G. limits.

20) FAILURE: FAILS OPEN

05-6KF-2257D-1	3/2R	ΡΡ	Ρ
FRCS-11044,11060	3/1R	P NA	Ρ

<u>ISSUE:</u> This diode failed open causes inability to close isolation valve manually. GPC/MDM close command provides redundancy. Loss of this, coupled with the loss of all hardware redundancy prevents isolation of a thruster leak. (see 4.1.1.B.4)

21) FAILURE: FAILS OPEN

C-2

 05-6KF-2257F-1
 3/2R
 P
 P

 FRCS-11064
 3/1R
 P
 NA
 P

ISSUE: This diode failed open causes inability to inhibit the ground driver manually to close the valve. Redundancy provided with the GPC/MDM commands. Loss of this, coupled with the loss of all hardware redundancy prevents isolation of a thruster leak. (see 4.1.1.B.4)

22) FAILURE: FAILS OPEN

05-6KF-2258-1 3/2R PPP FRCS-11070 2/2, CIL

ISSUE: IOA-RCS claims this failed open diode causes inability to open valve. This causes loss of vernier jets required for mission operations. (see 4.1.1.B.4)

23) FAILURE: FAILS SHORT TO GROUND

05-6KF-2258-3 3/2R PPP -FRCS-11221 2/2, CIL

<u>ISSUE:</u> IOA-RCS claims this failed short to ground diode causes inability to open valve. This causes loss of vernier jets required for mission operations. (see 4.1.1.B.4)

24,25) FAILURE: FAILS OPEN

NO FMEA FRCS-11072,11074

3/1R P NA P

<u>ISSUE:</u> The manifold isolation valve has two diodes in parallel that completes the circuit to ground. One diode failing open has no effect. Second diode failing open will causes inability to close the valve. Loss of this, coupled with the loss of all hardware redundancy prevents isolation of a thruster leak. (see 4.1.1.B.5)

26,27) FAILURE: FAILS SHORT

NO FMEA FRCS-11073,11075 3/3

<u>ISSUE:</u> The manifold isolation valve has two diodes in parallel that completes the circuit to ground. Either or both diode failing short has no effect. (see 4.1.1.B.5)

4.1.2.2.B.3 Hybrid Drivers (20 issues)

1) FAILURE: LOSS OF OUTPUT

05-6KF-2206-1	3/3	
FRCS-460,462	3/2R	\mathbf{PPP}

2) FAILURE: INADVERTENT OPERATION

05-6KF-2206-2	3/3	
FRCS-461,463	3/2R	\mathbf{PPP}

3) FAILURE: LOSS OF OUTPUT

05-6KF-2207-1 3/3 FRCS-464,464 3/2R PPP

4) FAILURE: INADVERTENT OPERATION

05-6KF-2207-2 3/3 FRCS-465,467 3/2R PPP

<u>ISSUE:</u> The first four issues concern falsely failing the valve closed. (see 4.1.1.B.1)

5) FAILURE: LOSS OF OUTPUT

05-6KF-2208-12/1RPFP, CILFRCS-668,670,672,674,676,678,680,6823/2RPPP

ISSUE: NASA FMEA considers multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failed open driver causes loss of accurate indication of the valve status from the event indicator. GPC/MDM microswitch discretes provide redundancy. Loss of all redundancy may lead to falsely failing the valve closed. (see 4.1.1.B.2)

6) FAILURE: INADVERTENT OPERATION

05-6KF-2113A-2 3/1R PFP, CIL FRCS-11033 3/3

ISSUE: NASA FMEA contains multiple failures (open driver failed on, ground driver failed on causing continuous power to the solenoid). IOA-RCS claims this driver inadvertently operating has no effect. (see 4.1.1.B.2)

7) FAILURE: LOSS OF OUTPUT

05-6KF-2210-1	3/1R	PFP,	CIL
FRCS-11024	3/2R	PPP	

ISSUE: NASA FMEA considers multiple failures (switch short, ground driver failed on causing continuous power to the solenoid). IOA-RCS claims this driver failed open (loss of output) causes loss of event indicator to determine valve status. GPC/MDM discretes provide redundancy. Loss of all redundancy may lead to falsely failing the valve close causing loss of mission operations. (see 4.1.1.B.2)

8) FAILURE: LOSS OF OUTPUT

05-6KF-2210A-1 3/1R PFP, CIL FRCS-11022 3/2R PPP

<u>ISSUE:</u> NASA FMEA considers multiple failures (switch short, ground driver failed on causing continuous power to the solenoid). IOA-RCS claims this driver failed open (loss of output) causes loss of event indicator to determine valve status. GPC/MDM discretes provide redundancy. Loss of all redundancy may lead to falsely failing the valve close causing loss of mission operations. (see 4.1.1.B.2)

9) FAILURE: INADVERTENT OUTPUT

05-6KF-2211-2 3/1R PFP, CIL FRCS-11031 3/3

ISSUE: NASA FMEA considers multiple failures (open driver failed on, ground driver failed on causing continuous power to the solenoid). IOA-RCS claims this driver inadvertently operating alone has no effect. (see 4.1.1.B.2)

10) FAILURE: INADVERTENT OUTPUT

05-6KF-2213-2 3/1R PFP, CIL FRCS-11027_ 3/3

<u>ISSUE:</u> NASA FMEA considers multiple failures (close driver failed on, ground driver failed on causing continuous power to the solenoid). IOA-RCS claims this driver inadvertently operating alone has no effect. (see 4.1.1.B.2)

11) FAILURE: INADVERTENT OUTPUT

05-6KF-2224-2 3/1R PFP, CIL FRCS-11035 3/3

<u>ISSUE:</u> NASA FMEA considers multiple failures (type I open driver failed on, type III open driver failed on causing continuous power to the solenoid). IOA-RCS claims this driver inadvertently operating alone has no effect. (see 4.1.1.B.2)

ender ein einen gestellten einen og og beste here her i som ettellte som som

12) FAILURE: INADVERTENT OUTPUT

05-6KF-2212-2 3/1R PFP, CIL FRCS-11029 2/2, CIL

<u>ISSUE:</u> NASA FMEA contains multiple failures (ground driver failed on causing continuous power to the solenoid). This driver failed high causes inability to open the isolation valve. This causes loss of verniers thus mission objectives. (see 4.1.1.B.3)

13) FAILURE: INADVERTENT OUTPUT

05-6KF-2208-2	3/1R	PPP		
FRCS-669,673,677,681	2/1R	PPP	(open driver),	CIL
671,675,679,683	3/1R	PPP	(close driver)	

ISSUE: This driver failed short causes inability to open the valve. This causes loss of jets on associated manifold. Redundancy provided by jets on another manifold. Loss of all redundancy causes loss of jets required to expel propellants in efforts to meet C.G. limits. Close driver failed short causes inability to isolate a thruster leak. (see 4.1.1.B.4)

14) FAILURE: INADVERTENT OUTPUT

05-6KF-2210-2 3/2R PPP FRCS-11025 2/2, CIL

<u>ISSUE:</u> IOA-RCS claims this failed short driver causes inability to open the valve. This causes loss of vernier jets required for mission operations. (see 4.1.1.B.4)

15) FAILURE: INADVERTENT OUTPUT

05-6KF-2210A-2	3/2R	PPP
FRCS-11023	3/1R	PPP

<u>ISSUE:</u> This driver failed short causes inability to close isolation valve. Loss of this, coupled with the loss of all hardware redundancy prevents isolation of a thruster leak. (see 4.1.1.B.4)

16) FAILURE: LOSS OF OUTPUT

05-6KF-2211-1	3/2R	PPP
FRCS-11030	2/2,	CIL

<u>ISSUE:</u> IOA-RCS claims this failed open driver (loss of output) causes inability to open the valve. This causes loss of vernier jets required for mission operation. (see 4.1.1.B.4)

17) FAILURE: LOSS OF OUTPUT

05-6KF-2212-1 3/2R P P P FRCS-11028 3/1R P NA P

<u>ISSUE:</u> This driver failed open (loss of output) causes inability to close the isolation valve. Loss of this, coupled with the loss of all hardware redundancy prevents isolation of a thruster leak. (see 4.1.1.B.4)

18) FAILURE: LOSS OF OUTPUT

 05-6KF-2213-1
 3/2R
 P
 P

 FRCS-11026
 3/1R
 P
 NA
 P

ISSUE: This driver failed open (loss of output) causes inability to close the isolation valve. Loss of this, coupled with the loss of all hardware redundancy prevents isolation of a thruster leak. (see 4.1.1.B.4)

19) FAILURE: LOSS OF OUTPUT

05-6KF-2113A-1 3/2R PPP FRCS-11032 2/2, CIL

<u>ISSUE:</u> IOA-RCS claims this failed open driver causes inability to open the valve. This causes loss of vernier jets required for mission operations. (see 4.1.1.B.4)

20) FAILURE: LOSS OF OUTPUT

05-6KF-2224-1 3/2R PPP FRCS-11034 2/2, CIL

ISSUE: This driver failed open (loss of output) causes inability to open the isolation valve. Inability to open this valve causes loss of verniers thus loss of mission. (see 4.1.1.B.4)

4.1.2.2.B.4 Fuses (1 issue)

FAILURE: FAILS OPEN

05-6KF-2006-1	3/2R	PP P
FRCS-11001,11002	3/1R	P NA P

<u>ISSUE:</u> This fuse failed open causes inability to close the valve manually. Redundancy provided with the GPC/MDM commands. Loss of this, coupled with the loss of all hardware redundancy prevents isolation of a thruster leak. (see 4.1.1.B.2)

-

4.1.2.2.B.5 Relays (9 issues)

1) FAILURE: INADVERTENT OUTPUT

 05-6KF-2126-2
 2/1R
 PFP, CIL

 FRCS-473,479
 3/1R
 PFP, CIL

<u>ISSUE:</u> NASA FMEA considers multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failed closed relay causes inability to close the valve. This, coupled with the loss of all hardware redundancy prevents isolation of a thruster leak. (see 4.1.1.B.3)

2) FAILURE: INADVERTENT OUTPUT

05-6KF-2126A-2	3/1R	PFP,	CIL
FRCS-475,481,	3/3		
477,483	2/1R	PFP,	CIL

ISSUE: NASA FMEA considers multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failed closed relay causes inability to open the valve. This causes loss of jets on manifolds 1 & 2. Redundancy provided by jets on manifolds 3 & 4. Loss of all redundancy causes loss of jets required to expel propellants in efforts to meet C.G. limits. First in a series relay failing closed has no effect (475,481). (see 4.1.1.B.3, 4.1.1.B.4)

3) FAILURE: INADVERTENT OUTPUT

05-6KF-2127-2	2/1R	PFP,	CIL	
FRCS-487,493	3/3			
489,495	-	2/1R	PFP,	CIL

ISSUE: NASA FMEA considers multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failed closed relay causes inability to open the valve. This causes loss of jets on manifolds 3,4 & 5. Redundancy provided by jets on manifolds 1 & 2. Loss of all redundancy causes loss of jets required to expel propellants in efforts to meet C.G. limits. First series relay failing closed has no effect (487,493). No redundancy for vernier jets on manifold 5 (2/2). (see 4.1.1.B.3, 4.1.1.B.4) 4) FAILURE: INADVERTENT OUTPUT

05-6KF-2127A-2	2/1R	PFP,	CIL
FRCS-485,491	2/1R	PFP,	CIL

ISSUE: NASA FMEA considers multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failed closed relay causes inability to open the valve. This causes loss of jets on manifolds 3,4 & 5. Redundancy provided by jets on manifolds 1 & 2. Loss of all redundancy causes loss of jets required to expel propellants in efforts to meet C.G. limits. No redundancy for vernier jets on manifold 5 (2/2). (see 4.1.1.B.3, 4.1.1.B.4)

5) FAILURE: FAILS TO TRANSFER (LOSS OF OUTPUT)

05-6KF-2127A-1	3/1R	PPP		
FRCS-484,490	2/1R	PFP,	CIL	
				 ann a' a' cui

ISSUE: This relay failing to transfer inability to open the 3/4/5 valve. This causes loss of jets on manifolds 3,4, & 5. Redundancy for jets on manifolds 3 & 4 provided on manifolds 1 & 2. Loss of all redundancy causes loss of jets required for to expel propellants in efforts to meet C.G. limits. No redundancy provided for manifold 5 (verniers - 2/2). (see 4.1.1.B.3)

6) FAILURE: INADVERTENT OPERATION

05-6KF-2128-2 2/1R PFP, CIL FRCS-705,709,713,717 2/1R PPP, CIL

ISSUE: NASA FMEA considers multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this close relay inadvertently operating causes inability to open the valve causing loss of jets on associated manifold. Redundancy provided by jets on another manifold. Loss of all redundancy causes inability to expel propellants in efforts to meet C.G. limits. (see 4.1.1.B.3, 4.1.1.B.4)

7) FAILURE: INADVERTENT OUTPUT

05-6KF-2128A-2	2/1R	PFP,	CIL
FRCS-703,707,711,715	3/1R	PFP,	CIL

<u>ISSUE:</u> NASA FMEA considers multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this open relay failed closed causes inability to close the valve. This, coupled with the loss of all hardware redundancy prevents isolation of a thruster leak. (see 4.1.1.B.3)
8) FAILURE: FAILS TO TRANSFER (LOSS OF OUTPUT) 05-6KF-2126-1 3/1R PPP FRCS-472,478 2/1R PPP, CIL **ISSUE:** IOA-RCS claims this relay failing to transfer causes inability to open the valve. This causes loss of jets on manifolds 1 & 2. Redundancy provided by jets on manifolds 3 & 4. Loss of all redundancy causes loss of jets required to expel propellants in efforts to meet C.G. limits. (see 4.1.1.B.4) 9) FAILURE: FAILS TO TRANSFER (LOSS OF OUTPUT) 05-6KF-2128A-1 3/1R PPP 2/1R PPP, CIL FRCS-702,706,710,714 This relay failing to transfer causes inability to open **ISSUE:** isolation valve. This causes loss of jets on associated manifold. Redundancy provided by jets on another manifold. Loss of all redundancy causes loss of jets required to expel propellants in efforts to meet C.G. limits. (see 4.1.1.B.4) 4.1.2.2.B.6 Resistors (10 issues) 1) FAILURE: FAILS OPEN 05-6KF-2081-1 3/3 FRCS-502,506,5<u>1</u>0,512 3/2R PPP FAILURE: FAILS OPEN 2) 05-6KF-2082-1 3/3 3/2R PPP FRCS-504,508 3) FAILURE: FAILS SHORT TO GROUND OR OPEN 3/3 05-6KF-2153-1,2 3/2R PPP FRCS-879 FAILURE: FAILS OPEN 4) 05-6KF-2085-1 3/3 FRCS-522,526 3/2R PPP FAILURE: FAILS OPEN 5) 05-6KF-2086-1 3/3 FRCS-520,524,528,530 3/2R PPP

6) FAILURE: FAILS OPEN

05-6KF-2091-1 3/3 FRCS-11012,11013,11014,11015 3/2R PPP

<u>ISSUE:</u> The first six issues concern falsely failing the valve closed. (see 4.1.1.B.1)

7) FAILURE: FAILS OPEN

05-6KF-2083-1 3/1R PFP, CIL FRCS-496,498,500 3/2R PPP

<u>ISSUE:</u> NASA FMEA considers multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failed open resistor causes loss of accurate indication of the valve status from the event indicator or the GPC/MDM microswitch discretes. This may lead to falsely failing the valve closed. (see 4.1.1.B.2)

8) FAILURE: FAILS OPEN

05-6KF-2084-1 3/1R PFP, CIL FRCS-514,516,518 3/2R PPP

ISSUE: NASA FMEA considers multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failed open resistor causes loss of accurate indication of the valve status from the event indicator or GPC/MDM microswitch discretes. This may lead to falsely failing the valve closed. (see 4.1.1.B.2)

9) FAILURE: FAILS OPEN

05-6KF-2089-1 2/1R PFP, CIL FRCS-718,732,746,760 3/2R PPP

ISSUE: NASA FMEA considers multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failed open resistor causes loss of accurate indication of the valve status from the event indicator or GPC/MDM microswitch discretes. This may lead to falsely failing the valve closed. (see 4.1.1.B.2)

موجد المناحد ال

10) FAILURE: FAILS OPEN

05-6KF-2090-1 3/1R PFP, CIL FRCS-11008 3/2R PPP

ISSUE: NASA FMEA considers multiple failures (ground driver failed on causing continuous power to the solenoid). IOA-RCS claims this failed open resistor causes loss of accurate talkback. This may lead to falsely failing the valve closed causing loss of mission operations. (see 4.1.1.B.2)

4.1.2.2.B.7 Toggle Switches (3 issues) -

1) FAILURE: INADVERTENT OPERATION

05-6KF-2032-2 3/1R PFP, CIL FRCS-11005,11007 3/1R PFP, CIL

<u>ISSUE:</u> NASA FMEA contains multiple failures (open driver failed on, causing continuous power to the solenoid). The switch inadvertently operating causes inability to close the valve. This, coupled with the loss of all hardware redundancy prevents isolation of a thruster leak. (see 4.1.1.B.3)

2) FAILURE: FAILS TO CONDUCT ONE OR MORE CONTACT SET

05-6KF-20<u>3</u>2-1 3/2R P P P FRCS-11003,110<u>0</u>4,11006 3/1R P NA P

ISSUE: This switch failed open causes inability to close the valve manually. Redundancy provided with the GPC/MDM commands. Loss of this, coupled with the loss of all hardware redundancy prevents isolation of a thruster leak. (see 4.1.1.B.3)

3) FAILURE: SWITCH FAILS SHORT

05-6KF-2030-2	3/1R	PPP	
FRCS-11096,11097,11101,11102	2/1R	PFP,	CIL
11106,11107,11111,11112			

<u>ISSUE:</u> Switch short across close contacts causes inability to open the valve. Inability to open the valve coupled with the loss of all hardware redundancy may causes loss of jets required to expel propellants to meet CG limits. (see 4.1.1.B.3) 4.1.2.2.B.8 Microswitches (8 issues)

1) FAILURE: ERRONEOUS OUTPUT

NO FMEA FRCS-11205

3/1R PPP

ISSUE: The tank isolation value 1/2 solenoid microswitch provides power to the talkback circuitry and to the relay inhibit. A microswitch failure across the close contacts while the value is open causes inability to close the value. This, coupled with the loss of all hardware redundancy prevents isolation of a thruster leak. (see 4.1.4.B.5)

2) FAILURE: ERRONEOUS OUTPUT

NO FMEA FRCS-11206 3/1R PPP

<u>ISSUE:</u> The tank isolation valve 3/4/5 solenoid microswitch provides power to the talkback circuitry and to the relay inhibit. A microswitch failure across the close contacts while the valve is open causes inability to close the valve. This, coupled with the loss of all hardware redundancy prevents isolation of a thruster leak. (see 4.1.1.B.5)

3-6) FAILURE: ERRONEOUS OUTPUT

NO FMEA FRCS-11207,11208, 3/2R PPP 11209,11210

<u>ISSUE:</u> The manifold isolation valve solenoid microswitch provides power to the talkback circuitry and to the relay inhibit. A microswitch failure across the either contacts will provide an inaccurate talkback. This may lead to falsely failing the valve closed. (see 4.1.1.B.5)

7-8) FAILURE: ERRONEOUS OUTPUT

NO FMEA FRCS-11078,11079 3/2R PPP

ISSUE: The manifold isolation valve solenoid microswitch provides power to the talkback circuitry. A microswitch failure across the either contact will provide an inaccurate talkback. This may lead to falsely failing the valve closed. (see 4.1.1.B.5)

4.1.2.2.B.9 Circuit Breaker (1 issue)

1) FAILURE: SHORT, FAILED CLOSED

05-6KF-2280-2 3/1R PFP, CIL FRCS-11077 3/3

<u>ISSUE:</u> NASA FMEA considers multiple failures (switch jam, open driver failed on causing continuous power to the solenoid). IOA-RCS claims this circuit breaker failed short alone has no effect. (see 4.1.1.B.2)

4.1.2.2.B.10 Meters / Rotary Switch (2 issues)

1) FAILURE: All Credible Modes

05-6KF-2158-1 3/3 FRCS-11193,11194 3/2R PPP

2) FAILURE: All Credible Modes

1

05-6KF-2034-1 3/3 FRCS-11191 3/2R PPP

<u>ISSUE:</u> Both of these issues concern falsely failing the valve closed due to inaccurate switch or meter data. (see 4.1.1.B.1)

- 2 - 1 - 1

4.1.2.2.B.11 Event Indicators (6 issues)

1) FAILURE: FAILS SHORT TO GROUND OR OPEN

05-6KF-2154-1,2 3/3 FRCS-879 3/2R PPP

2) FAILURE: FAILS SHORT TO GROUND OR OPEN

05-6KF-2155-1,2 3/3 FRCS-879A 3/2R PPP

3) FAILURE: FAILS OPEN

05-6KF-2155-2	3/3	
FRCS-880A,881A,882A,883A	3/2R	\mathbf{PPP}

4) FAILURE: FAILS OPEN

05-6KF-2156-2 3/3 FRCS-11016 3/2R PPP

<u>ISSUE:</u> The first four issues concern falsely failing the valve closed. (see 4.1.1.B.1)

5) FAILURE: FAILS SHORT TO GROUND

05-6KF-2155-1 2/1R PFP, CIL FRCS-880,881,882,883 3/2R PPP -

ISSUE: NASA FMEA considers multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failed short to ground event indicator causes loss of accurate indication of the valve status from the display. GPC/MDM microswitch discretes provide redundancy. Loss of all redundancy may lead to falsely failing the valve closed. (see 4.1.1.B.2)

6) FAILURE: FAILS SHORT TO GROUND

05-6KF-2156-1 3/1R PFP, CIL FRCS-11017 3/2R PPP

<u>ISSUE:</u> NASA FMEA considers multiple failures (ground driver failed on causing continuous power to the solenoid). IOA-RCS claims this event indicator failed short to ground causes loss of accurate indication of valve status from event indicator. Redundancy provided by GPC/MDM discretes. Loss of all redundancy may lead to falsely failing the valve closed causing loss of mission operations. (see 4.1.1.B.2) 4.1.2.3 Thruster Subsystem (41 issues)

4.1.2.3.A Hardware (10 issues)

4.1.2.3.A.1 Primary Thruster Bipropellant Solenoid Valves (6 issues)

1) FAILURE: PREMATURE OPERATION (DURING GROUND C/O TRICKLE CURRENT TEST)

03-2F-121310-1 3/3 ---RCS-10116X 1/1 ---, CIL

<u>ISSUE:</u> IOA considers a premature (unexpected) firing of an RCS thruster during ground operations and testing to be a 1/1 failure. Such a failure could result in loss of life due to exposure to prop vapors and/or thruster plume. This failure is the result of a reaction jet driver (RJD) failure. A "failed-on" thruster caused by an RJD failure is covered in the GNC subsystem.

2) FAILURE: FAILS OPEN, INTERNAL LEAKAGE

03-2F-121310-2	3/1R	FPP,	CIL	
RCS-181	1/1	,	CIL	(Fails open)
RCS-185, 187, 189	1/1	,	CIL	(Internal leakage)

ISSUE: A thruster biprop valve failed open or leaking due to piece-part structural failure or seal failure results in leakage of propellant. See 4.1.1.A.2. Such a failure could also result in zots upon subsequent thruster use.

3) FAILURE: FAILS CLOSED (ONE OR BOTH VALVES)

03-2F-121310-3	3/1R FPP,	CIL	(All FRCS thrusters)
RCS-184	3/2R FPP,	CIL	(-X axis)
RCS-186	2/1R FPP,	CIL	(+/-Y axis)
RCS-188	3/1R FPP,	CIL	(-Z axis)
RCS-10015X	3/2R FPP,	CIL	(+Z axis)

<u>ISSUE:</u> IOA recommends that the FRCS primary thrusters be separated by axis since the failure of thrusters in each axis can have different effects. IOA considered thrusters which fire in the same direction to be redundant to each other. Loss of all jets in the -X axis could result in loss of mission only. -X thrusters are not required for ET sep or FRCS prop dumping. Loss of both +Y or both -Y thrusters after the deorbit burn would result in loss of yaw jet (null jet) dumping capability and possible inability to deplete FRCS propellant. See 4.1.1.A.1. Loss of all -Z thrusters on the same side could result in inability to perform ET sep. Loss of all +Z thrusters could result in loss of mission only. +Z thrusters are not required for ET sep or FRCS prop dumping. IOA recommends either that this FMEA be separated into four new FMEAs, or that this FMEA be upgraded to a 2/1R FPP to cover the worst case.

4) FAILURE: STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE

NO FMEA RCS-182 1/1 ---, CIL

<u>ISSUE:</u> This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers external leakage of the primary thruster biprop solenoid valves assembly due to a housing failure to be a credible failure (ref. NSTS 22206, p. 2-14, item 2.3.7.a), and recommends that it be addressed on the FMEA/CIL. Failure results in leakage of propellant. See 4.1.1.A.2.

5) FAILURE: RESTRICTED FLOW

NO FMEA RCS-183 2/1R FPP, CIL

<u>ISSUE:</u> This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers restricted flow to be a credible failure mode for components with integral filters, and recommends that it be addressed for the thruster biprop valves. Effects same as "failed closed". See issue on 03-2F-121310-3, above, and 4.1.1.A.1.

6) FAILURE: DELAYED OPERATION, ONE VALVE OPENS SLOWLY OR LATE NO FMEA

RCS-10042X 1/1 ---, CIL

<u>ISSUE:</u> This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers the delayed opening of one biprop valve relative to the other to be a credible failure which should be addressed. Such a failure of the oxidizer valve could result in fuel migration into the oxidizer injector tube and detonation within the tube upon oxidizer flow (zots). Rupture of the valve assembly due to jet zots would result in leakage of propellant. See 4.1.1.A.2. IOA recommends that a 1/1 FMEA be generated for this failure mode.

104

4.1.2.3.A.2 Primary Thruster Injector Head Assembly (2 issues)

1) FAILURE: RESTRICTED FLOW

NO FMEA RCS-10018X 1/1 ---, CIL

<u>ISSUE:</u> This item is not currently addressed on the NASA FMEA/CIL. However, a note on 03-2F-121312-1 states that the injector FMEA was deleted and added as a cause on 121312-1. IOA considers the injector assembly to be at the same level of detail as other primary thruster components on the FMEA/CIL, and recommends that a separate 1/1 FMEA be regenerated for this item and failure mode. This will ensure that this critical failure gets the proper amount of attention. Restricted flow leading to an improper mixture ratio or inadequate cooling would probably result in loss of the thruster, and could result in combustion chamber or nozzle extension burn-through.

2) FAILURE: STRUCTURAL FAILURE, BURN-THROUGH

NO FMEA RCS-10019X 1/1 ---, CIL

ISSUE: This item is not currently addressed on the NASA FMEA/CIL. However, a note on 03-2F-121312-1 states that the injector FMEA was deleted and added as a cause on 121312-1. IOA considers the injector assembly to be at the same level of detail as other primary thruster components on the FMEA/CIL, and recommends that a separate 1/1 FMEA be regenerated for this item and failure mode. This will ensure that this critical failure gets the proper amount of attention. Such a failure of the injector head assembly could result in a fire/explosion potential leading to possible damage to the vehicle.

4.1.2.3.A.3 Vernier Thruster Assembly (2 issues)

1) FAILURE: FAILS OPEN, INTERNAL LEAKAGE

 03-2F-131310-2
 2/2
 ---, CIL

 RCS-192
 1/1
 ---, CIL (Fails open)

 RCS-195
 1/1
 ---, CIL (Internal leakage)

<u>ISSUE:</u> A thruster biprop valve failed open or leaking due to piece-part structural failure or seal failure results in leakage of propellant. See 4.1.1.A.2.

2) FAILURE: STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE

NO FMEA RCS-194 1/1 ---, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers external leakage of the vernier thruster biprop valve assembly due to a housing failure to be a credible failure (ref. NSTS 22206, p. 2-14, item 2.3.7.a), and recommends that it be addressed on the FMEA/CIL. Failure results in leakage of propellant. See 4.1.1.A.2.

🖕 share i na sana sana

_

4.1.2.3.B EPD&C (31 issues)

4.1.2.3.B.1 Remote Power Controllers (5 issues)

1) FAILURE: INADVERTENT OPERATION

05-6KF-2179-2 3/1R PFP, CIL FRCS-886,890,894,901 3/3

<u>ISSUE:</u> NASA FMEA considers multiple failures (RJD bus relays fail on, RJD fails on, manifold isolation valve failed, tank isolation valve failed, main bus off, causing inadvertent or uncontrollable thruster firing). IOA-RCS claims this RPC inadvertently operating alone has no effect. (see 4.1.1.B.2)

2) FAILURE: INADVERTENT OPERATION

05-6KF-2183-2 3/2R PFP, CIL FRCS-906,908 3/3

<u>ISSUE:</u> NASA FMEA considers multiple failures (RPC failed, spurious RJD command, manifold isolation valve failed, tank isolation valve failed, main bus fails on, causing inadvertent or uncontrollable thruster firing). IOA-RCS claims this RPC inadvertently operating alone has no effect. (see 4.1.1.B.2)

3) FAILURE: LOSS OF OUTPUT

· · · · · · · · · · · · · · · · · · ·				
05-6KF-2179-1	3/1R	PPP		
FRCS-885,889,904	2/1R	PPP,	CIL	
893	3/1R	PPP	(manifold 3)	

<u>ISSUE:</u> IOA-RCS claims this failed open RPC causes loss of driver power, thus jets, on associated manifold. Redundancy provided by jets on another manifold. Loss of all redundancy causes loss of jets required to expel propellants in efforts to meet C.G. limits. Manifold 3 has electrical redundancy for driver power (893). (see 4.1.1.B.4) 4) FAILURE: LOSS OF OUTPUT

05-6KF-2180-1	3/1R	PPP			
FRCS-887,891,902	2/1R	PPP,	CIL		
895	3/1R	PPP	(manifold	3)	

<u>ISSUE:</u> IOA-RCS claims this failed open RPC causes loss of logic power, thus jets, on associated manifold. Redundancy provided by jets on another manifold. Loss of all redundancy causes loss of jets required to expel propellants in efforts to meet C.G. limits. Manifold 3 has electrical redundancy for logic power (895). (see 4.1.1.B.4)

5) FAILURE: INADVERTENT OPERATION

05-6KF-2182-2	3/1R	PPP
FRCS-900	3/3	

ISSUE: NASA FMEA considers multiple failures. IOA-RCS claims this failure alone has no effect. (see 4.1.1.B.2)

4.1.2.3.B.2 Diode (7 issues)

1) FAILURE: FAILS OPEN

05-6KF-2259-1	3/1R	PFP,	CIL	
FRCS-913,919,941	2/1R	PPP,	CIL	
925,931 _	3/1R	PPP	(manifold	3)

<u>ISSUE:</u> IOA-RCS claims this failed open diode causes loss of driver power, thus jets, on associated manifold. Redundancy provided by jets on another manifold. Loss of all hardware redundancy causes loss of jets required to expel propellants in efforts to meet C.G. limits. Manifold 3 has additional electrical redundancy (925,931). (see 4.1.1.B.4)

2) FAILURE: FAILS OPEN

_

05-6KF-2260-1	3/1R	PFP,	CIL		
FRCS-909,915,943	2/1R	PPP	(1/1	ABORT),	CIL
921,927	3/1R	PPP	(mani	fold 3)	

ISSUE: IOA-RCS claims this failed open diode causes loss of driver power, thus jets, on associated manifold. Redundancy provided by jets on another manifold. Loss of all redundancy causes loss of jets required to expel propellants in efforts to meet C.G. limits. Loss of one yaw thruster during RTLS/TAL abort could result in inability to complete a propellant dump. Manifold 3 has electrical redundancy (921,927). (see 4.1.1.B.4)

e es parte se el c

13 S. 13 B.

3-7) FAILURE: FAILS SHORT TO GROUND

NO FMEA FRCS-11213,11214,11217 2/1R PFP, CIL 11215,11216 3/1R PFP (manifold 3), CIL

ISSUE: Diode failed short to ground causes loss of jets on associated manifold. Redundancy provided by jets on another manifold. Loss of all redundancy causes loss of jets required to expel propellants in efforts to meet C.G. limits. Manifold 3 has electrical redundancy for driver power (FMEA for fail open and fail short on 05-6KF-2260-1, -2). (see 4.1.1.B.4)

4.1.2.3.B.3 Hybrid Drivers (3 issues)

1) FAILURE: INADVERTENT OPERATION

05-6KF-2220-2 3/2R PFP, CIL FRCS-958 3/3

ISSUE: NASA FMEA considers multiple failures (RPC failed, spurious RJD command, manifold isolation valve failed, tank isolation valve failed, main bus fails on, causing inadvertent or uncontrollable thruster firing). IOA-RCS claims this driver inadvertently operating alone has no effect. (see 4.1.1.B.2)

2) FAILURE: LOSS OF OUTPUT

05-6KF-2214-1	3/1R	PFP,	CIL	
FRCS-947,949,956	2/1R	PPP,	CIL	
951,953	3/1R	PPP	(manifold	3)
 A strategy of generalized and so that 			The second se	

<u>ISSUE:</u> IOA-RCS claims this failed open driver causes loss of driver power, thus jets, on associated manifold. Redundancy provided by jets on another manifold. Loss of all redundancy causes loss of jets required to expel propellants in efforts to meet C.G. limits. Electrical redundancy provided for manifold 3 (951,953). (see 4.1.1.B.4)

3) FAILURE: INADVERTENT OPERATION

05-6KF-2214-2 3/1R PFP, CIL FRCS-948,950,952,954,955 3/3

ISSUE: NASA FMEA considers multiple failures (RJD bus relays fail on, RJD fails on, manifold isolation valve failed, tank isolation valve failed, main bus off, causing inadvertent or uncontrollable thruster firing). IOA-RCS claims this relay inadvertently operating alone has no effect. (see 4.1.1.B.2)

4.1.2.3.B.4 Fuses (3 issues)

1) FAILURE: FAILS OPEN

05-6KF-2009-1 3/2R PPP FRCS-959,962,965 2/1R PPP, CIL

<u>ISSUE:</u> This fuse failed open causes loss of energy to supply driver power to associated relay. Relay "A" provides energy to manifolds 1 & 3. Relay "B" provides energy to manifold 2. Relay "C" provides energy to manifolds 3 & 4. Loss of relay causes loss of jets on associated manifold. Redundancy provided by jets on another manifold. Loss of all hardware redundancy causes loss of jets required to expel propellants in efforts to meet C.G. limits. (see 4.1.1.B.4)

2) FAILURE: FAILS OPEN

05-6KF-2007-1	3/1R	PPP	
FRCS-961,964,967,	2/1R	PPP,	CIL
969	3/1R	PPP	(manifold 4)

ISSUE: IOA-RCS claims this failed open fuse causes loss of logic power, thus jets, on associated manifold. Redundancy provided by jets on another manifold. Loss of all redundancy causes loss of jets required to expel propellants in efforts to meet C.G. limits. Manifold 4 has electrical redundancy for logic power after ascent (969). (see 4.1.1.B.4)

3) FAILURE: FAILS OPEN

05-6KF-2008-1 3/1R PPP FRCS-960,963,966,970 2/1R PPP, CIL

ISSUE: IOA-RCS claims this failed open fuse causes loss driver power, thus jets, on associated manifold. Redundancy provided by jets on another manifold. Loss of all redundancy causes loss of jets required to expel propellants in efforts to meet C.G. limits. (see 4.1.1.B.4)

4.1.2.3.B.5 Relays (2 issues)

1) FAILURE: INADVERTENT OPERATION

05-6KF-2130-2 3/1R PPP FRCS-973,975,977 3/3

ISSUE: NASA FMEA considers multiple failures (RPC fails on, RJD fails on, manifold isolation valve failed, tank isolation valve failed, main bus off, causing inadvertent or uncontrollable thruster firing). IOA-RCS claims this relay inadvertently operating alone has no effect. (see 4.1.1.B.2)

succession and the second

2) FAILURE: FAILS TO TRANSFER

05-6KF-2130-1 3/1R PPP FRCS-972,974,976 2/1R PPP, CIL

<u>ISSUE:</u> IOA-RCS claims this failed open relay causes loss of driver power, thus jets, on associated manifold. Redundancy provided by jets on another manifold. Loss of all redundancy causes loss of jets required to expel propellants in efforts to meet C.G. limits. (see 4.1.1.B.4)

4.1.2.3.B.6 Resistors (1 issue)

1) FAILURE: FAILS SHORT

NO FMEA FRCS-1035 3/3

ISSUE: The RLR42 resistors have been changed to the RWR80 resistors which can short. IOA-RCS recommends this failure be included into the FMEAs. (the open failure mode for this resistor is on 05-6KF-2111-1).

4.1.2.3.B.7 Toggle Switches (5 issues)

1) FAILURE: INADVERTENT OPERATION

05-6KF-2036-2 3/1R PPP FRCS-11121,11122,11123,11131 3/3 11132,11133,11141,11142, 11143,11151,11152,11153

ISSUE: NASA FMEA considers multiple failures (RJD fails on, manifold isolation valve failed, tank isolation valve failed, main bus off, causing inadvertent or uncontrollable thruster firing). IOA-RCS claims this switch inadvertently operating alone has no effect. (see 4.1.1.B.2)

2) FAILURE: INADVERTENT OPERATION

05-6KF-2041-2 3/2R PFP, CIL FRCS-11156,11157,11158 3/3

ISSUE: NASA FMEA considers multiple failures (spurious RJD command, manifold isolation valve failed, tank isolation valve failed, main bus fails off, causing inadvertent or uncontrollable thruster firing). IOA-RCS claims this switch inadvertently operating alone has no effect. (see 4.1.1.B.2)

110

3) FAILURE: FAILS TO CONDUCT ONE OR MORE CONTACT SET

05-6KF-2035-1	3/1R	PPP		
FRCS-11115,11119,11125,	2/1R	PPP,	CIL	
11129,11135,11139				
11145.11149	3/1R	\mathbf{PPP}	(manifold	4)

ISSUE: IOA-RCS claims this failed open toggle switch causes loss of logic power, thus jets, on associated manifold. Redundancy provided by jets on another manifold. Loss of all redundancy causes loss of jets required to expel propellants in efforts to meet C.G. limits. Manifold 4 has electrical redundancy for logic power after ascent (11145,11149). (see 4.1.1.B.4)

4) FAILURE: FAILS TO CONDUCT ONE OR MORE CONTACT SET

05-6KF-2036-1	3/1R	\mathbf{PPP}	
FRCS-11120,11124,11130,11134	2/1R	PPP,	CIL
11140,11144,11150,11154			

ISSUE: IOA-RCS claims this failed open toggle switch causes loss of driver power, thus jets, for associated manifold. Redundancy provided by jets on another manifold. Loss of all redundancy causes loss of jets required to expel propellants in efforts to meet C.G. limits. (see 4.1.1.B.4)

5) FAILURE: INADVERTENT OPERATION

05-6KF-2035-2 3/1R PPP FRCS-11126,11127,11128,11116 3/3 11117,11118,11136,11137, 11138,11146,11147,11148

ISSUE: NASA FMEA considers multiple failures (RJD fails on, manifold isolation valve failed, tank isolation valve failed, main bus off, causing inadvertent or uncontrollable thruster firing). IOA-RCS claims this switch inadvertently operating alone has no effect. (see 4.1.1.B.2)

4.1.2.3.B.8 Signal Conditioners (1 issue)

1) FAILURE: ERRONEOUS OR LOSS OF OUTPUT

NO FMEA FRCS-11196 3/2R PFP, CIL

<u>ISSUE:</u> The OF3 signal conditioner routes data for the helium oxidizer tank pressure data. This may causes loss of mission due to uncertainty about quantity of propellant.

4.1.2.3.B.9 Pressure Sensors (2 issues)

1) FAILURE: INDICATES LOWER PRESSURE THAN NORMAL

NO FMEA FRCS-1144

3/2R PFP, CIL

<u>ISSUE:</u> The vernier thrusters' chamber pressure sensors indicating a lower than actual pressure may deselect the vernier jets. Reselection capability available. This may cause loss of some mission operations (primary pressure sensors failures on 03-2F-121314-2). (see 4.1.1.B.5)

2) FAILURE: INDICATES HIGHER PRESSURE THAN NORMAL

NO FMEA FRCS-1145

3/2R PFP, CIL

<u>ISSUE:</u> The vernier thrusters' chamber pressure sensors indicating a higher than actual pressure may be deselect a jet. Reselection of jet available. This may cause loss of some mission operations (primary pressure sensors failures on 03-2F-121314-1). (see 4.1.1.B.5)

4.1.2.3.B.10 Temperature Sensors (2 issues)

1) FAILURE: INDICATES LOWER TEMPERATURE THAN NORMAL

NO FMEA FRCS-1154 3/2R PFP, CIL

<u>ISSUE:</u> The vernier thrusters' injector temperature sensors indicating a lower than actual temperature may deselect a jet. Reselection of jet available. This may cause loss of some mission operations (primary injector temperature sensors failures on 03-2F-121315-2). (see 4.1.1.B.5)

2) FAILURE: INDICATES HIGHER TEMPERATURE THAN NORMAL

NO FMEA FRCS-1155

3/2R PFP, CIL

2

.

_ :

<u>ISSUE:</u> The vernier thrusters' injector temperature sensors indicating a higher than actual temperature may deselect a jet. Reselection of jet available. This may cause loss of some mission operations (primary injector temperature sensors failures on 03-2F-121315-1). (see 4.1.1.B.5) 4.1.2.4 Thermal Control Subsystem (3 issues)

4.1.2.4.A Hardware

IOA analyzed and assessed thermal control subsystem items as EPD&C items. See 4.1.2.4.B for assessment results.

4.1.2.4.B EPD&C (3 issues)

4.1.2.4.B.1 Thermal Switches (2 issues)-

1) FAILURE: FAILS CLOSED (HEATERS REMAIN ON)

NO FMEA FRCS-1300

===

=----

2/2, CIL

<u>ISSUE:</u> Vernier thruster switch not specifically called out on this FMEA. (see 4.1.1.B.5)

2) FAILURE: FAILS OPEN

NO FMEA FRCS-1301 3/2R PPP

<u>ISSUE:</u> Vernier thruster switch not specifically called out on this FMEA. (see 4.1.1.B.5)

4.1.2.4.B.2 Hybrid Drivers (1 issue)

1) FAILURE: INADVERTENT OUTPUT

05-6KF-2215-2 FRCS-1157,1159,1161,1163,1165,1167, 3/2R PPP 1169,1171,1173,1175,1177,1179

<u>ISSUE:</u> This driver failed short causes inability to turn off heater with thermostat. Heater can be turned off with switch. Loss of all redundancy may cause loss of some mission operations due to orbiter pointing deep space for cooling.

4.2 Aft RCS Assessment Results

The unresolved aft RCS hardware and EPD&C issues are presented in the following sections. Several general issues are first presented (section 4.2.1), followed by the specific unresolved issues (section 4.2.2).

4.2.1 General Aft RCS Issues

Many of the unresolved issues which exist on individual FMEAs and CILs are linked to several "general" issues identified by IOA during the RCS FMEA/CIL assessment. These general issues concern either the groundrules used by NASA/RI to perform the FMEA/CIL analysis, or the NASA/RI analysis of the RCS subsystem. Each of the general IOA issues results in numerous FMEA and CIL issues.

The general issues identified by IOA in the ARCS hardware and EPD&C assessments are discussed in the following sections.

4.2.1.A Hardware

Four general areas of difference between the IOA and NASA/RI aft RCS subsystem analyses are responsible for many of the unresolved ARCS hardware issues.

4.2.1.A.1 Inability to Complete Abort Propellant Dumps

During RTLS and TAL aborts, OMS propellant is dumped through the twenty-four ARCS primary thrusters, and RCS propellant is dumped through the four +X primary thrusters. Inability to complete full propellant dumps could result in violations of entry mass properties constraints and/or violations of the OMS or RCS propellant tank landing weight constraints due to the additional amount of undumped propellants remaining in the tanks.

Therefore, IOA has classified each single failure which results in the loss of one or more primary thrusters as a crit 1 during aborts. The current NASA criticalities on these types of failures do not include any abort crit 1 assignments.

_

For a flight on which an OMS abort dump to the propellant tank landing weight constraint (22%) is planned, loss of one ARCS thruster would reduce the amount of OMS propellant dumped and thus result in some OMS propellant remaining in the tank in excess of the tank landing weight limit. For a flight which has an abort entry X cg approaching the aft limit (1109.0 inches), any additional amount of undumped OMS propellant would move the X cg further aft, possibly resulting in violation of the aft limit.

Similarly, loss of one +X thruster reduces the RCS propellant dump rate by half for one pod and could result in an incomplete RCS dump. The additional amount of undumped propellant in the RCS tanks could result in violation of the RCS tank landing weight limit (70%) and/or violations of entry mass properties constraints.

Violation of a propellant tank landing weight limit could result in vehicle structural damage and or tank structural failure during entry or landing.

Six (6) of the ARCS issues are related to this general issue.

4.2.1.A.2 Propellant Leakage

: =

IOA considers any leakage of RCS propellant (MMH or NTO) to be potentially life and vehicle threatening, regardless of where the leakage occurs. NSTS 22206 states that "A single failure resulting in leakage of LO2, LH2, N2H4, or MMH shall be classified as a Criticality 1" (p. 2-11, item h). Therefore, IOA classifies any single failure which results in prop leakage as a 1/1. If redundant items must fail before leakage occurs, IOA classifies the failure as a functional criticality 1R. Propellant leakage can result in contamination and corrosion of other components, fire, explosion, or exposure of EVA and ground crews to propellant or propellant vapors.

Twelve (12) of the ARCS hardware issues are related to this general issue.

4.2.1.A.3 Isolation Valve Internal Relief Device Failure

The propellant tank isolation valves, crossfeed valves, primary manifold isolation valves, and vernier manifold isolation valves each have an internal pressure relief device which would relieve a downstream overpressurization condition if the valve was closed. With the exception of the aft RCS vernier manifold isolation valve (03-2A-202140-3, 1/1), NASA/RI assigns 3/3 criticalities to the FMEAs which address the failure of this device to relieve IOA contends that it is possible that a downstream pressure. failed closed relief device could allow a downstream pressure build-up sufficient to cause a prop line leak. This is supported by the fact that the prop line structural failure FMEA (03-2A-202108-1) lists this failure as a cause. Since this failure could result in line failure and prop leakage, IOA recommends that the current 3/3 FMEAs for the relief device failures be upgraded accordingly.

Three (3) of the ARCS hardware issues are related to this general issue.

4.2.1.A.4 Additional Items and Failure Modes

A number of RCS subsystem items and failure modes identified by IOA during the analysis phase are not covered in the current NASA FMEA/CIL. IOA recommends that these items and failure modes be incorporated into the FMEA/CIL. These issues are identified in Appendix F by issue codes HDW 4 and HDW 5.

Thirty-four (34) of the ARCS hardware issues are related to this general issue.

4.2.1.B EPD&C

IOA has several general EPD&C issues that tend to inflate the number of issues shown in the assessment tables. The following general issues remain unresolved.

4.2.1.B.1 Loss of Talkback Data

IOA considers that the loss of data to determine the actual position of a valve to be a 3/2R PPP. Valve position data is provided by the GPC/MDM discretes and the event indicators, which provide redundancy for each other. Loss of all redundancy may lead to falsely failing the valve closed which could effect mission operations. NASA FMEAs have a 3/3 criticality for these failures.

This type of failure mode accounts for 25 open issues shown in the assessment tables for the aft EPD&C (6 issues in the helium pressurization subsystem and 19 in the propellant storage and distribution subsystem). They are identified by issue code EPD&C 1 in Appendix F.

4.2.1.B.2 FMEA Downgrades to 3/3 or 3/2R PPP - NSTS 22206 Interpretations

Numerous issues remain open due to different interpretations of NSTS 22206. All these issues concern the definition of the redundancy string. IOA did not consider multiple or unrelated failures in determining the criticality. IOA claims these FMEAs warrant a 3/2R PPP or 3/3 for the failure mode.

This type of failure mode accounts for 54 open issues shown in the assessment tables for the aft RCS EPD&C (1 issue in the helium pressurization subsystem, 46 issues in the propellant storage and distribution subsystem, and 7 issues in the thruster subsystem). They are identified by issue code EPD&C 2 in Appendix F.

4.2.1.B.3 FMEA Failure Scenario Upgrades - NSTS 22206 Interpretations

These issues also remain open due to the different interpretations of NSTS 22206. All these issues concern the definition of the redundancy string. IOA did not consider multiple or unrelated failures in determining criticality, however IOA did consider the functional redundancy for the item in question. Based on this, IOA failure scenarios create a 1R or CIL item condition, without using multiple or unrelated failures. IOA recommends these failure scenarios and criticality upgrades be included in the NASA FMEA/CIL.

These failure modes account for 9 open issues in the propellant storage and distribution subsystem as shown in the aft RCS EPD&C assessment tables. They are identified by issue code EPD&C 3 in Appendix F.

4.2.1.B.4 EPD&C Issues Tied to Open IOA Hardware Issues

i.....

19. CH

2

These issues are directly related to the open IOA hardware issues. These failure modes account for 8 open issues in the propellant storage and distribution subsystem. They are identified by issue code EPD&C 4 in Appendix F.

4.2.1.B.5 Additional EPD&C Failure Modes Recommended by IOA

These failure modes are not currently addressed by the NASA FMEA/CIL. IOA recommends these failure modes be incorporated into the FMEA/CIL.

These failures account for 32 open issues shown in the assessment tables for the aft RCS EPD&C (3 issues in the helium pressurization subsystem, 16 issues in the propellant storage and distribution subsystem, 5 issues in the thruster subsystem, and 8 issue in the thermal control subsystem). They are identified by issue code EPD&C 5 in Appendix F.

4.2.2 Specific Aft RCS Issues

The specific aft RCS hardware and EPD&C unresolved issues are presented in the following sections and paragraphs which were referenced in tables I and II. The organization of the sections and paragraphs follow the RCS hierarchy shown in Figures 4-7, and used in tables I and II.

Unresolved issues which are related to general issues discussed in section 4.2.1 contain a reference to the applicable general issue. Each issue is presented in a standard format which gives the failure mode, applicable FMEA number and IOA assessment ID, the NASA and IOA criticality and screen assignments, and the rationale behind the IOA issue. Refer to assessment sheets in Appendix C for further information on each issue. _

5

_

=

-

4.2.2.1 Helium Pressurization Subsystem (24 issues)

4.2.2.1.A Hardware (14 issues)

4.2.2.1.A.1 Helium Tank Isolation Valves (4 issues)

1) FAILURE: FAILS OPEN

03-2A-201020-2 3/1R PPP RCS-202 3/1R PFP, CIL

ISSUE: IOA recommends that this failure mode be upgraded to a 3/1R PFP. A failure of the redundant secondary regulator would not be detectable in flight (fail B screen). No way to tell that one level of redundancy has been lost.

2) FAILURE: INTERNAL LEAKAGE

NO FMEA RCS-202A 3/1R PFP, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers internal leakage to be a credible failure mode and recommends that it be addressed on the FMEA/CIL. Effects same as "fails open". See issue on 03-2A-201020-2, above.

3) FAILURE: RESTRICTED FLOW

NO FMEA RCS-10020X 2/1R PFF, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers restricted flow to be a credible failure mode and recommends that a 2/1R PFF FMEA and CIL be added. Effects same as "failed closed". Failure not detectable during dual leg operation (fail B screen). Contamination can affect both valves simultaneously (fail C screen).

4) FAILURE: STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE

NO FMEA RCS-10021X 1/1 ---, CIL

1

-

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers external leakage of the He isol valve due to a housing failure to be a credible failure (ref. NSTS 22206, p. 2-14, item 2.3.7.a), and recommends that it be addressed on the FMEA/CIL. Failure results in loss of helium pressurant.

4.2.2.1.A.2 Regulator Assemblies (3 issues)

1) FAILURE: FAILS CLOSED, RESTRICTED FLOW

03-2A-20103 0 -2	2/1R PPF,	CIL	
RCS-211	2/1R PFF,	CIL	(Fails closed)
RCS-212	2/1R PFF,	CIL	(Restricted flow)

ISSUE: IOA recommends that the B screen be failed for these failure modes. A failed closed regulator would not be detectable during dual leg operation. IOA accepts NASA/RI failure of C screen, however has not identified a single event which can result in the loss of both parallel regs. Contamination from downstream source (prop vapors) requires multiple failures (quad check valve poppets). The NASA/RI C screen classification is inconsistent between the forward and aft RCS regulator analyses.

2) FAILURE: STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE

NO FMEA RCS-213 1/1 ---, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers external leakage of the He regulator due to a housing failure to be a credible failure (ref. NSTS 22206, p. 2-14, item 2.3.7.a), and recommends that it be addressed on the FMEA/CIL. Failure results in loss of helium pressurant.

3) FAILURE: SENSING PORT LEAKAGE

NO FMEA RCS-214 3/2R PFP, CIL

ISSUE: This failure mode is not currently addressed on the NASA RCS FMEA/CIL, but is addressed on the NASA OMS FMEA/CIL (03-3-1004-3, sensing port leakage, 3/2R PFP). IOA recommends that this failure mode also be addressed for the RCS regulators, with the same rationale used in the OMS subsystem.

Ξ

=

-

= :

= :

I

4.2.2.1.A.3 Quad Check Valve Assemblies (2 issues)

1) FAILURE: FAILS OPEN, INTERNAL LEAKAGE

03-2A-201095-1 3/3 ---RCS-218 2/1R PFP, CIL

ISSUE: IOA recommends that this failure mode be upgraded to a 2/1R PFP. IOA contends that, with series check valve poppets failed open or leaking, the contamination of upstream components by prop or prop vapors during a mission could result in loss of prop tank repressurization capability and subsequent inability to utilize ARCS prop. Contamination by prop could cause parallel regulators to fail closed.

2) FAILURE: STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE

NO FMEA RCS-10024X 1/1 ---, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers external leakage of the quad check valve assembly due to a housing failure to be a credible failure (ref. NSTS 22206, p. 2-14, item 2.3.7.a), and recommends that it be addressed on the FMEA/CIL. Failure results in loss of helium pressurant, and leakage of prop and/or prop vapors. See 4.2.1.A.2.

4.2.2.1.A.4 Quick Disconnect Couplings (5 issues)

1,2) FAILURE: EXTERNAL LEAKAGE

03-2A-201070-1 2/1R FFP, CIL RCS-200 2/1R FFP, CIL

03-2A-201091-1 3/1R FFP, CIL RCS-208, 216, 220, 243 3/1R FFP, CIL

<u>ISSUE:</u> IOA recommends that "poppet fails open" be added as a failure mode on the FMEAs listed. This is a credible failure mode and is addressed on other QD coupling FMEAs.

3-5) FAILURE: FAILS TO COUPLE

03-2A-201070-2, 201091-2, 202150-2 3/3 ---RCS-201, 209, 217, 221, 226, 232, 238, 244 3/3 ---

<u>ISSUE:</u> IOA recommends that "restricted flow" be added as a failure mode on the FMEAs listed. This is a credible failure and is addressed on other QD coupling FMEAs.

4.2.2.1.B EPD&C (10 issues)

4.2.2.1.B.1 Diodes (4 issues)

1) FAILURE: FAILS OPEN

05-6KA-2267-1 3/3 ARCS-1326,1336 3/2R PPP

<u>ISSUE:</u> This issue concerns falsely failing the valve closed. (see 4.2.1.B.1)

2) FAILURE: FAILED SHORT

05-6KA-2252-2 3/1R PFP, CIL ARCS-1323,1325,1333,1335 3/3

ISSUE: NASA FMEA contains multiple failures (same diode short to ground). IOA-RCS claims this diode failed short alone has no effect. (see 4.2.1.B.2)

3) FAILURE: FAILS OPEN

NO FMEA ARCS-12329 2/1R PPP, CIL

ISSUE: IOA-RCS claims this diode failed open causes inability to open the valve. Redundancy provided by other valve. Loss of this causes inability to expel propellants to meet landing weight constraints.

4) FAILURE: FAILS SHORT

NO FMEA ARCS-12330

3/3

<u>ISSUE:</u> IOA-RCS claims this diode failing short has no effect. No FMEA exists for this failure.

4.2.2.1.B.2 Hybrid Drivers (2 issues)

1) FAILURE: LOSS OF OUTPUT

05-6KA-2201-1 3/3 ARCS-1346,1358 3/2R PPP

2) FAILURE: LOSS OF OUTPUT

05-6KA-2201A-1 3/3 ARCS-1348,1360 3/2R PPP

<u>ISSUE:</u> Both of these issues concern falsely failing the valve closed. (see 4.2.1.B.1)

=

4.2.2.1.B.3 Resistors (2 issues)

1) FAILURE: FAILS OPEN

05-6KA-2077-1 3/3 ARCS-1372,1374,1378,1380 3/2R PPP

2) FAILURE: FAILS OPEN

05-6KA-2078-1 3/3 ARCS-1376,1377,1392,1393 3/2R PPP

ISSUE: Both of these issues concern falsely failing the valve closed. (see 4.2.1.B.1)

4.2.2.B.1.4 Microswitches (1 issue)

1) FAILURE: ERRONEOUS OUTPUT

NO FMEA ARCS-12331 3/2R PPP

ISSUE: IOA-RCS claims this failed open resistor causes loss of acccurate indication of the valve status from the event indicator or the GPC/MDM microswitch discretes. This may lead to falsely failing the valve closed.

4.2.2.1.B.5 Event Indicators (1 issue)

1) FAILURE: FAILS OPEN

.

 05-6KA-2151-1 3/3 ARCS-1413 3/2R PPP

<u>ISSUE:</u> This issue concerns falsely failing the valve closed. (see 4.2.1.B.1)

-

. .-

and the second second

4.2.2.2 Propellant Storage and Distribution Subsystem (135 issues)

4.2.2.2.A Hardware (23 issues)

4.2.2.2.A.1 Propellant Tank Acquisition Assembly (1 issue)

1) FAILURE: STRUCTURAL FAILURE, HELIUM PASSAGE, SCREEN DRY-OUT

.

03-2F-211110-2 1/1 ---, CIL RCS-227 1/1 ---, CIL

ISSUE: IOA recommends that the propellant tank acquisition device components be itemized in the item list or functional description sections to show specifically what is covered by this FMEA (e.g.: upper compartment channels/screens, lower compartment channels/screens, feedout tubes, plenum, bulkhead, etc.).

4.2.2.2.A.2 Pressure Relief Assemblies (3 issues)

1) FAILURE: BURST DISK LEAKAGE

NO FMEA RCS-241 2/1R PFP, CIL

<u>ISSUE:</u> Internal leakage of the burst disk is a credible failure mode and is_not currently addressed on the NASA FMEA/CIL. IOA recommends that this failure mode be added to 03-2A-201060-5 (pressure relief valve assy, burst disk ruptures prematurely, 2/1R PFP). The failure history of the burst disk includes internal leakage.

2) FAILURE: RESTRICTED FLOW

NO FMEA RCS-10026X 3/1R FNP, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers restricted flow to be a credible failure mode for components with integral filters and/or orifices, and recommends that it be addressed for the pressure relief valve. Failure mode can be added to 03-2A-201060-3 (pressure relief valve assy, burst disk fails to rupture, 3/1R FNP).

3) FAILURE: STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE

NO FMEA RCS-10027X 1/1 ---, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. FMEA 03-2A-201060-1 addresses only a bellows failure. IOA considers external leakage of the relief valve assembly due to a housing failure to be a credible failure (ref. NSTS 22206, p. 2-14, item 2.3.7.a), and recommends that it be addressed on the FMEA/CIL. Failure results in loss of helium pressurant, and leakage of prop or prop vapors. See 4.2.1.A.2.

4.2.2.2.A.3 Ground Manual Isolation Valve (1 issue)

1) FAILURE: STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE

NO FMEA RCS-247 1/1 ---, CIL

1.1

 $\overline{\mathbf{v}} = \overline{\mathbf{v}}$

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers external leakage of the ground manual isolation valve due to a housing failure to be a credible failure (ref. NSTS 22206, p. 2-14, item 2.3.7.a), and recommends that it be addressed on the FMEA/CIL. Failure results in loss of helium pressurant, and leakage of prop and/or prop vapors. See 4.2.1.A.2.

4.2.2.2.A.4 Propellant Tank Isolation Valves (5 issues)

1) FAILURE: FAILS CLOSED (1/2 VALVE)

03-2A-202110-1 3/1R PPP RCS-251 3/1R PPP, 1/1 ABORT, CIL

ISSUE: IOA recommends that this failure mode be upgraded to a 3/1R PPP, 1/1 abort for the 1/2 valve. This failure results in the loss of one +X thruster for the RTLS and TAL abort ARCS propellant dump, and could result in inability to complete the dump. See 4.2.1.A.1.

2) FAILURE: RELIEF DEVICE FAILS CLOSED

03-2A-202110-23/3---RCS-10029X2/1RPNP, CIL (1/2 VALVE)RCS-10030X3/1RPNP(3/4/5 VALVES)

<u>ISSUE:</u> These values are nominally open during all phases, and will be closed only during some crossfeed/interconnect operations or to isolate a downstream failure. During crossfeed/interconnect operations, the downstream propellant line is not subject to overpressurization because it is open to a tank. Therefore, this failure mode is applicable only during straight-feed operations when a failure has occurred which requires closing of the tank isol values. IOA recommends that this failure mode be upgraded to a 2/1R PNP for the 1/2 value and 3/1R PNP for the 3/4/5 values (not a 1/1's, since a previous failure is required for the values to be closed). See 4.2.1.A.3.

3) FAILURE: RESTRICTED FLOW (1/2 VALVE)

NO FMEA RCS-249 3/1R PPP, 1/1 ABORT, CIL

<u>ISSUE:</u> This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers restricted flow to be a credible failure mode for components with integral filters, and recommends that it be addressed for the propellant tank isolation 1/2 valves. Effects same as "failed closed" for the 1/2 valve. See issue on 03-2A-202110-1, above, and 4.2.1.A.1.

4) FAILURE: RESTRICTED FLOW (3/4/5 VALVES)

NO FMEA

RCS-10028X 3/1R PFP, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers restricted flow to be a credible failure mode for components with integral filters, and recommends that a new 3/1R PFP FMEA be added for restricted flow of the propellant tank isolation 3/4/5 valves. Restricted flow through one 3/4/5 valve would not be detectable during dual leg operation (fail B screen). 5) FAILURE: STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE

NO FMEA RCS-248 1/1 ---, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. FMEA 03-2A-202111-1 addressed only a bellows failure. IOA considers external leakage of a prop tank isolation valve due to a housing failure to be a credible failure (ref. NSTS 22206, p. 2-14, item 2.3.7.a), and recommends that it be addressed on the FMEA/CIL. Failure results leakage of propellant. See 4.2.1.A.2.

4.2.2.2.A.5 Crossfeed Valves (3 issues)

1) FAILURE: RELIEF DEVICE FAILS CLOSED

03-2A-202111-3 3/3 ---RCS-10033X 3/1R PNP

<u>ISSUE:</u> These values are nominally closed during a flight and are open only during crossfeed/interconnect operations. IOA recommends that the FMEA for this failure mode be upgraded to a 3/1R PNP. Failure of the relief devices in all RCS and OMS crossfeed values is required for overpressurization and leakage of the crossfeed lines to occur. See 4.2.1.A.3.

2) FAILURE: RESTRICTED FLOW

NO FMEA RCS-258 2/2 ---, 1/1 ABORT, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers restricted flow to be a credible failure mode for components with integral filters, and recommends that it be addressed for the RCS crossfeed valves. This failure can be added to 03-2A-202111-2 (RCS crossfeed valve, fails closed, 2/2, 1/1 abort).

3) FAILURE: STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE

NO FMEA RCS-259A 1/1 ---, CIL

- -

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. FMEA 03-2A-202111-1 addressed only a bellows failure. IOA considers external leakage of a crossfeed valve due to a housing failure to be a credible failure (ref. NSTS 22206, p. 2-14, item 2.3.7.a), and recommends that it be addressed on the FMEA/CIL. Failure results leakage of propellant. See 4.2.1.A.2. 4.2.2.2.A.6 Primary Manifold Isolation Valves (4 issues)

1) FAILURE: RELIEF DEVICE FAILS CLOSED

03-2A-202120-2 3/3 ---RCS-10035X 2/1R PNP, CIL

<u>ISSUE:</u> These values are nominally open during all phases, and will not be closed unless a downstream failure occurs which requires isolation. Therefore, this failure mode is not applicable until another failure occurs. IOA recommends that the FMEA for this failure mode be upgraded to a 2/1R PNP (not a 1/1, since a previous failure is required for the value to be closed). See 4.2.1.A.3.

2) FAILURE: FAILS CLOSED, FAILS TO REMAIN OPEN

03-2A-202120-3 3/1R PPP RCS-267, 271, 275, 279 3/1R PPP, 1/1 ABORT, CIL

<u>ISSUE:</u> IOA recommends that this failure mode be upgraded to a 3/1R PPP, 1/1 abort. This failure results in the loss of three primary thrusters and could result in the inability to complete RTLS and TAL abort RCS and OMS propellant dumps. See 4.2.1.A.1. IOA also recommends that the "E" effects be revised. Loss of three manifolds results in probable inability to maintain entry control.

3) FAILURE: RESTRICTED FLOW

-

NO FMEA RCS-287 3/1R PPP, 1/1 ABORT, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers restricted flow to be a credible failure mode for components with integral filters, and recommends that it be addressed for the primary manifold isolation valves. Effects same as "fails closed". See issue on 03-2A-202120-3, above, and 4.2.1.A.1.

4) FAILURE: STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE

NO FMEA RCS-286 1/1 ---, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. FMEA 03-2A-202111-1 addressed only a bellows failure. IOA considers external leakage of a primary manifold isolation valve due to a housing failure to be a credible failure (ref. NSTS 22206, p. 2-14, item 2.3.7.a), and recommends that it be addressed on the FMEA/CIL. Failure results leakage of propellant. See 4.2.1.A.2. 4.2.2.2.A.7 Vernier Manifold Isolation Valves (2 issues)

1) FAILURE: STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE

NO FMEA RCS-286A 1/1 ---, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. FMEA 03-2A-202140-3 addressed a bellows failure. IOA considers external leakage of a vernier manifold isolation valve due to a housing failure to be a credible failure (ref. NSTS 22206, p. 2-14, item 2.3.7.a), and recommends that it be addressed on the FMEA/CIL. Failure results leakage of propellant. See 4.2.1.A.2.

2) FAILURE: RESTRICTED FLOW

NO FMEA RCS-287 2/2 ---, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers restricted flow to be a credible failure mode for components with integral filters, and recommends that it be addressed for the vernier manifold isolation valves. Effects same as "fails closed". This failure mode can be added to 03-2A-202140-1 (vernier manifold isolation valve, fails closed, 2/2).

4.2.2.2.A.8. Quick Disconnect Couplings (4 issues)

1,2) FAILURE: EXTERNAL LEAKAGE

03-2A-201080-1 2/1R FFP, CIL RCS-254, 256, 268, 272, 276, 280, 284 2/1R FFP, CIL

03-2A-201090-1 3/1R FFP, CIL RCS-229, 233, 235 3/1R FFP, CIL

ISSUE: IOA recommends that "poppet fails open" be added as a failure mode on the FMEAs listed. This is a credible failure mode and is addressed on other QD coupling FMEAs.

-- --

3,4) FAILURE: FAILS TO COUPLE

03-2A-201080-3, 201090-2 3/3 ---RCS-230, 234, 236, 255, 257, 269, 273, 277, 281, 285 3/3 ---

<u>ISSUE:</u> IOA recommends that "restricted flow" be added as a failure mode on the FMEAs listed. This is a credible failure and is addressed on other QD coupling FMEAs.

4.2.2.2.B EPD&C (112 issues)

4.2.2.2.B.1 Remote Power Controllers (3 issues)

1) FAILURE: INADVERTENT OPERATION

05-6KA-2177-2 3/1R PFP, CIL ARCS-12019 3/3

ISSUE: NASA FMEA contains multiple failures (open driver failed on, ground driver failed on, causing continuous power to the solenoid). IOA-RCS claims this RPC imadvertently operating alone has no effect. (see 4.2.1.B.2)

2) FAILURE: INADVERTENT OPERATION

05-6KA-2178-2 3/1R PFP, CIL ARCS-12019 3/3

ISSUE: NASA FMEA contains multiple failures (open driver failed on, ground driver failed on, causing continuous power to the solenoid). IOA-RCS claims this RPC inadvertently operating alone has no effect.

_

.

3) FAILURE: LOSS OF OUTPUT

05-6KA-2178 <u>-</u> 1	3/2R PPP
ARCS-12020	2/2, CIL

<u>ISSUE:</u> Lose capability to open manifold isolation valve. Inability to open valve causes loss of verniers thus mission operations.

4.2.2.2.B.2 Diodes (35 issues)

1) FAILURE: FAILS OPEN

05-6KA-2268-1 3/3 ARCS-12123 3/2R PPP

2) FAILURE: FAILS OPEN

05-6KA-2269-1	3/3	
ARCS-1448,1452,1456,1460	3/2R	PPP

3) FAILURE: FAILS OPEN

05-6KA-2279-1 3/3 ARCS-12054,12056 3/2R PPP

<u>ISSUE:</u> The first three issues concern falsely failing the valve closed. (see 4.2.1.B.1)

4) FAILURE: FAILS OPEN

05-6KA-2253-1 2/1R PFP, CIL ARCS-12086,12088 3/3

ISSUE: NASA FMEA contains multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this diode failed open alone (causing continuous power to the motor) has no effect. (see 4.2.1.B.2)

5) FAILURE: FAILS OPEN

05-6KA-2253E-1 3/1R PFP, CIL ARCS-12098 3/3

ISSUE: NASA FMEA contains multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this diode failed open alone (causing continuous power to the motor) has no effect. (see 4.2.1.B.2)

6) FAILURE: FAILS OPEN

05-6KA-2253F-1 3/1R PFP, CIL ARCS-12100 3/3

ISSUE: NASA FMEA contains multiple failures (shorted diode, continuous power to the motor and a bellows leak). IOA-RCS claims this diode failed open alone has no effect. (see 4.2.1.B.2)

7) FAILURE: FAILS SHORT

05-6KA-2253F-2 3/1R PFP, CIL ARCS-12101 3/3

ISSUE: NASA FMEA contains multiple failures (close relay failed on, continuous power to the motor and a bellows leak). IOA-RCS claims this diode failed short alone causes no effect. (see 4.2.1.B.2)

8) FAILURE: FAILS OPEN

05-6KA-2254-1 2/1R PFP, CIL ARCS-12107,12109 3/3

<u>ISSUE:</u> NASA FMEA contains multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this diode failed open alone (causing continuous power to the motor) has no effect. (see 4.2.1.B.2)

9) FAILURE: FAILS OPEN

05-6KA-2254E-1 3/1R PFP, CIL ARCS-12119 3/3

<u>ISSUE:</u> NASA FMEA contains multiple failures (diode short, continuous power to the motor and a bellows leak). IOA-RCS claims this diode failed open alone has no effect. (see 4.2.1.B.2)

10) FAILURE: FAILS OPEN

05-6KA-2254F-1 3/1R PFP, CIL ARCS-12121 3/3

ISSUE: NASA FMEA contains multiple failures (diode open, continuous power to the motor and a bellows leak). IOA-RCS claims this diode failed open alone has no effect. (see 4.2.1.B.2)

11) FAILURE: FAILS OPEN

05-6KA-2261-1 2/1R PFP, CIL ARCS-12130,12132,12151,12153 3/3

ISSUE: NASA FMEA contains multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this diode failed open alone (causing continuous power to the motor) has no effect. (see 4.2.1.B.2)

12) FAILURE: FAILS OPEN

05-6KA-2261E-1 3/1R PFP, CIL ARCS-12142,12163 3/3

ISSUE: NASA FMEA contains multiple failures (diode short, close relay fails on, continuous power to the motor and a bellows leak). IOA-RCS claims this diode failed open alone has no effect. (see 4.2.1.B.2)

1

== :

्रा दा ते अ**इ**ल्हास्ट (
13) FAILURE: FAILS OPEN

05-6KA-2261F-1 3/1R PFP, CIL ARCS-12144,12165 3/3

<u>ISSUE:</u> NASA FMEA contains multiple failures (diode short, continuous power to the motor and a bellows leak). IOA-RCS claims this diode failed open alone has no effect. (see 4.2.1.B.2)

14) FAILURE: FAILS SHORT

05-6KA-2261F-2 3/1R PFP, CIL ARCS-12145,12166 3/3

ISSUE: NASA FMEA contains multiple failures (diode opens, close relay fails on, continuous power to the motor and a bellows leak). IOA-RCS claims this diode failed short alone has no effect. (see 4.2.1.B.2)

15) FAILURE: FAILS OPEN

2 1

05-6KA-2255-1 2/1R PFP, CIL ARCS-12192,12194,12208,12210 3/3 12224,12226,12240,12242

<u>ISSUE:</u> - NASA FMEA contains multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this diode failed open alone (causing continuous motor power) has no effect. (see 4.2.1.B.2)

16) FAILURE: FAILS OPEN

05-6KA-2255E-1 3/1R PFP, CIL ARCS-12204,12220,12236,12252 3/3

<u>ISSUE:</u> NASA FMEA contains multiple failures (system leak, diode short, continuous power to the motor and a bellows leak). IOA-RCS claims this diode failed open alone has no effect. (see 4.2.1.B.2)

17) FAILURE: FAILS OPEN

05-6KA-2255F-1 3/1R PFP, CIL ARCS-12206,12222,12238,12254 3/3

<u>ISSUE:</u> NASA FMEA contains multiple failures (diode short, continuous power to the motor and a bellows leak). IOA-RCS claims this diode failed open alone has no effect. (see 4.2.1.B.2)

18) FAILURE: FAILS OPEN

05-6KA-2257-1 3/1R PFP, CIL ARCS-12036 3/3

<u>ISSUE:</u> NASA FMEA contains multiple failures (switch short, open driver failed on, causing continuous power to the solenoid). IOA-RCS claims this diode failed open alone has no effect. (see 4.2.1.B.2)

19) FAILURE: FAILS OPEN

05-6KA-2257A-1 3/1R PFP, CIL ARCS-12038 3/3

ISSUE: NASA FMEA contains multiple failures (switch short, close driver failed on, causing continuous power to the solenoid). IOA-RCS claims this diode failed open alone has no effect. (see 4.2.1.B.2)

20) FAILURE: FAILS SHORT

05-6KA-2257F-2 3/2R PPP ARCS-12063 3/3

ISSUE: NASA FMEA contains multiple failures (switch short, circuit breaker failed closed, causing continuous power to the solenoid). FIOA-RCS claims this diode failed short alone has no effect. (see 4.2.1.B.2)

21) FAILURE: FAILS SHORT

 05-6KA-2253E-2
 2/1R
 PFP (1/1 ABORT), CIL

 ARCS-12099
 2/2
 (1/1 ABORT), CIL

ISSUE: NASA FMEA contains multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failure causes inability to close the valve (open relay has constant inhibit). This prevents crossfeed capability thus loss of mission operations (2/2). Inability to crossfeed may cause incomplete OMS abort dump (1/1 abort). (see 4.2.1.B.3)

134

≣ ;

=

22) FAILURE: FAILS SHORT

 05-6KA-2254E-2
 3/1R
 PFP (1/1 ABORT), CIL

 ARCS-12120
 2/2
 (1/1 ABORT), CIL

ISSUE: NASA FMEA contains multiple failures (diode opens, continuous power to the motor and a bellows leak). IOA-RCS claims this failure causes inability to close the valve (open relay has constant inhibit). This prevents crossfeed capability thus loss of mission operations (2/2). Inability to crossfeed may cause incomplete OMS abort dump (1/1 abort). (see 4.2.1.B.3)

23) FAILURE: FAILS SHORT

05-6KA-2254F-2	3/1R	PFP,	CIL
ARCS-12122	3/1R	PFP,	CIL

ISSUE: NASA FMEA contains multiple failures (diode opens, continuous power to the motor and a bellows leak). IOA-RCS claims this failure causes the valve to close on ascent (GPC mode). Redundancy provided by second leg and from crossfeed operation. Loss of all redundancy causes inability to expel propellants to meet landing weight constraints. (see 4.2.1.B.3)

24) FAILURE: FAILS SHORT

05-6KA-2261E-2	3/1R	PFP,	CIL
ARCS-12143,12164	3/1R	PFP,	CIL

ISSUE: NASA FMEA contains multiple failures (open diode, continuous power to the motor and a bellows leak). IOA-RCS claims this failure causes the inability to close the valve. This, coupled with the loss of all hardware redundancy prevents isolation of a thruster leak. (see 4.2.1.B.3)

25) FAILURE: FAILS SHORT

05-6KA-2255E-2	3/1R	PFP, CIL	
ARCS-12205,12221,12237,12253	3/1R	PFP, CIL	

<u>ISSUE:</u> NASA FMEA contains multiple failures (diode opens, continuous power to the motor and a bellows leak). IOA-RCS claims this failure causes inability to close the valve (open relay has constant inhibit). This, coupled with the loss of all hardware redundancy prevents isolation of a thruster leak. (see 4.2.1.B.3)

26) FAILURE: FAILS SHORT

05-6KA-2255F-2	3/1R	PFP,	CIL
ARCS-12207,12223,12239,12255	3/1R	PFP,	CIL

ISSUE: NASA FMEA contains multiple failures (system leak, diode opens, continuous power to the motor and a bellows leak). IOA-RCS claims this failure has no effect if command was from switch (normal mission configuration). However, if the command was from the GPC, this failure causes the inability to open the valve (close relay has constant inhibit). Switch redundancy provided. Loss of this, coupled with the loss of all hardware redundancy causes inability to expel propellants to meet landing weight constraints. (see 4.2.1.B.3)

litati i-

27) FAILURE: FAILS SHORT

05-6KA-2257-2	3/3		
ARCS-12037	3/2R	PFP, (CIL

ISSUE: IOA-RCS claims this failure causes inability to open the isolation valve manually. Redundancy to open the valve provided with the GPC/MDM commands. Loss of all redundancy prevents vernier operation thus loss of mission.

28) FAILURE: INADVERTENT OUTPUT

05-6KA-2255=2 3/3 ARCS-12193,12195,12209,12211 3/2R PPP 12225,12227,12241,12243

ISSUE: This issue concerns falsely failing the valve closed. (see 4.2.1.B.1)

29) FAILURE: FAILS OPEN

05-6KA-2257G-1 3/3 ARCS-12064 3/1R P NA P

<u>ISSUE:</u> Lose GPC close command to the ground driver. Redundancy provided with manual command. Loss of all redundancy prevents isolation of thruster leak.

.

30) FAILURE: FAILS OPEN

05-6KA-2258-1	3/2R	PPP .
ARCS-12052	2/2.	CIL

<u>ISSUE:</u> Lose GPC and manual command to open the isolation valve. No redundancy provided. This prevents vernier operation thus loss of mission. 31) FAILURE: SHORTS TO GROUND

05-6KA-2258-3 3/2R PPP ARCS-12344 2/2, CIL

<u>ISSUE:</u> Lose GPC and manual command to open the isolation valve. No redundancy provided. This prevents vernier operation thus loss of mission.

32-33) FAILURE: FAILS OPEN

NO FMEA ARCS-12068,12070 3/1R P NA P

ISSUE: The manifold isolation valve has two diodes in parallel that completes the circuit to ground. One diode failing open has no effect. Second diode failing open (the redundancy) causes inability to close the valve to isolate a thruster leak.

34-35) FAILURE: FAILS SHORT

NO FMEA ARCS-12069,12071 3/3

ISSUE: The manifold isolation valve has two diodes in parallel that completes the circuit to ground. Either or both diode failing short has no effect.

4.2.2.2.B.3 Hybrid Drivers (21 issues)

1) FAILURE: LOSS OF OUTPUT

05-6KA-2206-1 3/3 ARCS-1472,1474 3/2R PPP

2) FAILURE: INADVERTENT OUTPUT

05-6KA-2206-2 3/3 ARCS-1473,1475 3/2R PPP

3) FAILURE: LOSS OF OUTPUT

05-6KA-2207A-1	3/3	
ARCS-1476,1477,1482,1483	3/2R	PPP

4) FAILURE: LOSS OF OUTPUT

 05-6KA-2217-1
 3/3

 ARCS-1488,1490,1492,1494
 3/2R

 5) FAILURE: INADVERTENT OUTPUT

 05-6KA-2217-2
 3/3

ARCS-1489,1491,1493,1495 3/2R PPP

<u>ISSUE:</u> The first five issues concern falsely failing the valve closed. (see 4.2.1.B.1)

6) FAILURE: LOSS OF OUTPUT

05-6KA-2207-1 2/1R PFP, CIL ARCS-1478,1484 3/2R PPP

ISSUE: NASA FMEA contains multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failure may cause inability to accurately determine position of the valve. Loss of all redundancy may lead to falsely failing the valve closed. (see 4.2.1.B.2)

7) FAILURE: INADVERTENT OUTPUT

05-6KA-2207-2 3/1R PPP ARCS-1479,1485 3/3

ISSUE: NASA FMEA contains multiple failures (driver failed on, manifold isolation valve failed open, thruster leak). IOA-RCS claims this driver inadvertently operating alone has no effect. (see 4.2.1.B.2)

•

Ť

8) FAILURE: LOSS OF OUTPUT

05-6KA-2219-1	2/1R	PFP,	CIL			
ARCS-1480,1486	3/2R	PPP	AND DESCRIPTION OF A DE	1997 - 1998 - 1997 - 1977 - 1977 - 1977 - 1977 - 19	- Land Street of	

ISSUE: NASA FMEA contains multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failure may cause inability to accurately determine position of the valve. Loss of all redundancy may lead to falsely failing the valve closed. (see 4.2.1.B.2)

138

9) FAILURE: INADVERTENT OUTPUT

05-6KA-2219-2 3/1R PFP, CIL ARCS-1481,1487 3/3

ISSUE: NASA FMEA contains multiple failures (driver failed on, manifold isolation valve failed open, thruster leak). IOA-RCS claims this driver inadvertently operating alone has no effect.

10) FAILURE: LOSS OF OUTPUT

05-6KA-2208-1	2/1R	₽FP,	CIL
ARCS-1496,1498,1500,1502	3/2R	PPP	
1504.1506.1508.1510			

ISSUE: NASA FMEA contains multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failure may cause inability to accurately determine position of the valve. Loss of all redundancy may lead to falsely failing the valve closed. (see 4.2.1.B.2)

11) FAILURE: INADVERTENT OPERATION

05-6KA-2113A-2	3/1R	PFP,	CIL
ARCS-12033	3/3		

<u>ISSUE:</u> NASA FMEA contains multiple failures (open driver failed on, ground driver failed on, causing continuous power to the solenoid). IOA-RCS claims this driver inadvertently operating alone has no effect. (see 4.2.1.B.2)

12) FAILURE: LOSS OF OUTPUT

Ξ. 3

05-6KA-2210-1	3/1R	PFP,	CIL
ARCS-12024	3/2R	PPP	

<u>ISSUE:</u> NASA FMEA contains multiple failures (switch short, ground driver failed on, causing continuous power to the solenoid). IOA-RCS claims this failure may cause inability to accurately determine position of the valve. Loss of all redundancy may lead to falsely failing the valve closed. (see 4.2.1.B.2)

139

13) FAILURE: LOSS OF OUTPUT

05-6KA-2210A-1 3/1R PFP, CIL ARCS-12022 3/2R PPP

ISSUE: NASA FMEA contains multiple failures (switch short, ground driver failed on, causing continuous power to the solenoid). IOA-RCS claims this failure may cause inability to accurately determine position of the valve. Loss of all redundancy may lead to falsely failing the valve closed. (see 4.2.1.B.2)

14) FAILURE: INADVERTENT OPERATION

05-6KA-2211-2 3/1R PFP, CIL ARCS-12031 3/3

ISSUE: NASA FMEA contains multiple failures (open driver failed on, ground driver failed on, causing continuous power to the solenoid). IOA-RCS claims this driver inadvertently operating alone has no effect. (see 4.2.1.B.2)

15) FAILURE: INADVERTENT OPERATION

05-6KA-2212-2 3/1R PFP, CIL ARCS-12029 3/3

ISSUE: NASA FMEA contains multiple failures (open driver failed on, ground driver failed on, causing continuous power to the solenoid). IOA-RCS claims this driver inadvertently operating alone has no effect. (see 4.2.1.B.2) = :

i i

16) FAILURE: INADVERTENT OPERATION

05-6KA-2213-2 3/1R PFP, CIL ARCS-12027 3/3

ISSUE: NASA FMEA contains multiple failures (close driver failed on, ground driver failed on, causing continuous power to the solenoid). IOA-RCS claims this driver inadvertently operating alone has no effect. (see 4.2.1.B.2)

n in company services

17) FAILURE: INADVERTENT OPERATION

05-6KA-2224-2 3/1R PFP, CIL ARCS-12035 3/3

ISSUE: NASA FMEA contains multiple failures (type I driver failed on, type III driver failed on, causing continuous power to the solenoid). IOA-RCS claims this driver inadvertently operating alone has no effect. (see 4.2.1.B.2)

18) FAILURE: LOSS OF OUTPUT

05-6KA-2113A-1	3/2R	PPP
ARCS-12032	2/2,	CIL

<u>ISSUE:</u> Lose capability to open the isolation valve. This prevents vernier operation thus loss of mission.

19) FAILURE: INADVERTENT OPERATION

05-6KA-2210-2	3/2R	PPP	
ARCS-12025	2/2,	CIL	-

ISSUE: Failure provides inhibit to the "open" driver so that it cannot be turned on. This causes inability to open the isolation valve which causes loss of verniers thus mission operations.

20) FAILURE: INADVERTENT OPERATION

05-6KA-2211-1	3/2R	PPP
ARCS-12031	2/2,	CIL

ISSUE: Lose capability to open the isolation valve. Inability to open the valve causes loss of verniers thus mission operations.

21) FAILURE: LOSS OF OUTPUT

100 m

 05-6KA-2224-1
 3/1R
 PPP

 ARCS-12034
 2/2, CIL

ISSUE: Lose capability to open the isolation valve. This prevents vernier operation thus loss of mission. NASA FMEA failure also credible. Lose capability to close valve to isolate a thruster leak. IOA-RCS recommends both failures be covered on this FMEA.

4.2.2.2.B.4 Relays (11 issues)

1) FAILURE: INADVERTENT OPERATION

05-6KA-2126-2 3/1R PFP, CIL ARCS-1546,1548 3/3

ISSUE: NASA FMEA contains multiple failures (second series relay failed closed, continuous power to the motor and a bellows leak). IOA-RCS claims this relay inadvertently operating alone causes no effect. (see 4.2.1.B.2)

2) FAILURE: INADVERTENT OPERATION

05-6KA-2132-2 3/1R PFP, CIL ARCS-1562,1564,1570,1572 3/3

ISSUE: NASA FMEA contains multiple failures (close relay fails on, continuous power to the motor and a bellows leak). IOA-RCS claims the latching relay inadvertently operating alone has no effect. (see 4.2.1.B.2)

3) FAILURE: LOSS OF OUTPUT

05-6KA-2133-1	3/1R	PPP
ARCS-1557,1559,1565,1567	3/2R	PPP

ISSUE: NASA FMEA contains multiple failures (open relay fails off, tank isolation valve failed closed, thruster failed off). IOA-RCS claims this failure causes inability to open the crossfeed valve. Electrical redundancy provided. Loss of this, coupled with the loss of all hardware redundancy may causes loss of mission. Note : FMEA incorrectly identifies relay 45V76A116K44. It should be 56V76A116K46. Refer to VS70-943099 and ARCS ID 1557. (see 4.2.1.B.2)

4) FAILURE: INADVERTENT OPERATION

05-6KA-2136-2	2/1R	PFP	(1/1)	ABORT),	\mathtt{CIL}
ARCS-1542,1 <u>5</u> 44	2/2		(1/1)	ABORT),	CIL

ISSUE: NASA FMEA contains multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failure causes inability to close 1/2 valve. This prevents crossfeed capability thus loss of mission operations (2/2). Inability to crossfeed may cause incomplete OMS abort dump (1/1 abort). (see 4.2.1.B.3)

5) FAILURE: INADVERTENT OPERATION

05-6KA-2127-2	2/1R	PFP,	CIL
ARCS-1552,1556	3/1R	PFP,	CIL

ISSUE: NASA FMEA contains multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failure will close the valve and cause inability to re-open it. Redundancy provided by second 3/4/5 leg and from crossfeed operation. Loss of all redundancy causes loss of jets required to expel propellants to meet landing weight constraints. (see 4.2.1.B.3)

142

-

6) FAILURE: INADVERTENT OPERATION

05-6KA-2137-22/1RPFP(1/1 ABORT), CILARCS-1550,15542/2(1/1 ABORT), CIL

ISSUE: NASA FMEA contains multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failure causes inability to close 3/4/5 valve. This prevents crossfeed capability thus loss of mission operations (2/2). Inability to crossfeed may cause incomplete OMS abort dump (1/1 abort). (see 4.2.1.B.3)

7) FAILURE: INADVERTENT OPERATION

05-6KA-2133-2	2/1R	PFP,	CIL
ARCS-1558,1560,1566,1568	3/1R	PFP,	CIL

ISSUE: NASA FMEA contains multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failure causes inability to close crossfeed valve. This, coupled with the loss of all hardware redundancy prevents isolation of a thruster leak. (see 4.2.1.B.3)

8) FAILURE: INADVERTENT OPERATION

05-6KA-2128-2	2/1R	PPP,	CIL		
ARCS-1576,1580,1584,1586	3/1R	PPP	(1/1	ABORT),	CIL

ISSUE: NASA FMEA contains multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failure will close the valve and cause the inability to re-open it. This causes loss of jets on associated manifold. Redundancy provided by jets on other manifolds. Loss of all redundancy causes inability to expel propellants to meet landing weight constraints. Loss of manifold thrusters during RTLS/TAL abort could result in inability to complete a propellant dump. (see 4.2.1.B.3)

9) FAILURE: INADVERTENT OPERATION

Ξ

05-6KA-2128A-2	2/1R	PPP,	CIL
ARCS-1574,1578,1582,1588	3/1R	PNP	

ISSUE: NASA FMEA contains multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failure causes inability to close manifold isolation valve. This, coupled with the loss of all hardware redundancy causes inability to isolate a thruster leak. (see 4.2.1.B.3)

10) FAILURE: LOSS OF OUTPUT

05-6KA-2126-1	3/1R	PPP	(1/1	ABORT),	CIL
ARCS-1545,1547	2/2		(1/1)	ABORT),	CIL

<u>ISSUE:</u> Lose capability to close the valve. This prevents crossfeed capability thus loss of mission (2/2). Inability to crossfeed may cause incomplete OMS abort dump (1/1 abort).

11) FAILURE: LOSS OF OUTPUT

05-6KA-2127-1 2/2, CIL ARCS-1551,1555 2/1R PPP, CIL

ISSUE: Lose capability to close the valve. This prevents crossfeed capability and inability to isolate a leak.

4.2.2.2.B.5 Resistors (19 issues)

1) FAILURE: FAILS OPEN

05-6KA-2081-1 3/3 (1/1 ABORT), CIL ARCS-1589,1591,1603,1605 3/2R PPP

2) FAILURE: FAILS OPEN

05-6KA-2082=1 3/3 ARCS-1597,1601 3/2R PPP

3) FAILURE: FAILS OPEN

05-6KA-2085-1 ARCS-1613,1615,1617,1629 3/3 3/2R PPP

the second s

= :

THE F

- :

1

F

4) FAILURE: FAILS OPEN

05-6KA-2086-1 3/3 (1/1 ABORT), CIL ARCS-1607,1611,1619,1623, 3/2R PPP 1627,1631,1633,1635

5) FAILURE: FAILS OPEN 05-6KA-2102-1 ARCS-1641,1647,1651,1655, 1659,1665,1669,1673

3/2R PPP

3/3

6) FAILURE: FAILS OPEN

05-6KA-2088-1 ARCS-1679,1681,1685,1687,1693,1695,1699,1701, 1707,1709,1713,1715,1721,1723,1727,1729

7) FAILURE: FAILS OPEN

05-6KA-2091-1 3/3 ARCS-12012,12013,12014,12015 3/2R PPP

ISSUE: The first seven issues concern falsely failing the valve closed. (see 4.2.1.B.1)

8) FAILURE: FAILS OPEN

.

E.

E i

05-6KA-2083-1	2/1R	PFP	(1/1 ABORT),	CIL
ARCS-1593,1595,1599	3/2R	PPP		

ISSUE: NASA FMEA contains multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failure may cause inability to accurately determine position of the valve. Loss of all redundancy may lead to falsely failing the valve closed. (see 4.2.1.B.2)

ISSUE: NASA FMEA contains multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failure may cause inability to accurately determine position of the valve. Loss of all redundancy may lead to falsely failing the valve closed. (see 4.2.1.B.2)

10) FAILURE: FAILS OPEN

05-6KA-2103-1 ARCS-1643,1645,1649, 3/2R PPP 1661,1663,1669

ISSUE: NASA FMEA contains multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failure may cause inability to accurately determine position of the valve. Loss of all redundancy may lead to falsely failing the valve closed. (see 4.2.1.B.2) 11) FAILURE: FAILS OPEN

05-6KA-2089-1	2/1R	PPP
ARCS-1683,1697,1711,1725	3/2R	PPP

<u>ISSUE:</u> NASA FMEA contains multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failure may cause inability to accurately determine position of the valve. Loss of all redundancy may lead to falsely failing the valve closed. (see 4.2.1.B.2)

12)	FAILURE:	FAILS	OPEN	-	•
05-61 ARCS-	KA-2090-1 -12008			3/1R 3/2R	PFP PPP

ISSUE: NASA FMEA contains multiple failures (switch short, ground driver failed on, causing continuous power to the solenoid). IOA-RCS claims this failure may cause inability to accurately determine position of the valve. Loss of all redundancy may lead to falsely failing the valve closed. (see 4.2.1.B.2)

=

-

13-19) FAILURE: FAILS SHORT

NO FMEA ARCS-1644,1646,1650 1662,1<u>6</u>64,1668

<u>ISSUE:</u> A short across these resistors is a credible failure. IOA-RCS recommends they be incorporated into a FMEA.

3/3

4.2.2.2.B.6 Toggle Switches (4 issues)

1) FAILURE: INADVERTENT OPERATION

05-6KA-2039-2 3/1R PPP ARCS-12126,12127,12147,12148 2/2 (1/1 ABORT), CIL

ISSUE: NASA FMEA contains multiple failures (close relay failed on, continuous power to the motor and a bellows leak). IOA-RCS claims the switch failed short across close contacts will close the valve and cause inability to re-open it. This prevents crossfeed capability thus loss of mission (2/2). Inability to crossfeed may cause incomplete OMS abort dump (1/1 abort). (see 4.2.1.B.4) 2) FAILURE: INADVERTENT OPERATION

05-6KA-2032-2 3/1R PFP, CIL ARCS-12204,12205,12206 3/1R PPP

ISSUE: NASA FMEA contains multiple failures (diode failed open, open driver failed on causing continuous power to the solenoid). IOA-RCS claims this failure causes the inability to close the valve. This, coupled with the loss of all hardware redundancy prevents isolation of a thruster leak. (see 4.2.1.B.3)

3) FAILURE: INADVERTENT OPERATION

05-6KA-2028-2	3/1R	PPP	(1/1)	ABORT),	CIL
ARCS-12082,12083,12084	2/2		(1/1)	ABORT),	CIL

ISSUE: Switch failed short across open contacts causes inability to close the valve. This prevents crossfeed capability thus loss of mission operation (2/2). Inability to crossfeed may cause incomplete OMS abort dump (1/1 abort). (see 4.2.1.B.4)

4) FAILURE: INADVERTENT OPERATION

05-6KA-2029-2	3/1R	PPP	(1/1 ABORT),	CIL
ARCS-12103,12104,12105	2/2		(1/1 ABORT),	CIL

<u>ISSUE:</u> - Switch failed short across open contacts causes inability to close the valve. This prevents crossfeed capability thus loss of mission operation (2/2). Inability to crossfeed may cause incomplete OMS abort dump (1/1 abort). (see 4.2.1.B.4)

4.2.2.2.B.7 Microswitches (9 issues)

1) FAILURE: ERRONEOUS OUTPUT

NO FMEA ARCS-12332

2/2 (1/1 ABORT), CIL

ISSUE: The tank isolation valve 1/2 solenoid talkback switch provides power to the talkback circuitry and the relay inhibit. A microswitch failure across the close contacts will not allow the valve to be closed This prevents crossfeed capability thus loss of mission operations (2/2). Inability to crossfeed may cause incomplete OMS abort dump (1/1 abort). (see 4.2.1.B.5) 2) FAILURE: ERRONEOUS OUTPUT

NO FMEA ARCS-12333

3/1R PPP

ISSUE: The tank isolation valve 3/4/5 solenoid talkback switch provides power to the talkback circuitry and the relay inhibit. A microswitch failure across the open contacts prevents valve from being opened. Hardware redundancy provided by second leg of 3/4/5, the 1/2 valve, and crossfeed operation. Loss of all redundancy causes loss of jets required to expel propellants to meet landing weight constraints. (see 4.2.1.B.5)

3) FAILURE: ERRONEOUS OUTPUT

NO FMEA ARCS-12334

3/1R PFP

<u>ISSUE:</u> The crossfeed isolation value 1/2 solenoid talkback switch provides power to the talkback circuitry and the relay inhibit. A microswitch failure across the close contacts prevents value from being closed. This prevents isolation of a thruster leak. (see 4.2.1.B.5)

4-7) FAILURE: ERRONEOUS OUTPUT

NO FMEA ARCS-12336,12337,12338,12339 3/2R PPP

ISSUE: IOA-RCS claims this failed open resistor causes loss of acccurate indication of the valve status from the event indicator or the GPC/MDM microswitch discretes. This may lead to falsely failing the valve closed. (see 4.2.1.B.5)

8-9) FAILURE: ERRONEOUS OUTPUT

NO FMEA ARCS-12074,12075 3/2R PPP

ISSUE: IOA-RCS claims this failed open resistor causes loss of acccurate indication of the valve status from the event indicator or the GPC/MDM microswitch discretes. This may lead to falsely failing the valve closed. (see 4.2.1.B.5)

≣

4.2.2.2.B.8 Circuit Breaker (2 issues)

1) FAILURE: SHORT, FAILED CLOSED

05-6KA-2280-2 3/1R PFP, CIL ARCS-12073 3/3

<u>ISSUE:</u> NASA FMEA contains multiple failures (switch jam, open driver failed on, causing continuous power to the solenoid. IOA-RCS claims this circuit breaker failed closed alone has no effect. (see 4.2.1.B.2)

2) FAILURE: FAILED OPEN

53

=

05-6KA-2280-1	3/1R	PPP
ARCS-12072	2/2,	CIL

<u>ISSUE:</u> Lose capability to open the isolation valve. This prevents vernier operation thus loss of mission. NASA FMEA failure also credible. Lose capability to close valve to isolate a thruster leak. IOA-RCS recommends both failures be covered on this FMEA. (see 4.2.1.B.3)

4.2.2.2.B.9 Event Indicators (8 issues)

1) FAILURE: FAILS OPEN

05-6KA-2153-1 3/3 ARCS-1857 3/2R PPP

2) FAILURE: FAILS OPEN

05-6KA-2154-2 3/3 ARCS-1858A 3/2R PPP

3) FAILURE: FAILS OPEN

05-6KA-2159-1 3/3 ARCS-1856 3/2R PPP

4) FAILURE: FAILS OPEN

05-6KA-2155-2	3/3	
ARCS-1859A	3/2R	PPP

5) FAILURE: FAILS OPEN

05-6KA-2156-2 3/3 ARCS-12017 3/2R PPP

<u>ISSUE:</u> The first five issues concern falsely failing the valve closed. (see 4.2.1.B.1)

÷

6) FAILURE: FAILS SHORT TO GROUND

05-6KA-2154-1 2/1R PFP, CIL ARCS-1858 3/2R PPP -

ISSUE: NASA FMEA contains multiple failures (continuous power to the motor and a bellows leak). IOA-RCS claims this failure may cause inability to accurately determine position of the valve. Loss of all redundancy may lead to falsely failing the valve closed. (see 4.2.1.B.2)

7) FAILURE: FAILS SHORT TO GROUND

05-6KA-2155-1 2/1R PFP, CIL ARCS-1859 3/2R PPP

ISSUE: NASA FMEA contains multiple failures (continuous power to the motor and a bellows leak - NOTE: FMEA scenario for failure not valid). IOA-RCS claims this failure may cause inability to accurately determine position of the valve. Loss of all redundancy may lead to falsely failing the valve closed. (see 4.2.1.B.2)

8) FAILURE: FAILS SHORT TO GROUND

05-6KA-2156-1	3/1R	PFP,	CIL
ARCS-12016	3/2R	PPP	

ISSUE: NASA FMEA contains multiple failures (switch short, ground driver fails on, causing continuous power to the solenoid). IOA-RCS claims this failure may cause inability to accurately determine position of the valve. Loss of all redundancy may lead to falsely failing the valve closed. (see 4.2.1.B.2)

4.2.2.3 Thruster Subsystem (23 issues)

4.2.2.3.A Hardware (10 issues)

4.2.2.3.A.1 Primary Thruster Bipropellant Solenoid Valves (6 issues)

1) FAILURE: FAILS OPEN, INTERNAL LEAKAGE

03-2A-221310-1 3/1R FPP, CIL RCS-290 1/1 ---, CIL (Fails open) RCS-294, 296, 298 1/1 ---, CIL (Internal leakage)

<u>ISSUE:</u> A thruster biprop valve failed open or leaking due to piece-part structural failure or seal failure results in leakage of propellant. See 4.2.1.A.2. Such a failure could also result in jet zots upon subsequent use of the thruster.

2) FAILURE: PREMATURE OPERATION (DURING GROUND C/O TRICKLE CURRENT TEST)

03-2A-221310-3 3/3 ---RCS-10138X 1/1 ---, CIL

= =

=

ISSUE: IOA considers a premature (unexpected) firing of an RCS thruster during ground operations and testing to be a 1/1 failure. Such a failure could result in loss of life due to exposure to prop vapors and thruster plume. This failure is the result of a reaction jet driver (RJD) failure. A "failed-on" thruster caused by an RJD failure is covered in the GNC subsystem.

3) FAILURE: FAILS CLOSED (ONE OR BOTH VALVES)

03-2A-221310-4 3/1R FPP, CIL RCS-293, 295, 297 3/1R FPP, 1/1 ABORT, CIL

ISSUE: IOA recommends that this failure mode be upgraded to a 3/1R FPP, 1/1 abort. This failure results in the loss of one primary thruster and could result in the inability to complete RTLS and TAL abort RCS and OMS propellant dumps. See 4.2.1.A.1.

151

4) FAILURE: STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE

NO FMEA RCS-291 1/1 ---, CIL

<u>ISSUE:</u> This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers external leakage of the primary thruster biprop solenoid valves assembly due to a housing failure to be a credible failure (ref. NSTS 22206, p. 2-14, item 2.3.7.a), and recommends that it be addressed on the FMEA/CIL. Failure results in leakage of propellant. See 4.2.1.A.2.

5) FAILURE: RESTRICTED FLOW

NO FMEA

RCS-292 3/1R FPP, 1/1 ABORT, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers restricted flow to be a credible failure mode for components with integral filters, and recommends that it be addressed for the primary thruster biprop valves. Effects same as "fails closed". See issue on 03-2A-221310-4, above, and 4.2.1.A.1.

6) FAILURE: DELAYED OPERATION, ONE VALVE OPENS SLOWLY OR LATE

NO FMEA RCS-10043X - 1/1 ---, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers the delayed opening of one biprop valve relative to the other to be a credible failure which should be addressed. Such a failure of the oxidizer valve could result in fuel migration into the oxidizer injector tube and detonation within the tube upon oxidizer flow (zots). Rupture of the valve assembly due to jet zots would result in leakage of propellant. See 4.2.1.A.2. IOA recommends that a 1/1 FMEA be generated for this failure mode.

152

-

.

4.2.2.3.A.2 Primary Thruster Injector Head Assembly (2 issues)

1) FAILURE: RESTRICTED FLOW

NO FMEA RCS-10040X 1/1 ---, CIL

ISSUE: This item is not currently addressed on the NASA FMEA/CIL. IOA considers the injector assembly to be at the same level of detail as other primary thruster components on the FMEA/CIL, and recommends that a separate 1/1 FMEA be regenerated for this item and failure mode. This will ensure that this critical failure gets the proper amount of attention. Restricted flow leading to an improper mixture ratio or inadequate cooling would probably result in loss of the thruster, and could result in combustion chamber or nozzle extension burn-through.

2) FAILURE: STRUCTURAL FAILURE, BURN-THROUGH

NO FMEA RCS-10041X 1/1 ---

= .2

_

-

ISSUE: This item is not currently addressed on the NASA FMEA/CIL. IOA considers the injector assembly to be at the same level of detail as other primary thruster components on the FMEA/CIL, and recommends that a separate 1/1 FMEA be regenerated for this item and failure mode. This will ensure that this critical failure gets the proper amount of attention. Such a failure of the injector head assembly could result in a fire/explosion potential leading to possible damage to the vehicle.

n relevant al sub-sec

4.2.2.3.A.3 Vernier Thruster Assembly (2 issues)

1) FAILURE: FAILS OPEN, INTERNAL LEAKAGE

03-2A-231310-3 3/1R FPP, CIL RCS-301 1/1 ---, CIL (Fails open) RCS-304 1/1 ---, CIL (Internal leakage)

ISSUE: A thruster biprop valve failed open or leaking due to piece-part structural failure or seal failure results in leakage of propellant. See 4.2.1.A.2. The NASA criticalities assigned to these vernier thruster failures are inconsistent between the forward and aft RCS subsystems. 2) FAILURE: STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE

NO FMEA RCS-303 1/1 ---, CIL

ISSUE: This failure mode is not currently addressed on the NASA FMEA/CIL. IOA considers external leakage of the vernier thruster biprop valve assembly due to a housing failure to be a credible failure (ref. NSTS 22206, p. 2-14, item 2.3.7.a), and recommends that it be addressed on the FMEA/CIL. Failure results in leakage of propellant. See 4.2.1.A.2.

4.2.2.3.B EPD&C (13 issues)

4.2.2.3.B.1 Remote Power Controllers (2 issues)

1) FAILURE: INADVERTENT OPERATION

05-6KA-2179-2 3/1R PFP, CIL ARCS-1872,1874,1880,1884, 3/3 1889,1891,1896,1900

ISSUE: NASA FMEA contains multiple failures (RJD command, relay failed closed, manifold isolation valve failed, tank isolation valve failed, main bus failed, causing inadvertent or uncontrollable thruster firing). IOA-RCS claims this RPC inadvertently operating alone has no effect. (see 4.2.1.B.2)

2) FAILURE: INADVERTENT OUTPUT

 05-6KA-2184-2
 3/1R
 PFP, CIL

 ARCS-1904,1906
 3/3

the second se

ISSUE: NASA FMEA contains multiple failures (RPC failed on, RJD command, manifold isolation valve failed, tank isolation valve failed, main bus failed off, causing inadvertent or uncontrollable thruster firing). IOA-RCS claims this RPC inadvertently operating alone has no effect.

4.2.2.3.B.2 Hybrid Drivers (3 issues)

1) FAILURE: INADVERTENT OPERATION

05-6KA-2214-2 3/1R PFP, CIL ARCS-1980,1982,1984,1986 3/3 1988,1990,1992,1994

ISSUE: NASA FMEA contains multiple failures (RJD command, relay failed, manifold isolation valve failed, tank isolation valve failed, main bus failed, causing inadvertent or uncontrollable thruster firing). IOA-RCS claims this driver inadvertently operating alone has no effect. (see 4.2.1.B.2)

2) FAILURE: INADVERTENT OUTPUT

05-6KA-2185-2	3/1R	PFP,	\mathtt{CIL}
ARCS-2000,2002	3/3		

ISSUE: NASA FMEA contains multiple failures (driver failed on, RJD command, manifold isolation valve failed, tank isolation valve failed, main bus failed off, causing inadvertent or uncontrollable thruster firing). IOA-RCS claims this driver inadvertently operating alone has no effect. (see 4.2.1.B.2)

3) FAILURE: INADVERTENT OUTPUT

05-6KA-2220 <u>-</u> 2	3/1R	PFP,	CIL
ARCS-1996,1998	3/3		

ISSUE: NASA FMEA contains multiple failures (driver failed on, RJD command, manifold isolation valve failed, tank isolation valve failed, main bus failed off, causing inadvertent or uncontrollable thruster firing). IOA-RCS claims this driver inadvertently operating alone has no effect. (see 4.2.1.B.2)

4.2.2.3.B.3 Relays (1 issue)

1) FAILURE: INADVERTENT OPERATION

05-6KA-2130-2 3/1R PPP ARCS-2024,2026,2028 3/3

<u>ISSUE:</u> NASA FMEA contains multiple failures (RJD command, relay failed closed, manifold isolation valve failed, tank isolation valve failed, main bus failed, causing inadvertent or uncontrollable thruster firing). IOA-RCS claims the latching relay failing closed alone has no effect. (see 4.2.1.B.2) 4.2.2.3.B.4 Toggle Switches (2 issues)

1) FAILURE: INADVERTENT OPERATION

05-6KA-2036-2 3/1R PPP ARCS-12262,12272,12282,12292 3/3 12263,12273,12283,12293

ISSUE: NASA FMEA contains multiple failures (RJD command, manifold isolation valve failure, tank isolation valve failure, main bus failure, causing inadvertent or uncontrollable thruster firing). IOA-RCS claims the switch inadvertently operating alone has no effect. (see 4.2.1.B.2)

2) FAILURE: FAILS TO CONDUCT ONE OR MORE CONTACT SET

05-6KA-2035-1	3/1R	PFP, CIL
ARCS-12256,12260	3/1R	PFP (or $2/2$), CIL
12276,12280		

ISSUE: IOA-RCS agrees with NASA FMEA criticalities and screens for manifolds 1-4 (3/1R PFP). However, IOA-RCS recommends the manifold 5 failure also be included in the effects as a 2/2 condition.

in :

= :

4.2.2.3.B.5 Pressure Sensors (3 issues)

1-3) FAILURE: INDICATES HIGHER OR LOWER PRESSURE THAN ACTUAL

NO FMEA ARCS-2286,2287,2288 3/2R PPP

-

<u>ISSUE:</u> Redundancy management may fail jets. Vernier jet activity may be limited. IOA-RCS recommends these failures be incorporated into a FMEA. Note : Existing FMEA on pressure sensors contain only the primary jets.

a de la companya de l Companya de la company

4.2.2.3.B.6 Temperature Sensors (2 issues)

1-2) FAILURE: INDICATES HIGHER OR LOWER TEMPERATURE THAN ACTUAL

NO FMEA ARCS-2296,2297 3/2R PPP

<u>ISSUE:</u> Redundancy management may fail jets. Vernier jet activity may be limited. IOA-RCS recommends these failures be incorporated into a FMEA. Note : Existing FMEA on temperature sensors contain only the primary jets. 4.2.2.4 Thermal Control Subsystem (8 issues)

4.2.2.4.A Hardware

- -

- -

IOA analyzed and assessed thermal control subsystem items as EPD&C items. See 4.2.2.4.B for assessment results.

4.2.2.4.B EPD&C (8 issues)

4.2.2.4.B.1 Thermal Switches (8 issues)

1-3) FAILURE: FAILS OPEN

NO FMEA ARCS-2334,2336,2338 3/2R PPP

ISSUE: Propellant in jet may freeze. Redundancy provided with jets on other manifolds. If jet is required, orbiter may orient itself toward solar heating. This may effect mission operations.

4-6) FAILURE: FAILS HIGH

NO FMEA ARCS-2335,2337,2339 3/3

<u>ISSUE:</u> Thermostat failing high provides continuous power to jet heaters. Heaters can be switched off. No effect.

7) FAILURE: FAILS OPEN

NO FMEA ARCS-2340 2/2

<u>ISSUE:</u> Propellant in jet may freeze. No redundancy provided. This may effect mission operations.

8) FAILURE: FAILS HIGH

NO FMEA ARCS-2341 3/3

<u>ISSUE:</u> Thermostat failing high provides continuous power to jet heaters. Heaters can be switched off. No effect.

4.3 Additional Comments and Concerns

During the assessment of the NASA RCS FMEA/CIL, IOA identified several areas of concern which are not evinced by the individual failure mode issues presented in this report. These concerns are discussed in the following hardware and EPD&C sections. Several general comments about the IOA assessment and resolution process are also given.

4.3.A Hardware Comments and Concerns

The IOA RCS hardware FMEA and CIL assessments were performed on the NASA/RI FMEA/CIL reevaluation information received by IOA as of 1/01/88. Any updates or changes in this information made by NASA/RI after this date are not reflected in this report. The IOA assessment of the RCS hardware CILs was performed against the post-CCB CIL package dated 12/05/87. This information was presented at RCS PRCB on 23 December 1987. The IOA assessment of the RCS hardware FMEAs (non-CILs) was performed against a criticality and screen summary package dated 9/03/87. For the FMEA (non-CIL) assessment, IOA had only criticality and screen information. The "effects" and other areas listed on a FMEA sheet could not be assessed. Updated FMEA sheets were not generated by NASA/RI.

RCS thermal control and instrumentation items are covered on the NASA RCS hardware FMEA/CIL, however IOA analyzed and assessed these items as EPD&C items. See the EPD&C portions of this report for the assessment results on these items.

Each of the hardware issues in this report have been discussed with the NASA RCS subsystem manager (SSM). The SSM has indicated agreement with a number of the IOA issues, however all issues remain classified by IOA as "open". IOA does not consider an issue to be resolved until it is either incorporated into the NASA FMEA/CIL, or withdrawn by IOA.

On the current NASA FMEA/CIL, one FMEA or CIL sheet may include several components and/or failure modes. The criticality and screens assigned on the FMEA or CIL reflect only the worst case component failure mode. IOA accepted this practice since the components and failure modes are addressed. However, IOA is concerned that this lumping of components and failure modes on individual FMEAs and CILs reduces insight into RCS subsystem failures. Many of the components and failure modes lumped together on one FMEA or CIL would have different criticality and screen assignments if they were separated onto individual FMEAs and CILs, and better insight would be obtained. For example, the vernier thruster assembly FMEAs (03-2F-131310 and 03-2A-231310) include the inlet valves, injector, thrust chamber, nozzle extension, heater, insulation, pressure transducer, and temperature transducer. These vernier thruster components are at the same level of detail as the same primary thruster components which are separated onto individual FMEAs and CILs. A better

understanding of the failures of each of the vernier thruster components could be obtained if they were separated onto individual FMEAs and CILs and assigned unique criticalities. IOA recommends a more consistent level of detail on the NASA RCS hardware FMEA/CIL, and less lumping of components and failure modes on FMEAs and CILs.

Related to this concern are the issues raised by IOA that leakage of valve housings should be addressed on the FMEA/CIL. IOA recommended that a new FMEA and CIL be generated for each valve housing, however accepted the lumping of all valve housings on the two existing helium and propellant line leakage FMEAs.

Some RCS subsystem failures do not exist as "failure modes" on current FMEAs and CILs. Instead, they are listed only as causes on FMEAs and CILs for other failure modes. IOA questions whether a critical RCS failure mode listed only as a cause on a FMEA or CIL receives adequate attention. All critical failures should be listed as failure modes on FMEAs and CILs to ensure that they receive the appropriate amount of attention.

4.3.B EPD&C Comments and Concerns

IOA takes issue with the NASA interpretations of NSTS 22206, Section 2.1.s, page 2-4, the definition of redundancy. The NASA-applied definition of the redundancy string allowed the selection of specific failures which were required to cause known problems, i.e., failures required to cause continuous power to the AC motor valves, or failures required to apply continuous power to the manifold 5 solenoid valve. IOA considers this definition of redundancy to be related more to a Hazard Analysis rather than a FMEA/CIL analysis and considers many NASA redundancy strings to include multiple failures.

IOA analyzed the specific function of the item and determined the impact of the failure. Per NSTS 22206 interpretation, the redundancy string was defined as any other item that is capable of performing the specific function of this item. Criticalities were then assigned based on this redundancy.

This discrepancy was discussed at a meeting with the NASA subsystem manager. In general, the NASA definition tended to be more conservative (assigned a more severe criticality on the FMEA). However, IOA was requested to follow NSTS 22206. The difference in interpretations accounts for the high number of issues cited.

i ta

Also at the meeting with the subsystem manager, IOA presented the issue concerning closing a valve to isolate a leak with the GPC. The subsystem manager stated that the GPC is not used to isolate a leak since the software has to be manually loaded. Due to time limitations, IOA was not able to extract all these issues concerning this out of this report.

An extensive amount of re-analysis was done for the assessment report. Since the manifold 5 isolation valve wiring changed after the IOA analysis was complete, IOA completely re-analyzed the new design. Additionally, all diodes and switches were re-analyzed in efforts to match the NASA FMEA breakdown for these items. 5.0 REFERENCES

• •

=

3.5

-

-

Reference documentation available from NASA and Rockwell was used in the analysis. The documentation used included the following:

- 1. Reaction Control System Workbook, RCS 2102, March 3, 1980
- Reaction Control System Shuttle Flight Operations Manual, Volume 8D, March 31, 1980
- 3. OMS/RCS Systems Briefs Handbook, October 1, 1984
- 4. STS Operational Flight Rules Rationale, December 16, 1985 and PCN-1, February 14, 1986
- 5. NSTS 22206, Instructions for Preparation of FMEA and CIL, October 10, 1986.
- 6. Reliability Desk Instruction, No. 100-2G, Flight Hardware FMEA & CIL, 1-31-84.
- 7. VS70-942102 Rev. G, 6-7-84, FRCS Integrated System Schematics, 102, RI Level III.
- 8. VS70-942099 Rev. D, EOD01, 8-30-84, FRCS Integrated System Schematics, 099, 103, 104, RI Level III.
- 9. VS70-943099, Rev. B, EOB12, 7-22-85, OMS/RCS Integrated System Schematics, 099, 103, 104, RI Level III.
- 10. VS70-943102, Rev. C, 10-29-80, OMS/RCS Integrated System Schematics, 102, RI Level III.
- 11. MB0160-007, Rev M, 3-11-80, Steel Tubing, Mat'l spec., RI.
- 12. MC276-0017, Rev D, 6-23-84, Helium High Pressure Coupling, Proc. spec., RI.
- 13. MC276-0018, Rev B, 2-14-84, Hypergolic Service Coupling, Proc. spec., RI.
- 14. MC282-0082, Rev D, 3-17-82, Pressurant Storage Tank, Proc. spec., RI.
- 15. MC284-0421, Rev E, 5-3-82, Pressure Relief Valve, Proc. spec., RI.
- 16. MC284-0430, Rev E, 6-22-81, AC Motor Valve, Proc. spec., RI.
- 17. MC284-0480, Rev C, 5-3-82, Manual Operated Valve, Proc. spec., RI.
- MC284-0481, Rev B, 6-23-84, Quad Check Valve, Proc. spec., RI
 MC363-0031, Rev C, 3-15-78, Electrical Heater, Detail Proc.

161

spec., RI.

-

- 20. ME276-0032, Rev B, 7-20-79, Test Point Coupling, Spec. Control Dwg., RI.
- 21. AMS5562A, 7-15-80, Steel Tubing, Mat'l spec., SAE.
- 22. 73P550015, Rev B, 3-22-82, Gimbal Bellows, Proc. spec., MDAC.
- 23. 73P550003 Alignment Bellows Drawing, MDAC.
- 24. MC282-0061, Rev. G, RCS Propellant Tank, Proc. Spec., MDAC.
- 25. MC271-0095, RCS Propellant Line Flexible Assembly, Proc. Spec., MDAC.
- 26. MC467-0029, Rev. G, RCS Vernier Thruster Assembly, Proc. Spec., MDAC.
- 27. VS70-420309, Rev. D, 6-4-84, Aft RCS Subsystem Control Left OMS Pod Schematic Diagram.
- 28. JSC-11174, Space Shuttle Systems Handbook, Rev. C, DNC-5, 9-13-85.

rens s.

APPENDIX A ACRONYMS

-	Alternating Current
-	Aft Load Controller
-	Aft Load Control Assembly
-	Aft Motor Control Assembly
-	Abort-Once-Around
-	Aft Power Controller
-	Aft Reaction Control System (Subsystem)
	Assembly
-	Abort-To-Orbit
-	Attitude
_	Bus Control ELement
-	Backup Flight System
-	Bus Terminal Unit
_	Caution and Warning
_	Critical Items List
_	Close (Closed)
_	Command Commander
_	Control
_	Controller
_	Criticality
_	Cathodo-Pay Tube
_	Displays and Controls
_	Displays and conclois Digital Autopilot
_	Digital Autopilot
_	Direct current Department of Defense
	Department of Defense
-	Data Processing System (Subsystem)
-	Detailed fest objective
-	Entry Interlace
-	Electrical Power Distribución and concroi
-	External Tank Februaria
-	Farrenneit
-	Flight Alt
-	Flight Control Operating System
-	Fault Detection and Annunciation
-	Flight Forward
-	Forward Load Control Assembly
-	Flight
-	Failure Mode
-	Forward Motor Control Assembly
-	Failure Modes and Effects Analysis
-	Forward Reaction Control System (Subsystem)
-	Flight Software
-	Feet
-	Fuel
-	Function
-	Forward
-	Gravity
-	Government Furnished Equipment
-	Guidance, Navigation, and Control
_	General Purpose Computer

i .

l

: =---

-

ar Qu

-

.

.

GSE	-	Ground Support Equipment
He	-	Helium
HW	_	Hardware
T/C	_	Interconnect
T/0	-	Input/Output
	_	Inside Diameter
TMI	_	Inortial Measurement Unit
	_	Independent Orbiter Assessment
TOA	_	Independent Orbiter Assessment
1200	-	Isolacion Initial Specific Impulse
ISP		Initial Specific Impulse
JSC	-	Johnson Space Center
ь 		Leit
LCA	-	Load Controller Assembly
LRU	-	Line Replaceable Unit
MAN	-	Manual
MCA	-	Motor Control Assembly
MCC	-	Mission Control Center (JSC)
MDAC	-	McDonnell Douglas Astronautics Company
MDM	-	Multiplexer/Demultiplexer
MECO	-	Main Engine Cutoff
MM	-	Major Mode
MMH	-	Monomethyl Hydrazine
msec	-	Millisecond
N204	-	Nitrogen Tetroxide
NA	-	Not Applicable
NASA	-	National Aeronautics and Space Administration
NSTS	-	National Space Transportation System
NTO	-	Nitrogen Tetroxide
OA .		Operational Aft
OF	-	Operational Forward
OI	-	Operational Instrumentation
OMRSD	-	Operational Maintenance Requirements and
		Specifications Document
OMS	-	Orbital Maneuvering System
OP	-	Open
OPS	-	Operations Sequence
ox		Oxidizer
OXID	_	Oxidizer
P	-	Pitch
PAD	-	Propellant Acquisition Device
PASS	-	Primary Avionics Software System
DRT		Push-Button Indicator
PC	_	Chamber Pressure
DCA	_	Power Control Assembly
DCT	_	Potential Critical Item
PCM	_	Pulse Code Modulation
DCMMII	_	Pulse Code Modulation Master Unit
DIS		Primary Landing Site
כניי	_	Primary Reaction Control System (jet)
PRCS	-	Primary Reaction control bystem (jet)
LUTOO	_	Drbeenrb
DDOC	-	Pressure
PROC	-	Processor Processor Pounds per Square Inch
PROC psi		Processor Pounds per Square Inch Pounds per Square Inch Absolute
PROC psi psia psid		Processor Pounds per Square Inch Pounds per Square Inch Absolute Pounds per Square Inch Differential
PROC psi psia psid		Processor Pounds per Square Inch Pounds per Square Inch Absolute Pounds per Square Inch Differential Pounds per Square Inch Gage

A-2

PTI	-	Programmed Test Input
PWR	-	Power
R	-	Right
R	-	Roll
RCS	-	Reaction Control System
RHC	-	Rotation Hand Controller
RI	-	Rockwell International
RJD	_	Reaction Jet Driver
RM	-	Redundancy Management
RPC	-	Remote Power Controller
RTLS	-	Return-to-Launch Site
scfm	-	Standard Cubic Feet per Minute
SFOM	-	Shuttle Flight Operations Manual
SOP	-	Subsystem Operating Program
SPEC	-	Specification
SSM	-	Subsystem Manager
SSSH	-	Space Shuttle Systems Handbook
STS	-	Space Transportation System
SUM	-	Summary
SYS	-	System
TAL	-	Transatlantic Abort Landing
THC	-	Translation Hand Controller
TK	-	Tank
TPS	-	Thermal Protection System
VERN	-	Vernier
VLV	-	Valve
VRCS	-	Vernier Reaction Control System (jet)
Y	-	Yaw

A-3

• • • • • • •

.

--

· · ·

. .

. .

-

.

•

APPENDIX B

DEFINITIONS, GROUND RULES, AND ASSUMPTIONS

B.1 Definitions

-

i kana

B.2 Project Level Ground Rules and Assumptions B.3 RCS-Specific Ground Rules and Assumptions

APPENDIX B DEFINITIONS, GROUND RULES, AND ASSUMPTIONS

7

₩Ę.

.

B.1 Definitions

Definitions contained in <u>NSTS 22206, Instructions For Preparation</u> of <u>FMEA/CIL</u>, 10 October 1986, were used with the following amplifications and additions.

INTACT ABORT DEFINITIONS:

<u>RTLS</u> - begins at transition to QPS 6 and ends at transition to OPS 9, post-flight

<u>TAL</u> - begins at declaration of the abort and ends at transition to OPS 9, post-flight

 \underline{AOA} - begins at declaration of the abort and ends at transition to OPS 9, post-flight

<u>ATO</u> - begins at declaration of the abort and ends at transition to OPS 9, post-flight

<u>CREDIBLE (CAUSE)</u> - an event that can be predicted or expected in anticipated operational environmental conditions. Excludes an event where multiple failures must first occur to result in environmental extremes

<u>CONTINGENCY CREW PROCEDURES</u> - procedures that are utilized beyond the standard malfunction procedures, pocket checklists, and cue cards

EARLY MISSION TERMINATION - termination of onorbit phase prior to planned end of mission

<u>EFFECTS/RATIONALE</u> - description of the case which generated the highest criticality

<u>HIGHEST CRITICALITY</u> - the highest functional criticality determined in the phase-by-phase analysis

<u>MAJOR MODE (MM)</u> - major sub-mode of software operational sequence (OPS)

<u>MC</u> - Memory Configuration of Primary Avionics Software System (PASS)

<u>MISSION</u> - assigned performance of a specific Orbiter flight with payload/objective accomplishments including orbit phasing and altitude (excludes secondary payloads such as GAS cans, middeck P/L, etc.)
<u>MULTIPLE ORDER FAILURE</u> - describes the failure due to a single cause or event of all units which perform a necessary (critical) function

<u>OFF-NOMINAL CREW PROCEDURES</u> - procedures that are utilized beyond the standard malfunction procedures, pocket checklists, and cue cards

<u>OPS</u> - software operational sequence

<u>PRIMARY MISSION OBJECTIVES</u> - worst case primary mission objectives are equal to mission objectives

PHASE DEFINITIONS:

:=...

<u>. .</u>

<u>PRELAUNCH PHASE</u> - begins at launch count-down Orbiter power-up and ends at moding to OPS Major Mode 102 (liftoff)

<u>LIFTOFF MISSION PHASE</u> - begins at SRB ignition (MM 102) and ends at transition out of OPS 1 (Synonymous with ASCENT)

<u>ONORBIT PHASE</u> - begins at transition to OPS 2 or OPS 8 and ends at transition out of OPS 2 or OPS 8

<u>DEORBIT PHASE</u> - begins at transition to OPS Major Mode 301 and ends at first main landing gear touchdown

LANDING/SAFING PHASE - begins at first main gear touchdown and ends with the completion of post-landing safing_operations

is seen of the state of the

APPENDIX B DEFINITIONS, GROUND RULES, AND ASSUMPTIONS

B.2 IOA Project Level Ground Rules and Assumptions

The philosophy embodied in <u>NSTS 22206, Instructions for</u> <u>Preparation of FMEA/CIL, 10 October 1986</u>, was employed with the following amplifications and additions.

1. The operational flight software is an accurate implementation of the Flight System Software Requirements (FSSRs).

RATIONALE: Software verification is out-of-scope of this task.

2. After liftoff, any parameter which is monitored by system management (SM) or which drives any part of the Caution and Warning System (C&W) will support passage of Redundancy Screen B for its corresponding hardware item.

> RATIONALE: Analysis of on-board parameter availability and/or the actual monitoring by the crew is beyond the scope of this task.

3. Any data employed with flight software is assumed to be functional for the specific vehicle and specific mission being flown.

RATIONALE: Mission data verification is out-of-scope of this task.

=

≣

4. All hardware (including firmware) is manufactured and assembled to the design specifications/drawings.

RATIONALE: Acceptance and verification testing is designed to detect and identify problems before the item is approved for use.

5. All Flight Data File crew procedures will be assumed performed as written, and will not include human error in their performance.

RATIONALE: Failures caused by human operational error are out-of-scope of this task.

- 6. All hardware analyses will, as a minimum, be performed at the level of analysis existent within NASA/Prime Contractor Orbiter FMEA/CILs, and will be permitted to go to greater hardware detail levels but not lesser.
 - RATIONALE: Comparison of IOA analysis results with other analyses requires that both analyses be performed to a comparable level of detail.
- 7. Verification that a telemetry parameter is actually monitored during AOS by ground-based personnel is not required.

RATIONALE: Analysis of mission-dependent telemetry availability and/or the actual monitoring of applicable data by ground-based personnel is beyond the scope of this task.

8. The determination of criticalities per phase is based on the worst case effect of a failure for the phase being analyzed. The failure can occur in the phase being analyzed or in any previous phase, whichever produces the worst case effects for the phase of interest.

RATIONALE: Assigning phase criticalities ensures a thorough and complete analysis.

9. Analysis of wire harnesses, cables, and electrical connectors to determine if FMEAs are warranted will not be performed nor FMEAs assessed.

RATIONALE: Analysis was substantially complete prior to NSTS 22206 ground rule redirection.

10. Analysis of welds or brazed joints that cannot be inspected will not be performed nor FMEAs assessed.

RATIONALE: Analysis was substantially complete prior to NSTS 22206 ground rule redirection.

11. Emergency system or hardware will include burst discs and will exclude the EMU Secondary Oxygen Pack (SOP), pressure relief valves and the landing gear pyrotechnics.

> RATIONALE: Clarify definition of emergency systems to ensure consistency throughout IOA project.

APPENDIX B DEFINITIONS, GROUND RULES, AND ASSUMPTIONS

- B.3 RCS Specific Groundrules and Assumptions
- B.3.A Hardware
 - 1. The function of an RCS thruster is to provide thrust in a certain axis and direction. Therefore, from a top down system analysis approach, thrusters which fire in the same axis and direction may be considered redundant to each other.
 - 2. All aft RCS thrusters are required for the successful completion of OMS/RCS propellant dumps during RTLS and TAL aborts.
 - It is assumed that after the failure of an RCS thruster, the RCS redundancy management will automatically deselect the opposite-firing thruster.
 - 4. Any leakage of RCS propellants is potentially life and vehicle threatening regardless of where the leak occurs (NSTS 22206, p. 2-11, item h). IOA classifies any single failure which results in propellant leakage as a 1/1. If redundant items must fail before leakage occurs, IOA assign a functional criticality 1R.
 - 5. The IOA redundancy string applied to the "fails closed" failure mode for the helium tank isolation valves, propellant tank isolation valves, manifold isolation valves, and crossfeed valves does not include a failure which requires that the valve be closed.
 - 6. Inability to deplete propellants or complete planned propellant dumps can lead to violations of orbiter entry mass properties constraints and/or violations of propellant tank landing weight constraints (ARCS only).

B.3.B EPD&C

- IOA-RCS assumed the inability to re-open a value on ascent is not a credible event. These values (helium isolation value A & B, tank isolation values 1/2 & 3/4/5, and manifold isolation values 1-5) are open prelaunch and are used to supply propellants to jets for control, ET separation, and RTLS/TAL aborts.
- 2. IOA-RCS assumed if a valve was closed for some reason (i.e. isolate a leak) after ascent, the inability to re-open this valve was a credible failure and the reason to close was not in the redundancy string.

3. The above valves and the aft crossfeed valves can be

configured manually or with the GPC. The primary and secondary application of these commands depends on the mission phase. For secondary application, IOA-RCS issued a "NA" for the B screen since this would be a stand-by function.

- 4. IOA-RCS issued a "NA" for B screens for all electrical components failed open that are used to isolate a leak. Isolation of a leak is a stand-by function. If a failed short item causes inability to isolate a leak (valve failed open), this item has the applicable B screen assigned to it.
- 5. IOA-RCS assumed that loss of logic power for reaction jet drivers on ascent was not a credible failure since multiple failures (driver power circuit failed off) must occur. However, after ascent, driver power is turned off during sleep periods. Inability to turn on logic power, thus driver power, is now credible. This causes loss of jets on associated manifolds.
- 6. MDM discretes and the event indicators provide the logic and visual status of the valve position. Resistors, diodes, and hybrid drivers are used in the circuitry that provide this data. IOA-RCS claims the failure of these items may lead to a false indication of the valve position. The worst effect of these indicators would be to falsely fail the valve closed which may effect on-orbit operations.
- 7. An issue has been made of all RLR type resistors with a short failure mode with a 3/3 criticality. This type resistor cannot fail short. Updated FMEAs have not been received to delete this failure mode.
- 8. Electrical components within the valve (microswitches, diodes, etc) have been analyzed for the assessment report. This analysis is shown in Appendix E.
- 9. All switches have been re-analyzed for the assessment report. They have been broken into five categorical groups. This analysis is shown in Appendix E.
- 10. Diodes have been re-analyzed for the assessment report. The diodes have been broken out into the seven groups (depending on the function of the diode in the circuit) as shown below :
 - x Limit switches or Talkback
 - A GPC close
 - B GPC open
 - C Manual open
 - D Manual close
 - E Manual open/close inhibit
 - F Manual close/open inhibit

. .

--

ana an a' 1997 an Anna Anna an Anna an

. بوه ۲۰۰۰ و ۲۰۰۰ نیز می می و این این می می این این می

الم المراجع الم المراجع المراجع

· . . .

۰.

APPENDIX C DETAILED ASSESSMENT

This section contains the IOA assessment worksheets generated during the assessment of this subsystem. The information on these worksheets facilitates the comparison of the NASA FMEA/CIL (Pre and Post 51-L) to the IOA detailed analysis worksheets included in Appendix E. Each of these worksheets identifies the NASA FMEA being assessed, corresponding MDAC Analysis Worksheet ID (Appendix E), hardware item, criticality, redundancy screens, and recommendations. For each failure mode, the highest assessed hardware and functional criticality is compared and discrepancies noted as "N" in the compare row under the column where the discrepancy occurred.

> LEGEND FOR IOA ASSESSMENT WORKSHEETS

Hardware Criticalities:

- = Loss of life or vehicle 1
- = Loss of mission or next failure of any redundant item 2
 - (like or unlike) could cause loss of life/vehicle

3 = All others

Functional Criticalities:

1R = Redundant hardware items (like or unlike) all of which, if failed, could cause loss of life or vehicle

2R = Redundant hardware items (like or unlike) all of which, if failed, could cause loss of mission

- ----

Redundancy Screens A, B and C:

Ρ	=	Passed	Screen

- = Failed Screen F
- NA = Not Applicable

NASA Data :

. 7

Baseline = NASA FMEA/CIL New

= Baseline with Proposed Post 51-L Changes

CIL Item :

X = Included in CIL

Compare Row : N = Non compare for that column (deviation)

ASSESSME ASSESSME NASA FME	NT D NT I A #:	ATE: D:	1/01/8 RCS-10 03-2F-	38)0 -1010)10-1			N2 I	ASA DA BASELI N	ATA: INE NEW	[[X]	· .
SUBSYSTE MDAC ID: ITEM:	:M:		FRCS 100 HELIUN	1 STC	RAGE	TANI	x			ч.			
LEAD ANA	LYST	:	C.D. I	RUSI	2		-						
ASSESSME	NT:												
	CRIT	ICAL	ITY	RI	DUND	ANCY	SCREI	ens			CIL	м	
	r HD	W/FU	NC	A		В		С			T T T		
NASA IOA	[1 [1	/1 /1]]	[[]	[[]	[[]		[X [X	י []	*
COMPARE	Į	/]	ľ]	[]	[]		[]	
RECOMMEN	IDATI	ons:	(If	diff	ferent	: fro	om NAS	SA)					
-	[. /]	[]	[]	נ י]	(AI	[D/D] ELE:	FE)
* CIL RE	TENT	ION	RATION	ALE:	(If a	appl	icable	≥) Al INAI	DEQUA	re re	[[]]	
REMARKS:	RENC	ES.	IOA RI	ECOM	IENDS	ADD	ING A	STA	LEWEN.	г тс) TH	E E	FFEC

-

T

3

- 7

NO DIFFERENCES. IOA RECOMMENDS ADDING A STATEMENT TO THE EFFECTS ABOUT POSSIBLE VIOLATIONS OF THE ORBITER ENTRY MASS PROPERTIES CONSTRAINTS.

REPORT DATE 2/26/88

C-2

.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-101 03-2F-1010	070-1		NASA DATA BASELINE NEW	.: [] 7 [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 101 HELIUM FII	LL COUPI	LING		
LEAD ANALYST:	C.D. PRUST	Г	-		
ASSESSMENT:					
CRITICAL	ITY RI	EDUNDANO	CY SCREE	NS	CIL ITEM
HDW/FU	NC A		В	С	
NASA [2 /1R IOA [2 /1R] [F]] [P] [] [F] NA]	[P] [P]	[X]* [X]
COMPARE [/] [N] [N]	[]	[]
RECOMMENDATIONS:	(If dif	ferent 1	from NAS	A)	ar.
_ [/] [] []	[]	[] ADD/DELETE)
* CIL RETENTION	RATIONALE:	(If app	plicable) ADEQUATE INADEQUATE	[]
REMARKS:					

IOA AGREES WITH NASA/RI FAILURE OF A AND B SCREENS. CONDITION OF CAP SEALS UNDETECTABLE AFTER CAP INSTALLATION. IOA RECOMMENDS ADDING A STATEMENT TO THE EFFECTS REGARDING POSSIBLE VIOLATIONS OF ORBITER ENTRY MASS PROPERTIES CONSTRAINTS.

REPORT DATE 2/26/88

2.5

- -

in the second

-

ASSESSMENT DATE:	1/01/88	NASA DATA:
ASSESSMENT ID:	RCS-102	BASELINE []
NASA FMEA #:	03-2F-101070-2	NEW [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 102 HELIUM FILL COUPLING	

LEAD ANALYST: C.D. PRUST

ASSESSMENT:

	CR	ITICALITY FLIGHT			I	REDUNDANCY SCREENS					CIL ITEM				
	1	HD	W/FU	NC	2	L .	E	3	C	2					
NASA IOA	[[3 3	/3 /3]]	[[]]	[[-]]	[[]]	[[]	*		
COMPARE	[/]	[]	[]	[]	[]			

RECOMMENDATIONS: (If different from NASA)

-	[1]	[]	[]	[]	[]
		-								(ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [] INADEQUATE []

......

.

REMARKS:

NO DIFFERENCES. IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO COUPLE" AND "RESTRICTED FLOW".

NASA DATA: ASSESSMENT DATE: 1/01/88 BASELINE [ASSESSMENT ID: RCS-103 NEW [X] NASA FMEA #: 03-2F-101020-3 SUBSYSTEM: FRCS MDAC ID: 103 HE ISOL A & B VLVS ITEM: C.D. PRUST LEAD ANALYST: ASSESSMENT: REDUNDANCY SCREENS CIL CRITICALITY ITEM FLIGHT В С HDW/FUNC Α [P] [P] [P] [3 /1R]] * NASA [P] [P] [3 /1R] [P] IOA COMPARE [/] [] [] [] Γ] RECOMMENDATIONS: (If different from NASA) [A] [3/1R] [P] [F] [P] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE Γ] INADEQUATE [] **REMARKS:** IOA NOW RECOMMENDS THAT THE B SCREEN BE FAILED AND THAT THIS ITEM

AND FAILURE MODE BE PLACED ON THE CIL. A FAILURE OF THE REDUNDANT SECONDARY REG IS NOT DETECTABLE IN FLIGHT. IOA RECOMMENDS THE ADDITION OF A STATEMENT TO THE EFFECTS REGARDING POSSIBLE VIOLATIONS OF ORBITER ENTRY MASS PROPERTIES CONSTRAINTS.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-1032 NONE	A		NASA DATA BASELINE NEW	: [] []	
SUBSYSTEM: MDAC ID: ITEM:	FRCS 103 HE ISOL	A & B V	/LVS			
LEAD ANALYST:	C.D. PRI	JST	-			
ASSESSMENT:						
CRITICAL	ITY	REDUNDA	NCY SCRE	EENS	CIL TTEM	
HDW/FU	NC	A	В	C		
NASA [/ IOA [3 /1R] [] [P]	[] [P]	[] [P]	[] []	*
COMPARE [N /N] [[И	[N]	[N]	[]]	
RECOMMENDATIONS:	(If d	ifferent	from NA	ASA)		
_ [3 /1R _] [P]	[F]	[P] (AI	[A] DD/DEL	ETE)
* CIL RETENTION	RATIONAL	E: (If a	applicabl	le) ADEQUATE INADEQUATE	[]	
REMARKS: NASA/RI DO NOT C SSM AGREED THAT	OVER THIS	S FAILUF LURE MOD	E MODE (DE SHOULI	(INTERNAL LEAD DE ADDED TO	KAGE). 03-2F PPP	THE
NOW RECOMMENDS A	3/1R PF	P FOR 03	-2F-1010	20-3. SEE AS	SSESSM	ENT

== :

_ :

SHEET RCS-103.

ASSESSMENT DATE: 1/01/88 NASA DATA: BASELINE [ASSESSMENT ID: RCS-104 NEW [X] NASA FMEA #: 03-2F-101020-4 FRCS SUBSYSTEM: MDAC ID: 104 ITEM: HE ISOL A & B VLVS LEAD ANALYST: C.D. PRUST ASSESSMENT: REDUNDANCY SCREENS CIL CRITICALITY FLIGHT ITEM **B** . С HDW/FUNC Α [P] ר אם] [NA] [P] [P]] * [3 /1R] [NASA [P] [X] IOA $\begin{bmatrix} 2 \\ 1R \end{bmatrix}$ [P] [N] COMPARE [N /] **RECOMMENDATIONS:** (If different from NASA) [2/1R] [P] [P] [P] [A] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable)

> ADEQUATE [] INADEQUATE []

REMARKS:

1

 IOA ACCEPTS NASA/RI PASSAGE OF B SCREEN. IOA RECOMMENDS THAT THIS ITEM AND FAILURE MODE BE UPGRADED TO A 2/1R AND PLACED ON THE CIL. INABILITY TO REPRESS FRCS PROP TANK AND SUBSEQUENT INABILITY TO USE OR DEPLETE PROP COULD RESULT IN VIOLATIONS OF ENTRY MASS PROPERTIES CONSTRAINTS AND LOSS OF LIFE OR VEHICLE DURING ENTRY.

REPORT DATE 2/26/88

ASSESSMENT DATE:	1/01/88	NASA DATA:	x]
ASSESSMENT ID:	RCS-105	BASELINE [
NASA FMEA #:	03-2F-101013-1	NEW [
SUBSYSTEM: MDAC ID: ITEM:	FRCS 105 HE LINE, ALL EXCEPT ISOL	VLV TO PRESS	REGULATOR

LEAD ANALYST: C.D. PRUST

ASSESSMENT:

	CRI	T] FI	CAL LIGH	ITY T	F	EDUN	DANCY	SCR	EENS		C: I'	IL Fen	1		
	H	DŴ	I/FU	NC	A		В		C	2					
NASA IOA	[[1 1	/1 /1]]	[[]]	[[]]	[[]]	[[X X]	*	
COMPARE	[/]	[].	٢]	[]	[]		

RECOMMENDATIONS: (If different from NASA)

ſ	1]	[]	1]	[]	[]
-	•	-	-	-	-	-			· (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [] INADEQUATE []

三

REMARKS:

NO DIFFERENCES. IOA RECOMMENDS ADDING A STATEMENT TO THE EFFECTS REGARDING POSSIBLE VIOLATIONS OF ORBITER ENTRY MASS PROPERTIES CONSTRAINTS. THIS FMEA SHOULD ALSO INCLUDE HELIUM COMPONENT BODIES IN THE ITEM LIST AND CORRESPONDING RETENTION RATIONALE. THE SSM AGREED THAT VALVE BODIES SHOULD BE ADDED.

REPORT DATE 2/26/88

1/01/88 RCS-106 NONE		NASA DAT BASELIN NI	FA: VE [] SW []						
FRCS 106 HE LINE, ALL	EXCEPT IS	OL VLV TO PE	RESS REGULATOR						
C.D. PRUST	C.D. PRUST								
ITY REDUN F NC A	DANCY SCRI B	eens C	CIL ITEM						
] []] []	[] []	[] []	[] * [X]						
] []	[]	[]]	[N]						
(If differe	nt from NA	ASA)							
] []	[]	[]	[] (ADD/DELETE)						
RATIONALE: (If	applicab	le) Adequati Inadequati	E [] E []						
OVER RESTRICTE EFORMATION (CR FECTS, HOWEVER ESTIONABLE. A R OR COMPONENT SSED ON THE FM	D FLOW IN IMPING). THE CRED NY CONTAM . IOA REG EA/CIL, BU	A SEGMENT (SUCH AN OCC IBILITY OF S INATION WOUL COMMENDS THA UT DOES NOT	OF LINE DUE TO CURRENCE COULD SUCH AN LD FLOW TO AT SUCH A REGARD THIS						
	<pre>1/01/88 RCS-106 NONE FRCS 106 HE LINE, ALL C.D. PRUST ITY REDUN F NC A] []] [] REDUN F ITY REDUN F ITY REDUN F ITY REDUN F ITY REDUN F I]] []] []]] []]] []]] []]] []] []]] []] []]] []] []]] []] []]] []]] []]] []]] []]] []]] []]] []]]] []]] []]] []]] []]] []]] []]] []]] []]] []]]] []]]] []]]]] []]]]] []]]]] []]]]]] []]]]] []]]]]] []]]]]]]] []]]]]]]]]]]]]]]]]] []</pre>	<pre>1/01/88 RCS-106 NONE FRCS 106 HE LINE, ALL EXCEPT ISO C.D. PRUST ITY REDUNDANCY SCRI F NC A B] [] []] [] []] [] []] [] []</pre>	1/01/88 NASA DAT RCS-106 NONE BASELIN BASELIN NONE FRCS 106 HE LINE, ALL EXCEPT ISOL VLV TO PR C.D. PRUST ITY REDUNDANCY SCREENS ITY REDUNDANCY SCREENS NC A B C] [] []] [] []] [] []] [] []] [] [] (If different from NASA)] []] [] [] (If different from NASA)] [] [] [] [(If different from NASA)] [] [(If different from NASA)] [] [(If different from NASA)] [] [DVER RESTRICTED FLOW IN A SEGMENT (CENTRAL CENTRAL CE						

τα

€2

C-9

٦.

ASSESSMENT DATE:	1/01/88	NASA DATA:
ASSESSMENT ID:	RCS-107	BASELINE []
NASA FMEA #:	03-2F-101013-1	NEW [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 107 HE LINE, ISOL VLV TO PH	RESS REGULATOR

LEAD ANALYST: C.D. PRUST

ASSESSMENT:

	CR:	IT:	ICAL	[TY P		REDUNDANCY					SCREENS					CIL TTEM			
	1	HDI	N/FUI	NC		A				B			С					-	
NASA IOA	[[1 2	/1 _. /1R]]	[[P]	((P]]	[[P]		[[X X]	*
COMPARE	ľ	N	/N]	[N]	[N]	Γ	N]		[]	-

RECOMMENDATIONS: (If different from NASA)

r /	1	r	٦	Г	٦	ſ	1	r 1
ι /	1	L	J	L	4	L	-	(ADD)/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [] INADEQUATE []

=

- -

REMARKS: IOA ORIGINALLY CONSIDERED THE PARALLEL LINE SEGMENTS OF THE ISOL VLV LEGS TO BE REDUNDANT. HOWEVER, IOA AGREES WITH THE NASA/RI CRIT 1/1 ASSIGNMENT. IOA RECOMMENDS ADDING A STATEMENT TO THE EFFECTS REGARDING POSSIBLE VIOLATIONS OF ORBITER ENTRY MASS PROPERTIES CONSTRAINTS. THIS FMEA SHOULD ALSO INCLUDE HELIUM COMPONENT BODIES IN THE ITEM LIST AND CORRESPONDING RETENTION RATIONALE. THE SSM AGREED THAT VALVE BODIES SHOULD BE ADDED.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-108 NONE			NASA DATA BASELINE NEW	; [[]]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 108 HE LINE,	ISOL	VLV TO PRE	SS REGULATO	2	
LEAD ANALYST:	C.D. PRUS	ST				
ASSESSMENT:						
CRITICAL FLIGH HDW/FU	ITY I F NC I	REDUND A	ANCY SCREE B	ns C	CIL ITEM	
NASA [/ IOA [2 /1R] [] P]	[] [P]	[] [P]	[[x] *]
COMPARE [N /N	1 [[И	[N]	[N]	[N]
RECOMMENDATIONS:	(If di	fferen	t from NAS	A)		
[/] []	[]]	[] (A)	[DD/DE] LETE)
* CIL RETENTION	RATIONALE	: (If	applicable	2) ADEQUATE INADEQUATE	[[]]
REMARKS:						

NASA/RI DO NOT COVER RESTRICTED FLOW IN A SEGMENT OF LINE DUE TO OBSTRUCTION OR DEFORMATION (CRIMPING). SUCH AN OCCURRENCE COULD RESULT IN 2/1R EFFECTS, HOWEVER THE CREDIBILITY OF SUCH AN OCCURRENCE IS QUESTIONABLE. ANY CONTAMINATION WOULD FLOW TO DOWNSTREAM FILTER OR COMPONENT. IOA RECOMMENDS THAT SUCH A FAILURE BE ADDRESSED ON THE FMEA/CIL, BUT DOES NOT REGARD THIS RECOMMENDATION AS AN OPEN ISSUE.

REPORT DATE 2/26/88

: 🚍

: =

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-109 03-2F-101091-1	NASA DATA: BASELINE [] NEW [X]							
SUBSYSTEM: MDAC ID: ITEM:	FRCS 109 HIGH PRESSURE HELIUM TEST	PORT COUPI	LINGS A & B						
LEAD ANALYST:	C.D. PRUST								
ASSESSMENT:									
CRITICALI FLIGHI HDW/FUN	TY REDUNDANCY SCREEN C IC A B	s c	CIL ITEM						
NASA [3 /1R IOA [3 /1R] [F] [F] [] [P] [NA] [P] P]	[X]* []						
COMPARE [/] [N] [N] []	[N]·						
RECOMMENDATIONS:	(If different from NASA)							
[3 /1R] [F] [F] [P] (AD	[A] DD/DELETE)						
* CIL RETENTION F	ATIONALE: (If applicable)	ADEQUATE NADEQUATE	[]						

-

_

i T

-

IOA AGREES WITH NASA/RI FAILURE OF A AND B SCREENS. IOA RECOMMENDS THAT "POPPET FAILS OPEN" BE ADDED AS A FAILURE MODE ON THIS FMEA/CIL. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE QUANTITY ON THIS FMEA/CIL SHOULD BE 12. THE SSM AGREED WITH THE IOA ISSUE. IOA RECOMMENDS ADDING A STATEMENT TO THE EFFECTS REGARDING POSSIBLE VIOLATIONS OF ORBITER ENTRY MASS PROPERTIES CONSTRAINTS.

REPORT DATE 2/26/88

ASSESSMENT DATE: 1/01/88 NASA DATA: ASSESSMENT ID: RCS-110 BASELINE [] NASA FMEA #: 03-2F-101091-2 NEW [X]										
SUBSYSTEM: MDAC ID: ITEM:	UPLINGS A & B									
LEAD ANALYST:	C.D. P	RUST								
ASSESSMENT:										
CRITIC	ALITY	REDUND	ANCY SCR	EENS	CIL TTEM					
FLI HDW/	FUNC	A	В	С						
NASA [3 / IOA [3 /	3] 3]	[] []	[] []	[] []	[]*					
COMPARE [/	′]	[]	[]	[]	[]					
RECOMMENDATION	IS: (If	differen	t from N	ASA)						
	3]	[]	[]	[]	[] (ADD/DELETE)					
* CIL RETENTIO	ON RATIONA	LE: (If	applicab	le) ADEQUAT INADEQUAT	E [] E []					
REMARKS: IOA FAILURE M COUPLE" AND "	DES ON AN	ALYSIS S	HEET SHO IOA REC	ULD INCLUDE COMMENDS THA	"FAILS TO T "RESTRICTED					

FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE.

REPORT DATE 2/26/88 C-13

٠,

-

Ę.

. .

E : 🛶

n in a -

÷ .

1 🙀

7 - **8**

ASSESSMI ASSESSMI NASA FMI	ENT ENT EA #	DATE: ID: :	1/01/ RCS-1 03-21	01/88 NASA DA S-111 BASELI -2F-101030-1 N							YA: IE [] XW [X]				
SUBSYST MDAC ID ITEM:	EM : :		FRCS 111 HE PF	ESS	REGU	ILATOR	ASS	EMBLY							
LEAD AND	ALYS	г:	C.D.	PRUS	т										
ASSESSMI	en t:														
	CRI'	FICAL FLIGH DW/FU	ITY F NC	R A	EDUN	IDANCY B	SCR	EENS C			l E m				
NASA IOA	ן נ	3 /1R 3 /1R]]	[P [P]	[F [N.] A]	[P [P]]	[]	K]*]				
COMPARE	נ	/]	נ ^י]	[N]	Γ]	[]	4]				
RECOMMEN	IDAT:	cons:	(If	dif	fere	nt fr	om N.	ASA)							
-	[1]	[]	[]	[] ([ADD/I] DELET	E)			
* CIL RI	TEN	TION I	RATION	ALE:	(If	appl	icab	le) A INA	DEQUATE DEQUATE	[T]				

REMARKS:

IOA AGREES WITH NASA/RI RATIONALE FOR FAILURE OF B SCREEN. IOA RECOMMENDS ADDING A STATEMENT TO THE EFFECTS REGARDING POSSIBLE VIOLATIONS OF ORBITER ENTRY MASS PROPERTIES CONSTRAINTS.

REPORT DATE 2/26/88

C-14

C-2,

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-112 03-2F-10	1030-2		NASA DATA BASELINE NEW	: [] [X]			
SUBSYSTEM: MDAC ID: ITEM:	FRCS 112 HE PRESS	REGULA	TOR ASSEM	IBLY				
LEAD ANALYST: C.D. PRUST								
ASSESSMENT:								
CRITICAL FLIGH HDW/FU	ITY T NC	REDUNDA A	NCY SCREE	ens C	CIL ITEM			
NASA [3 /1R IOA [2 /1R] [P] P]	[P] [NA]	[P] [P]	[] * [X]			
COMPARE [N /] []	[N]	[]	[N]			
RECOMMENDATIONS:	(If d	fferent	from NAS	SA)				
[2 /1R] [P]	[F]	[P] (A	[A] DD/DELETE			
* CIL RETENTION	RATIONALI	E: (If a	applicable	≥) ADEQUATE INADEQUATE	[]			
REMARKS								

IOA RECOMMENDS THAT THIS ITEM AND FAILURE MODE BE UPGRADED TO A 2/1R PFP AND PLACED ON THE CIL. INABILITY TO REPRESS FRCS PROP TANK AND SUBSEQUENT INABILITY TO USE OR DEPLETE PROP COULD RESULT IN VIOLATIONS OF ENTRY MASS CONSTRAINTS AND LOSS OF LIFE OR VEHICLE DURING ENTRY. THIS FAILURE IS UNDETECTABLE DURING DUAL LEG OPERATION AND, THEREFORE, FAILS THE B SCREEN DURING THE ASCENT FLIGHT PHASE.

REPORT DATE 2/26/88

-

100

.

T

ASSESSME ASSESSME NASA FME	NT NT	D2 I1 #:	ATE: D:	1/01/ RCS-1 NONE	88 13							N7 F	ASA 1 BASE:	DATA: LINE NEW	: []]]	<u>.</u>
SUBSYSTE MDAC ID: ITEM:	M:			FRCS 113 HE PR	ESS	5 I	REGU	LAI	OR	AS	SEMBL	Y						
LEAD ANA	LYS	ST	:	C.D.	PRU	JSI	C .											
ASSESSME	NT	:																
	CR	IT: FI	ICALI LIGHI	ITY r		RI	EDUN	DAN	CY	sc	REENS				CI IT	L EM	[
	1	HDV	N/FUN	1C		A			В			С	-	· -				
NASA IOA	[[2	/ /1R]	[[P]]	[[N] A]	[[P]]		[[x] ']	*
COMPARE	[N	/N]	[N]	[N]	[N]		[N]	
RECOMMEN	IDA:	FI	ONS:	(If	di	fi	fere	nt	fr	om	NASA)							
	[2	/1R]	[P]	[F]	[Ρ]	(Aľ] D/	A DE] LE:	ΓE)
* CIL RE	TEI	T	ION F	RATION	ALE	::	(If	ap	pl	ica	ble) IN	AI	DEQUI DEQUI	ATE ATE	[[]	
REMARKS: NASA/RI	DO	N	от со	OVER T	HIS	5 H	AIL	URE	М	ODE	(RES	TF	RICTI	ED FI	JOW).		THE -
SSM AGRE	ED	TI	HAT 1	THIS F	'AII	JUF	RE M	ODE	S	HOU	LD BE	P	ADDEI	от с	03	-2	F-	

-

T T

SSM AGREED THAT THIS FAILURE MODE SHOULD BE ADDED TO 03-2F-101030-2 (FAILS CLOSED), WHICH IS CURRENTLY CLASSIFIED AS A 3/1R PPP. IOA RECOMMENDS A 2/1R PFP FOR 03-2F-101030-2. SEE ASSESSMENT SHEET RCS-112.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-114 NONE		NASA DATA: BASELINE NEW	[]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 114 HE PRESS REGU	JLATOR ASSEM	3LY		
LEAD ANALYST:	C.D. PRUST				
ASSESSMENT:					
CRITICAL	ITY REDUN	NDANCY SCREEN	IS	CIL	r
HDW/FU	NC A	B	С		-
NASA [/ IOA [2 /1R] []] [P]	[] [NA]] [P]	[[x] *]
COMPARE [N /N] [N]	[N]	[N]	[N]
RECOMMENDATIONS:	(If differe	ent from NASA	A)	<u>.</u>	
[1 /1] []	[]	[] (AI	[A DD/DE] ELETE)
* CIL RETENTION	RATIONALE: (I	f applicable;	ADEQUATE	[]
REMARKS:			THADEXOULE	L	L

NASA/RI DO NOT COVER THIS FAILURE MODE (EXTERNAL LEAKAGE). THE SSM AGREED THAT THIS VALVE BODY SHOULD BE ADDED TO THE HELIUM LINE EXTERNAL LEAKAGE FMEA (03-2F-101013-1) WITH CORRESPONDING RETENTION RATIONALE. IOA ORIGINALLY CONSIDERED THE PARALLEL HELIUM PATHS TO BE REDUNDANT FOR THIS FAILURE (2/1R), BUT NOW CLASSIFIES THIS FAILURE AS A 1/1.

REPORT DATE 2/26/88

Ħ

-

ASSESSMENT DATE: 1/01/88 ASSESSMENT ID: RCS-115 NASA FMEA #: NONE								NASA DATA: BASELINE [] NEW []									
SUBSYSTEM MDAC ID: ITEM:	M:		FRCS 115 HE PRI	ES	5 I	REGUI	AT	OR	PR	IMARY	, 7	SENS	ING 1	201	RT		
LEAD ANA	LYST	:	C.D. 1	PRI	JST	г											
ASSESSMEN	NT:																
(CRIT	ICAL	ITY		RI	EDUNE	AN	CY	sc	REENS	5			C	L	•	
	F HD	LIGH W/FUI	r NC		A			в			С			Τ.	LEN	1	
NASA IOA	[2	/ /1R]]	[[P]]	[[P]]	[[P]		[[x]]	*
COMPARE	[N	/N]	נ	N]	[N]	[N]		[N]	
RECOMMENI	DATI	ons:	(If	d:	if	feren	nt :	fro	om 1	NASA)							
	[3	/2R]	[P]	[F]	[P]	(AI] DD/	A /DE] ELE	TE)
* CIL RE	rent:	ION 1	RATION	- -	E:	(If	apj	91 :	Lcal	ble) IN	AI IAI	DEQU DEQU	ATE ATE	[[]	
NASA/RI	DO NO	OT CO	OVER TH	II	5 1	FAILU	IRE	M	DE	(EXI	EI	NAL	LEAI	KA(ΞE	тн	ROUGH

☰

Ē

= :

NASA/RI DO NOT COVER THIS FAILURE MODE (EXTERNAL LEAKAGE THROUGH SENSING PORT). HOWEVER, THIS FAILURE MODE IS COVERED BY NASA/RI IN THE OMS SUBSYSTEM ON FMEA 03-3-1004-3 (3/2R PFP). IOA RECOMMENDS THAT THIS FAILURE MODE ALSO BE COVERED FOR THE RCS REGULATOR WITH THE SAME RATIONALE USED IN OMS. IOA WITHDRAWS 2/1R PPP CRIT.

REPORT DATE 2/26/88

ASSESSMI ASSESSMI NASA FMI	ENT DATE: ENT ID: EA #:	1/01/88 RCS-116 NONE			NASA DA BASELI N	TA: NE [] EW []
SUBSYSTE MDAC ID: ITEM:	EM : :	FRCS 116 HE PRESS	REGUL	ATOR PRI	MARY SENSIN	G PORT
LEAD ANA	ALYST:	C.D. PRUS	ST			
ASSESSMI	ENT:					
	CRITICAL	ITY 1	REDUND	ANCY SCR	EENS	CIL
	HDW/FU	NC 2	A	В	С	t i dm
NASA IOA	[/ [2 /1R] [] [] P]	[] [P]	[] [P]	[] * [X]
COMPARE	[N /N] []	ן א	[N]	[N]	[N]
RECOMMEN	NDATIONS:	(If di	fferen	t from N	ASA)	
	[/] []	[]	[]	[] (ADD/DELETE)
* CIL RI	ETENTION	RATIONALE	: (If	applicab	le) ADEQUAT INADEQUAT	E [] E []
REMARKS THIS FAL ADDRESSI CONTAMIN	: ILURE MOD ED ON FME NATION OF S CAUSES	E (BLOCKA As 03-2F- PILOT SC FOR THE R	GE OF 101030 REENS, EGULAT	SENSING -1 AND 1 RESTRIC	PORT) IS AD 01030-2, WH TOR ORIFICE RES COVERED	EQUATELY ICH LIST S, OR SENSE AN
ADDITION 03-2F-10	NAL FMEA 01030-2.	IS UNNECE SEE ASSE	SSARY. SSMENT	IOA RE SHEET R	COMMENDS À CS-112.	2/1R PFP FOR
		· · •			· · · · · · ·	- ale da la composición de la

REPORT DATE 2/26/88 C-19

_

∎ 7 ≣...i

- :

-

T

=

-

--

.

•

ASSESSMENT DA' ASSESSMENT ID NASA FMEA #:	E: 1/01/8 RCS-11 03-2F-	8 7 101091-1		NASA DATA BASELINE NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 117 HE PRE	SS REGUL	ATOR OUTLE	T TEST PORT	COUPLING
LEAD ANALYST:	C.D. P	RUST			
ASSESSMENT:					
CRITI	ALITY GHT	REDUND	ANCY SCREE	ins C	CIL ITEM
HDW,	FUNC	A	В	C	
NASA [3] IOA [2]	1R] 1R]	[F] [P]	[F] [NA]	[P] [P]	[X]* [X]_
COMPARE [N ,]	[N]	[N]	[]	[]
RECOMMENDATIO	S: (If	differen	t from NAS	SA)	
[3,	'1R]	[F]	[F]	[P] (Al	[A] DD/DELETE)
* CIL RETENTI	N RATIONA	LE: (If	applicable) ADEQUATE INADEQUATE	[]

== :

- :

÷

REMARKS:

IOA AGREES WITH NASA/RI 3/1R FFP ASSIGNMENT. IOA ORIGINALLY IDENTIFIED THIS AS A TWO-SEAL COUPLING RATHER THAN A MULTIPLE SEAL 0032 COUPLING. IOA RECOMMENDS THAT "POPPET FAILS OPEN" BE ADDED AS A FAILURE MODE ON THIS FMEA/CIL. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE QUANTITY ON THIS FMEA SHOULD BE 12. THE SSM AGREED WITH THE IOA ISSUE. IOA ALSO RECOMMENDS ADDING A STATEMENT TO THE EFFECTS REGARDING POSSIBLE VIOLATIONS OF ORBITER ENTRY MASS PROPERTIES CONSTRAINTS.

C-20-

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-118 03-2F-103		NASA DATA: BASELINE [] NEW [X]						
SUBSYSTEM: MDAC ID: ITEM:	FRCS 118 HE PRESS	T COU	PLING						
LEAD ANALYST:									
ASSESSMENT:									
CRITICAL		REDUNDAN	ICY SCREE	INS	CIL ITE	M			
HDW/FU	INC 2	A	В	с					
NASA [3 /3 IOA [3 /3] [] [] [] []	[] []	[[] *]			
COMPARE [/] [] []	[]	[]			
RECOMMENDATIONS:	(If di	fferent	from NAS	SA)					
[3 /3) [] [1	[]]	[ADD/D] ELETE)			
* CIL RETENTION	RATIONALE	: (If ar	plicable	adequate Adequate Inadequate	[]			
REMARKS: IOA FAILURE MODE COUPLE" AND "RES FLOW" BE ADDED A CREDIBLE FAILURE	S ON ANAL TRICTED F AS A FAILU MODE AND	YSIS SHE LOW".] RE MODE IS ADDE	ET SHOUI IOA RECOM ON THIS RESSED ON	D INCLUDE IMENDS THAT FMEA. THI I OTHER QD	"FAIL "RES S IS FMEAS	S TO TRICTED A			

REPORT DATE 2/26/88

THE SSM AGREED WITH THE IOA ISSUE.

s.....

199

ASSESSME ASSESSME NASA FME	ENT ENT EA	D2 I1 #:	ATE: D:	1/ RC 03	01/8 S-11 -2F-	88 19 -1(010	95-1	-				NZ 1	ASA I BASEI	DATA: LINE NEW	[[x]	=
SUBSYSTE MDAC ID: ITEM:	EM:			FR 11 QU	CS 9 AD C	CHI	ECK	X VAI	LVE	AS	SEMB	LY							
LEAD ANA	LY	ST	:	c.	D. 1	PRI	JSI	•											
ASSESSME	INT	:																	
	CR	IT FI HDV	ICALI LIGHI N/FUI	ITY F NC			RE A	DUNE	DANG	CY B	SCRE	ENS	s c			CI IT	L EM	I	
NASA IOA	[[3 2	/3 /1R]]		[[P]	[[F]	[[P]		[x]]	*
COMPARE	[N	/N]		[N]	[N]	[N]		[N]	
RECOMMEN	IDA!	ric	ONS:		(If	d:	lff	eren	it i	fro	om NA	SA)		97 I				
	נ	2	/1R]		[Ρ]	[F]	⁻ [Р]	(AD	[D/3	A DE] LE	TE)
* CIL RE	TEI	n t i	ION I	RAT	IONA	LI	2:	(If	app	ol i	.cabl	e) Il	AI VAI	DEQUA DEQUA	ATE ATE	[]	

_

.

- T

IOA RECOMMENDS THAT THIS ITEM AND FAILURE MODE BE UPGRADED TO A 2/1R AND PLACED ON THE CIL. WITH SERIES POPPETS FAILED OPEN, THE CONTAMINATION OF UPSTREAM COMPONENTS BY PROP OR PROP VAPORS COULD RESULT IN LOSS OF PROP TANK REPRESS CAPABILITY AND INABILITY TO USE OR DEPLETE FRCS PROP. THIS COULD LEAD TO VIOLATIONS OF ENTRY MASS PROPERTIES CONSTRAINTS AND LOSS OF LIFE OF VEHICLE DURING ENTRY. FAILURE OF ONE POPPET UNDETECTABLE DURING FLIGHT.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-120 03-2F-10	1095-2		NASA DATA: BASELINE NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 120 QUAD CHE	CK VALV	E ASSEMBL	Y	
LEAD ANALYST:	C.D. PRU	IST			1 <u>11</u>
ASSESSMENT:					
CRITICAL FLIGH	ITY T	REDUNDA	NCY SCREE	NS	CIL ITEM
nDw/ FO	NC .	л	2		
NASA [3 /1R IOA [2 /1R] [] [P] P]	[F] [F]	[P] [P]	[X] * [X]
COMPARE [N /] []	[]	[]	[]
RECOMMENDATIONS:	(If di	fferent	from NAS	A)	
[2 /1R] [P]	[F]	[P] (A)	[A] DD/DELETE)
* CIL RETENTION	RATIONALE	E: (If a	pplicable	adequate	[]
REMARKS: IOA RECOMMENDS I 2/1R. INABILITY	HAT THIS	ITEM AN SS FRCS	ID FAILURE PROP TAN	INADEQUATE MODE BE UP	L J GRADED TO A QUENT

INABILITY TO USE OR DEPLETE PROP COULD RESULT IN VIOLATIONS OF ENTRY MASS PROPERTIES CONSTRAINTS AND LOSS OF LIFE OR VEHICLE DURING ENTRY.

REPORT DATE 2/26/88

: :

۱Щ

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-121 03-2F-101	091-1	NASA DATA BASELINI NEV	A: E [] W [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 121 QUAD CHEC	K VALVE TEST	PORT COUPLING	GS A & B
LEAD ANALYST:	C.D. PRUS	Т		
ASSESSMENT:				
CRITICAI FLIGH	JITY R T	EDUNDANCY SCR	EENS	CIL ITEM
HDW/FU	NC A	В	С	
NASA [3 /1F IOA [2 /1F	[] [F] [P] [F]] [NA]	[P] [P]	[X]* [X]
COMPARE [N /	ז (א] [N]	[]	[]]
RECOMMENDATIONS:	(If dif	ferent from N	ASA)	
[3 /1F	:] [F] [F]	[P] (2	[A] ADD/DELETE)
* CIL RETENTION	RATIONALE:	(If applicab)	le) ADEQUATE	[]]

=

-

4 :

Ŧ

ini i

.

1 E

REMARKS:

,

IOA AGREES WITH NASA/RI 3/1R FFP ASSIGNMENT. IOA ORIGINALLY IDENTIFIED THIS AS A TWO-SEAL COUPLING RATHER THAN A MULTIPLE SEAL 0032 COUPLING. IOA RECOMMENDS THAT "POPPET FAILS OPEN" BE ADDED AS A FAILURE MODE ON THIS FMEA/CIL. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE QUANTITY ON THIS FMEA SHOULD BE 12. THE SSM AGREED WITH THE IOA ISSUE. IOA ALSO RECOMMENDS ADDING A STATEMENT TO THE EFFECTS REGARDING POSSIBLE VIOLATIONS OF ORBITER ENTRY MASS PROPERTIES CONSTRAINTS.

INADEQUATE []

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-122 03-2F-101	/01/88 NASA DATA: CS-122 BASELINE 3-2F-101091-2 NEW									
SUBSYSTEM: MDAC ID: ITEM:	INGS A	& B									
LEAD ANALYST:											
ASSESSMENT:											
CRITICAL FLIGH	CIL ITE	M									
HDW/F0			D	C							
NASA [3 /3 IOA [3 /3] [] [] [] []	[] []	[[] *]					
COMPARE [/] [] [] .	[]	Γ]					
RECOMMENDATIONS:	(If dif	ferent f	rom NA	SA)							
[3 /3] [] []	[]	[(ADD/D] ELETE)					
* CIL RETENTION RATIONALE: (If applicable)											
				INADEQUAT	'E [j					
REMARKS: IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A											

CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS.

THE SSM AGREED WITH THE IOA ISSUE.

REPORT DATE 2/26/88

-

ā . ā

R. 3

ļ

-

- ----

.....

C-25

NASA DATA: ASSESSMENT DATE: 1/01/88 BASELINE [] ASSESSMENT ID: RCS-123 NEW [X] 03-2F-111110-1 NASA FMEA #: FRCS SUBSYSTEM: 123 MDAC ID: PROPELLANT TANK ITEM: LEAD ANALYST: C.D. PRUST ASSESSMENT: CIL REDUNDANCY SCREENS CRITICALITY ITEM FLIGHT A B С HDW/FUNC [X] *]]]]] NASA [1/1 1 [[[X] 1 IOA [1 /1 1 [] [] [٦] ſ COMPARE [/] RECOMMENDATIONS: (If different from NASA) [] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [1 INADEQUATE ſ 1

==

REMARKS: NO DIFFERENCES. IOA RECOMMENDS THAT THE "D" EFFECTS BE REVISED. FAILURE AFTER ET SEP COULD ALSO RESULT IN LOSS OF LIFE OR VEHICLE. IOA ALSO RECOMMENDS ADDING A STATEMENT TO THE EFFECTS ABOUT POSSIBLE EXPOSURE OF EVA CREW AND GROUND CREW TO PROP OR PROP VAPORS.

REPORT DATE 2/26/88

ASSESSMENT DATE ASSESSMENT ID: NASA FMEA #:	: 1/01/88 RCS-124 03-2F-10210	8-1	NASA DA BASELI N	ATA: [NE [] NEW [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 124 PROP LINES,	ALL		
LEAD ANALYST:	C.D. PRUST			
ASSESSMENT:	•			
CRITICAI FLIGH HDW/FU	LITY REDU IT INC A	UNDANCY SCI B	REENS	CIL ITEM
NASA [1 /1 IOA [1 /1] []	[] []		[X]* [X]
COMPARE [/] []	[]	[]	[]
RECOMMENDATIONS:	(If differ	cent from N	IASA)	· - · · - ·
[/] []	[]	[]]	[] (ADD/DELETE)
* CIL RETENTION	RATIONALE: (I	f applicab	le)	
REMARKS: IOA RECOMMENDS T AS A CAUSE ON TH FAILURE WHICH SH SHOULD INCLUDE V CORRESPONDING RE EFFECTS DISCUSS PROP OR PROP VAP	HAT "FAILURE IS FMEA/CIL. OULD BE ADDRE ALVE BODIES I TENTION RATIO THE POSSIBLE ORS.	OF LINE BE IOA CONSI SSED ON TH N THE ITEM NALE. IOA EXPOSURE O	ADEQUATI INADEQUATI LLOWS TO DEI DERS THIS TO E FMEA/CIL. LIST AND ALSO RECOMM F EVA AND GE	E [] E [] FLECT" BE ADDED D BE A CREDIBLE THIS FMEA MENDS THAT THE ROUND CREWS TO

REPORT DATE 2/26/88

1

= ---

ен 194

== 9

t==**2**

-

=== ==

•••=

ASSESSME ASSESSME NASA FME	NT NT A #	DA ID	TE:	1/01/ RCS-1 NONE	/88 L25				N	ASA I BASEI	DATA: LINE NEW	[[]]	
SUBSYSTE MDAC ID: ITEM:	:M:			FRCS 125 PROP	LINE	5, A	LL							
LEAD ANA	LYS	5T:	:	C.D.	PRUS	г								
ASSESSME	ENT	:										t te v	e se la	
	CR	IT	CAL	ITY	R	EDUN	IDANCY	SCR	EENS			CIL	м	
	J	F] HDV	LIGH V/FU	IT INC	A		E	5	c	· - ·				
NASA IOA]	1	/ /1]]	[[]]	[_ []]	[[]]		[[X] *	
COMPARE	[N	/N]	٢	·]	Ľ]	٢]		[N]	
RECOMME	NDA	TI	ONS	: (I	f dif	fere	ent fi	com N	IASA)					
	נ	<u>.</u>	/]	C]	[]	ľ]	(Al	[2D/I] DELETE	E)
* CIL R	ETE	NT	ION	RATIC	NALE:	(1	f app	lical	ole) INZ	ADEQU ADEQU	JATE JATE	[[] 2.	
REMARKS												T T 1		7

8

NASA/RI DO NOT COVER RESTRICTED FLOW IN A SEGMENT OF LINE DUE TO OBSTRUCTION OR DEFORMATION (CRIMPING). SUCH AN OCCURRENCE COULD RESULT IN 1/1 EFFECTS, HOWEVER THE CREDIBILITY OF SUCH AN OCCURRENCE IS QUESTIONABLE. ANY CONTAMINATION WOULD FLOW TO DOWNSTREAM FILTER OR COMPONENT. IOA RECOMMENDS THAT SUCH A FAILURE BE ADDRESSED ON THE FMEA/CIL, BUT DOES NOT REGARD THIS RECOMMENDATION AS AN OPEN ISSUE.

REPORT DATE 2/26/88

ASSESSMEN ASSESSMEN NASA FMEA	r da r id #:	TE: :	1/01/8 RCS-12 03-2F-	8 6 102	:15	0 - 1	NASA DATA BASELINE ·1 NEW						TA: NE EW	: [] [X]		
SUBSYSTEM MDAC ID: ITEM:	:		FRCS 126 PROP F	ILI		ENT	RI	GŪ	LATOR		CHE	CK-OU	T C	COUPI	LING	;
LEAD ANAL	YST:		C.D. I	PRUS	T											
ASSESSMEN	T:															
C	RITI FL HDW	CALI IGHI /FUN	TY C	F	REI	OUND	ANC	EY B	SCREE	:NS	s c			CIL ITEN	4	
NASA IOA	[2 [2	/1R /1R]	[] []	[7		[[F NA]	[[P P]]		[X [X] *]	r
COMPARE	[/]	[]	[]		[N]	[]		[]	
RECOMMEND	ATIO	NS:	(If	dif	fe	erent	٤i	fro	om NAS	SA))					
	[/]	<mark>ַ (</mark>]		[]	[]	(AI	ן וס/סס] Elei	E)
* CIL RET	ENTI	ON P	RATIONA	ALE :	; ((If a	app	51i	.cable	e) Il	IA IAV	DEQUAT DEQUAT	'E 'E	[[]]	
										_	_					

IOA AGREES WITH NASA/RI FAILURE OF A AND B SCREENS.

REPORT DATE 2/26/88

5 - 1 9 - 1 - 19

τ.

•---

-

-

ASSESSMI ASSESSMI NASA FMI	ENT ENT EA	D2 II #:	ATE: D:	1/01/ RCS-1 03-2F	88 27 -102]	L50-2			N	IASA DAT BASELIN NE	'A: E [W [X]
SUBSYSTI MDAC ID: ITEM:	E M : :			FRCS 127 PROP	FILL	VENT	REGU	JLATOF	R CH	IECK-OUI	COUP	LING
LEAD ANALYST: C.D. PRUST												
ASSESSMENT:												
CRITICALITY REDUNDA FLIGHT								ANCY SCREENS CIL ITE B C				
NASA	r	3	/3	1	ſ	1	ſ	1	٢		ſ] *
IOA	Ľ	3	/3	j	Ĭ	j	Ì	j	Ĩ	ĵ	Ĩ	j ₂₀
COMPARE	[/]	נ]	[]	[]	[] .
RECOMMEN	NDA'	FI (ONS:	(If	difi	ferent	t fro	om NAS	SA)			
	[3	/3]	[]	[]	[] ([ADD/D] ELETE)
* CIL RI	ETEI	NT:	ION	RATION	ALE:	(If a	appl	icable) A INA	DEQUATE]

REMARKS: IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE. **;**

REPORT DATE 2/26/88
ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-128 03-2F-1111	L10-3		NASA DATA BASELINE NEW	: ; [] ; [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 128 PROP CHANN	IEL SCREE	NS		
LEAD ANALYST:	C.D. PRUST	2			
ASSESSMENT:					
CRITICAL FLIGH	ITY RE	EDUNDANCY	SCREEN	S	CIL ITEM
HDW/FU	NC A	В		С	
NASA [1 /1 IOA [1 /1] [] [] [] [] [] []]	[X]* [X]
COMPARE [/] [] [] []	[]
RECOMMENDATIONS:	(If diff	ferent fr	om NASA	.)	·
] [] [] [] (2	[] ADD/DELETE)
* CIL RETENTION	RATIONALE:	(If appl	icable) I	ADEQUATE NADEQUATE	[] []
REMARKS:				DE TOENT DE	

IOA RECOMMENDS THAT THE P.A.D. COMPONENTS BE ITEMIZED IN THE ITEM LIST OR FUNCTIONAL DESCRIPTION SECTIONS TO SHOW SPECIFICALLY WHAT IS COVERED BY THIS FMEA/CIL. IOA ALSO RECOMMENDS THAT THE "HIGH G" DISCUSSION BE REMOVED FROM THE FUNCTIONAL DESCRIPTION. THE SSM AGREED WITH THE IOA ISSUE.

: ==

.

:

-

ASSESSM ASSESSM NASA FM	ENT ENT EA	D2 I1 #:	ATE: D:	1/01/ RCS-1 NONE	88 29				ľ	NASA BASE	DATA: LINE NEW	[[]]	
SUBSYST MDAC ID ITEM:	EM: :			FRCS 129 PROP	FEED-	-OUT	TUBE								
LEAD AN	ALY	ST	:	C.D.	PRUST	Г									
ASSESSM	ENT	:													
	CR	IT: Fl	ICAL LIGH	ITY F	RI	EDUNE	ANCY	SCREE	NS			ĊI IT	LL CEN	ſ	
]	HDI	W/FU	NC	A		В		C	2					
NASA IOA	[[1	/ /1]	[[]	[[]	[[]		[[x]]	*
COMPARE	[N	/N]	[]	C]	[]		[N]	
RECOMME	NDA	FI (ONS:	(If	dif	feren	nt fro	om NAS	A)						
]		1]	[]	[]	[]	(AD	[D/	DE/] ELE	TE)
* CIL R	ETE	NT:	ION	RATION	ALE:	(If	appli	lcable) 7 IN7	ADEQU ADEQU	ATE ATE	[]]	
NASA/RI	: DO	N	OT C	OVER I	HIS I	FAILU	RE MO	DDE (R	ESI	RICT	ED FL	ŌV	I) .		IOA

NASA/RI DO NOT COVER THIS FAILURE MODE (RESTRICTED FLOW). IOA NOW CONSIDERS RESTRICTED FLOW IN THIS SECTION OF TUBE TO BE QUESTIONABLE. IOA DOES NOT REGARD THE ABSENCE OF THIS FAILURE MODE IN THE FMEA/CIL TO BE AN OPEN ISSUE, BUT DOES RECOMMEND THAT THIS FAILURE MODE BE ADDRESSED. _____

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-130 03-2F-101090-	NASA DA' BASELI 1 NI	NASA DATA: BASELINE [] NEW [X]					
SUBSYSTEM: MDAC ID: ITEM: COUPLING	FRCS 130 PROP TK UPPER	COMPARTMENT CHANNEL	CHECK-OUT					
LEAD ANALYST:	C.D. PRUST							
ASSESSMENT:								
CRITICAL FLIGH HDW/FU	ITY REDUN T NC A	DANCY SCREENS B C	CIL ITEM					
NASA [3 /1F IOA [2 /1F] [F]] [P]	[F] [P] [NA] [P]	[X] * [X]					
COMPARE [N /] [N]	[] [א]	[]					
RECOMMENDATIONS:	(If differe	ent from NASA)						
[3 /1F	[F]	[F] [P]	[A] (ADD/DELETE)					
* CIL RETENTION	RATIONALE: (If	applicable) ADEQUAT INADEOUAT	E [] E []					

REMARKS:

i Bernit

-

IOA AGREES WITH NASA/RI 3/1R FFP ASSIGNMENT. IOA ORIGINALLY IDENTIFIED THIS AS A TWO-SEAL COUPLING RATHER THAN A MULTIPLE-SEAL 0032 COUPLING. IOA RECOMMENDS THAT "POPPET FAILS OPEN" BE ADDED AS A FAILURE MODE ON THIS FMEA/CIL. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE. IOA ALSO RECOMMENDS ADDING STATEMENTS TO THE EFFECTS REGARDING POSSIBLE FIRE HAZARD, HAZARD TO GROUND CREW, AND POSSIBLE VIOLATIONS OF ENTRY MASS PROPERTIES CONSTRAINTS

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-131 03-2F-101	.090-2	NAS BAS	NASA DATA: BASELINE [] NEW [X]						
SUBSYSTEM: MDAC ID: ITEM: COUPLING	FRCS 131 PROP TK U	IPPER COM	PARTM	ENT CHAI	NNEL CHECH	-OUT				
LEAD ANALYST:	C.D. PRUS	T								
ASSESSMENT:										
CRITICAL FLIGH HDW/FU	ITY R T NC A	EDUNDANC	Y SCRI	EENS C	CII ITE	IM .				
11211/10			0	Ū						
NASA [3 /3 IOA [3 /3] [] [] [] []]	[] []	L C] *]				
COMPARE [/] [] []	[]	[]				
RECOMMENDATIONS:	(If dif	ferent f	rom Na	ASA)						
[3 /3] [ן נ	ן	[]	[(ADD/I] DELETE)				
* CIL RETENTION	RATIONALE:	(If app	licab	le) ADE(INADE(QUATE [QUATE []				
REMARKS: IOA FAILURE MODE COUPLE" AND "RES FLOW" BE ADDED A CREDIBLE FAILURE THE SSM AGREED W	S ON ANALY TRICTED FL S A FAILUR MODE AND ITH THE IC	SIS SHEE OW". IO E MODE O IS ADDRE A ISSUE.	T SHOU A RECON N THIS SSED O	ULD INC DMMENDS 5 FMEA. DN OTHER	LUDE "FAII THAT "RES THIS IS R QD FMEAS	S TO TRICTED A				

_

REPORT DATE 2/26/88

- • •

C-34

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-132 03-2F-102150-1	NASA DATA BASELINE . NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 132 PROP TK LOWER	COMPARTMENT CHANNEL B	LEED COUPLING
LEAD ANALYST:	C.D. PRUST		
ASSESSMENT:			
CRITICAL	ITY REDUNI	ANCY SCREENS	CIL
HDW/FU	NC A	ВС	
NASA [2 /1R IOA [2 /1R] [F]] [P]	[F] [P] [NA] [P]	[X] * [X]
COMPARE [/] [N]	נא] [א]	[]
RECOMMENDATIONS:	(If differen	nt from NASA)	
[/] []	[][] ()	[] \DD/DELETE)
* CIL RETENTION	RATIONALE: (If	applicable) ADEQUATE INADEQUATE	[] [].
REMARKS: IOA AGREES WITH	NASA/RI FAILURI	E OF A AND B SCREENS.	

 Ċ−35

ASSESSMI ASSESSMI NASA FMI	ENT DATE: ENT ID: EA #:	1/01/88 RCS-133 03-2F-1	02150-2	NASA DATA: BASELINE [] 2 NEW [X]							
SUBSYSTE MDAC ID: ITEM:	E M :	FRCS 133 PROP TK	LOWER	COMP	ARTMEN	IT CHANNEL	BLEED	COUPLING			
LEAD AN?	LYST:	C.D. PR	UST								
ASSESSME	ENT:										
	CRITICAL FLIGH HDW/FU	ITY F NC	REDUND	DANCY B	SCREI	ens C	CIL ITE	M			
NASA IOA	[3 /3 [3 /3] [] []]	[[]]	[] []	[[] *]			
COMPARE	[/] []	[]	[]	[]			
RECOMMEN	NDATIONS:	(If d	ifferen	t fro	om NAS	SA)					
	[3/3] []	[]	[]	[(ADD/D] ELETE)			
* CIL RE	ETENTION	RÁTIONAL	E: (If	appl:	icable	>) ADEQUATI INADEQUATI	E (E (]]			
URINUVO	•										

.

IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	NASA DATA: BASELINE [] NEW [X]										
SUBSYSTEM: MDAC ID: ITEM: COUPLING	FRCS 134 PROP TK L	OWER (COMPARTMEN	IT BULKHEAD	BLEED						
LEAD ANALYST: C.D. PRUST											
ASSESSMENT:											
CRITICAL FLIGH HDW/FU	CIL ITEM										
	а гъ	• •	r p i l	r D 1	r X] *						
IOA [2/IR		•]	[NA]	[P]							
COMPARE [/] [N	r]	[N]	[]	[]						
RECOMMENDATIONS:	(If dif	feren	t from NAS	SA)							
[/] []	[]	[]]	[] ADD/DELETE)						
* CIL RETENTION	RATIONALE:	(If a	applicable	≥) ADEQUATE INADEQUATE	[]						
REMARKS: IOA AGREES WITH	NASA/RI FA	ILURE	OF A AND	B SCREENS.							

REPORT DATE 2/26/88

.

-

-

C-37

المان المانية (ما المانية المانية) . • المانية من المانية المانية المانية المانية المانية المانية الم

· · ·

•

ASSESSI ASSESSI NASA FI	MENT MENT MEA	D/ I) #:	ATE: D:	1/01/ RCS-1 03-2F	'88 .35 7-10	2150-2	2	NASA DATA: BASELINE [] NEW [X]					
SUBSYST MDAC II ITEM: COUPLIN	rem: D: NG			FRCS 135 PROP	TK	LOWER	COMP	ARTMEI	١T	BULKHEAD) BLE	ED	
LEAD AN	VALY	ST	:	C.D.	PRU	ST							
ASSESSI	MENT	:							١				
	CR	IT: F]	ICAL LIGH	ITY T		REDUNE	DANCY	SCREI	ENS	5	CI IT	L EM	
		HD	/FU	NC		A	В			с			
NASI IOI	A [A [3 3	/3 /3]	[[]]	[[]]	[[]]	[[]	*
COMPARI	E [/]	[]	Γ]	Γ]	C]	
RECOMM	ENDA'	ric	ons:	(If	di	fferen	t fr	om NAS	SA))			
	[3	/3]	[]	[]	[] ([ADD/1] DELE	TE)
* CIL H	RETE	NT I	ION	RATION	ALE	: (If	appl	icable) IN	ADEQUATE IADEQUATE] []	
REMARKS	S: ILUR " AN	E I D '	MODE BES	S ON A	NAL D F	YSIS S Low".	HEET	SHOUI	LD MMF	INCLUDE	"FAI	LS T STRI	O CTE

FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OWNER. THE SSM AGREED WITH THE IOA ISSUE.

, r

Total I .

.

· · ...

REPORT DATE 2/26/88 C-38.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-136 03-2F-1023	/01/88 NASA DATA: CS-136 BASELINE [] 3-2F-102150-1 NEW [X]								
SUBSYSTEM: MDAC ID: ITEM:	FRCS 136 PROP TK VI	ENT AND REGULAT	TOR CHECK-OU	T COUPLING						
LEAD ANALYST:	C.D. PRUS	Т								
ASSESSMENT:										
CRITICAL FLIGH	ITY R	EDUNDANCY SCREI	ENS	CIL ITEM						
HDW/FU	NC A	В	C							
NASA [2 /1R IOA [2 /1R] [F] [P] [F]] [NA]	[P] [P]	[X] * [X]						
COMPARE [/	א] [א] [N]	[]	[]						
RECOMMENDATIONS:	(If dif	ferent from NAS	5A)							
[/] [] []	[] (A	[] DD/DELETE)						
* CIL RETENTION	RATIONALE:	(If applicable	e) ADEQUATE INADEQUATE	[] []						
IOA AGREES WITH	NASA/RI FA	ILURE OF A AND	B SCREENS.							

REPORT DATE 2/26/88 C-39

- ----

.

ASSESSM ASSESSM NASA FM	ent Ent Ea	D2 I] #:	ATE: D:	1/01/ RCS-1 03-21	/88 L37 F-10)2150-	-2		ľ	IASA DA BASEL: 1	ATA: INE [NEW [1] x]	 	
SUBSYST MDAC ID ITEM:	EM: :			FRCS 137 PROP	TK	VENT	AND I	REGUI	ATOR	CHECK	-out c	OUP	LING	
LEAD AN	ALY	ST	:	C.D.	PRU	JST								
ASSESSM	ENT	:												
	CR	IT:	CAL:	ITY		REDUN	NDANCY	C SCR	REENS		CI	L		
]	F1 HDV	V/FUI	NC	A		I	В		С		ITEM		
NASA IOA	[[3 3	/3 /3]	[[]] []]	[[]	[]	*	
COMPARE	[/]	[]	[]	[]	ľ]		
RECOMME	NDA'	FI C	ONS:	(If	f di	ffere	ent fi	com N	IASA)					

[3/3]	[]	[]	[]	[]
-								(ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [] INADEQUATE []

가는 가슴 및 빛이 있는 것 같아요. 이 것 같아. 것 같아.

i i

REMARKS:

IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE.

C-40

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	NT NT A	D/ I] #:	ATE: D:	1/0 RCS 03-	01/88 5-138 -2F-10	2106-	·1	NASA DATA: BASELINE [] NEW [X]							
SUBSYSTE MDAC ID: ITEM:	: M			FRO 138 GIN	FRCS 138 GIMBAL BELLOWS										
LEAD ANA	LY	ST	:	C.D. PRUST											
ASSESSME	NT	:													
	CRITICALITY REDUNDA FLIGHT							ANCY SCREENS			· * *	CIL ITEM			
	1	HD	W/FC	INC		A	в			C					
NASA IOA	[[1 1	/1 /1]]	[[]]	[[]]	ן []]		[[X X]]	*
COMPARE	[/]	[]	[]	Γ]		[]	
RECOMMEN	IDA'	TI	ons :		(If di	ffere	ent fr	om N	IASA)						
	[/]	[]	[]	I]	(AI] /00	'DE] LE	TE)
* CIL RE	TE	NT	ION	RAT:	IONALI	E: (If	f appl	icat	ole) IN	ADEQU IADEQU	ATE ATE	[]	

REMARKS:

1,105

IOA RECOMMENDS THAT "FAILURE OF LINE BELLOWS TO DEFLECT" AND "ISOLATION VALVE RELIEF DEVICE FAILURE TO RELIEVE" BE ADDED AS CAUSES ON THIS FMEA. IOA ALSO RECOMMENDS THAT THE EFFECTS DISCUSS THE POSSIBLE EXPOSURE OF EVA AND GROUND CREWS TO PROP OR PROP VAPORS.

ASSESSME ASSESSME NASA FME	NT [NT] A #:	DATE:	1/01/ RCS-1 NONE	88 39				1	IASA BASE	DATA: LINE NEW	[]]		
SUBSYSTE MDAC ID: ITEM:	М:		FRCS 139 GIMBA	L BI	ELLOW	s								-	
LEAD ANA	LYSI	:	C.D.	PRUS	ST										
ASSESSME	NT:														
	CRII F	ICAL	ITY T]	REDUN	DANCY	SCR	REENS			СІ ІТ	IL 'EM	ł		
	Н	W/FU	NC	2	A	В	I	C	2						
NASA IOA	[[]	/ /1]	([] .]	[[]]	[[]]		[[x]]	*	
COMPARE	[]	N / N]	[]	[]	ſ]		[N]		
RECOMMEN	DATI	ONS:	(If	di	ffere	nt fr	om N	iasa)							
	[/]	[]	[]	C]	(AI	[)D/	'DE] :LE	TE)	
* CIL RE	TENI	TION	RATION	ALE	: (If	appl	icab	ole) INZ	ADEQU ADEQU	ATE ATE	[[]		
REMARKS:	DO 1				133 T T 1		ODE				-	7 \	-	TO3	

NASA/RI DO NOT COVER THIS FAILURE MODE (RESTRICTED FLOW). IOA NOW CONSIDERS THE CREDIBILITY OF RESTRICTED FLOW IN A BELLOWS TO BE QUESTIONABLE. IOA DOES NOT REGARD THE ABSENCE OF THIS FAILURE MODE IN THE FMEA/CIL TO BE AN OPEN ISSUE, BUT DOES RECOMMEND THAT THIS FAILURE MODE BE ADDRESSED. .

REPORT DATE 2/26/88

ASSESSMEN ASSESSMEN NASA FMEN	NT NT A #	DA ID :	ТЕ: :	1/01/ RCS-1 NONE	88 40								NA E	SA BASI	DAT ELIN NH	ra: Ie Ew	[[]]	
SUBSYSTEN MDAC ID: ITEM:	4:			FRCS 140 PRESS	UR	E I	RELI	LEF	ļ	ss	EME	BLY								
LEAD ANA	LYS	т:		C.D.	PRI	บรา	2													
ASSESSME	NT:																			
(CRI	TI	CALI	(TY		RI	EDUI	NDA	NC	CY	SCI	REENŚ					C]	L	Ā	
	н	г L DW	/FUN	1C		A				В			С				-	. 67	1	
NASA IOA	[[2	/ /1R]]	[[P]]		[[NA]	[[P]]			[[x]]	*
COMPARE	[N	/N]	[N]		[N]	[N]			E	N]	
RECOMMEN	DAT	10	NS:	(If	d	if	fere	ent	1	fro	om 1	NASA)								
	[2	/1R]	[P]		נ	F]	[₽]		(AI	[)D,	A /DI] ELF	ETE)
* CIL RE	TEN	TI	ON I	RATION	AL	E:	(1:	fa	PI	oli	.cal	ble) IN	AI IAI)EQ)EQ	UATI UATI	22	[[]	
REMARKS:	DO	NO	тс	OVER T	HI	s 1	FAI	LUR	Έ	MC	DE	(BUR	เรา	C D	ISK	II	1TI	ERI	IAI	

NASA/RI DO NOT COVER THIS FAILURE MODE (BURST DISK INTERNAL LEAKAGE). IOA CONSIDERS THIS FAILURE MODE TO BE CREDIBLE AND RECOMMENDS IT BE ADDED TO 03-2F-101060-5. THE FAILURE HISTORY OF THE BURST DISK INCLUDES THIS FAILURE. THE SSM AGREED WITH THE IOA ISSUE.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-140A 03-2F-101060-5	NASA DAT BASELIN NI	CA: VE [] SW [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 140 PRESSURE RELIEF	ASSEMBLY	,
LEAD ANALYST:	C.D. PRUST		
ASSESSMENT:			
CRITICAL FLIGH HDW/FU	ITY REDUNDAN F NC A	ICY SCREENS B C	CIL ITEM
NASA [2 /1R IOA [2 /1R] [P] [] [P] [F] [P] NA] [P]	[X]* [X]
COMPARE [/] [] [[] [И	[]
RECOMMENDATIONS:	(If different	from NASA)	
[/] [] [[][]	[] (ADD/DELETE)
* CIL RETENTION N	RATIONALE: (If ap	oplicable) ADEQUATH INADEQUATH	2 [] 2 []

=

-

.

IOA AGREES WITH NASA/RI FAILURE OF B SCREEN. IOA RECOMMENDS THE ADDITION OF STATEMENTS TO THE EFFECTS REGARDING POSSIBLE VIOLATIONS OF ORBITER ENTRY MASS PROPERTIES CONSTRAINTS, AND HAZARD TO GROUND AND EVA CREWS FROM LEAKAGE OF PROP OR PROP VAPORS.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	SESSMENT DATE: 1/01/88 NASA I SESSMENT ID: RCS-141 BASEI SA FMEA #: 03-2F-101060-3 BASEI									
SUBSYSTEM: MDAC ID: ITEM:	FRCS 141 PRESSURE RELIEF	ASSEMBLY								
LEAD ANALYST:	C.D. PRUST									
ASSESSMENT:										
CRITICAL FLIGH	ITY REDUNDA	NCY SCREENS	CIL ITEM							
HDW/FU	NC A	ВС								
NASA [3 /1R IOA [1 /1	[F]]][]]	[NA] [P] [] []	[X]* [X]							
COMPARE [N /N] [N]	[N] [N]	[]							
RECOMMENDATIONS:	(If different	from NASA)	<u>-</u>							
[/] []	[]][]	[] ADD/DELETE)							
* CIL RETENTION	RATIONALE: (If a	pplicable) ADEQUATE INADEQUATE	[]							
REMARKS: IOA AGREES WITH CONSIDERED RELIE ANALYSIS.	NASA/RI RATIONAL EF VALVE TO BE AN	E FOR 3/1R FNP ASSIC EMERGENCY SYSTEM IN	GNMENT. IOA N THE ORIGINAL							

-

- -

- ----

•

- - -

-

: =

-

4 2000

1 <u>1</u> 1 1 <u>1</u> 1

i **i**si

а **н**а

· ----

•

ASSESSMENT DATE:	1/01/88	NASA DATA:
ASSESSMENT ID:	RCS-141A	BASELINE []
NASA FMEA #:	03-2F-101060-4	NEW [X]
SUBSYSTEM:	FRCS	
MDAC ID:	141	
ITEM:	PRESSURE RELIEF ASSEMBLY	

LEAD ANALYST: C.D. PRUST

ASSESSMENT:

	CRITICALITY	REDUN	DANCY SCREENS	CIL ITEM				
	HDW/FUNC	A	B C	~ ~ ~ ~ ~				
NASA IOA	[3 /1R] [1 /1]	[P] []	[NA] [P] [] []	[] * [X]				
COMPARE	[N/N]	[N]	[N] [N]	[N]				

RECOMMENDATIONS: (If different from NASA)

r	1	٦	r	٦	r	٦	r	г	гл
L		J	L	J	ι	1	L	1	LJ
									(ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [] INADEQUATE []

.

REMARKS:

IOA AGREES WITH NASA/RI RATIONALE FOR 3/1R PNP ASSIGNMENT. IOA CONSIDERED RELIEF VALVE TO BE AN EMERGENCY SYSTEM IN THE ORIGINAL ANALYSIS.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-142 03-2F-1	01091-1		NASA DATA: BASELINE [] NEW [X]						
SUBSYSTEM: MDAC ID: ITEM:	FRCS 142 RELIEF	RCS 42 RELIEF VALVE TEST PORT COUPLING								
LEAD ANALYST:	C.D. PR	UST								
ASSESSMENT:										
CRITICAI FLIGH	JITY IT	REDUND	ANCY SCRI	EENS	CIL ITEM					
HDW/FU	INC	A	В	С						
NASA [3 /1F IOA [3 /1F	2] [2] [F] P]	[F] [NA]	[P] [P]	[X]* []					
COMPARE [/] [N]	[N]	[]	[N]					
RECOMMENDATIONS:	(If d	ifferen	t from NA	ASA)						
[3 /1F	2] [F]	[F]	[P] (2	[A] ADD/DELETE)					
* CIL RETENTION	RATIONAL	E: (If	applicab)	le) ADEQUATE INADEQUATE						
REMARKS: IOA AGREES WITH	NASA/RI	FAILURE	OF A ANI	D B SCREENS.	IOA					

RECOMMENDS THAT "POPPET FAILS OPEN" BE ADDED AS A FAILURE MODE ON THIS FMEA/CIL. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE QUANTITY ON THIS FMEA/CIL SHOULD BE 12. THE SSM AGREED WITH THE IOA ISSUE. IOA RECOMMENDS ADDING A STATEMENT TO THE EFFECTS REGARDING POSSIBLE VIOLATIONS OF ORBITER ENTRY MASS PROPERTIES CONSTRAINTS.

REPORT DATE 2/26/88

ASSESSMEI ASSESSMEI NASA FMEI	NT NT A ‡	D2 II #:	ATE: D:	1/ RC 03	01/8 S-14 -2F-	8 3 •101()91-2	2		1	NASA DA BASELI N	NE IEW	[[x]	
SUBSYSTE MDAC ID: ITEM:	М:			FR 14 RE	CS 3 LIEF	VAI	LVE I	EST	PORT (COUI	PLING				
LEAD ANA	LYS	5 T :	:	c.	D. F	RUSI	C								
ASSESSME	NT:	:													
	CRI	LT:		JTY		RI	EDUNE	DANCY	SCREI	ens			CIL	M	
	ł	HDI	W/FU	NC		A		В		(2				
NASA IOA	[[3 3	/3 /3]]		[[]	[[]]	[[]]		[[]]	*
COMPARE	[/]		[]	[]	[]		[]	
RECOMMEN	DAT	FI (ONS:		(If	difi	ferer	nt fr	om NAS	SA)					
	[3	/3]		[]	[]	[]	(AI	[DD/D] ELE	ETE)
* CIL RE	TEI	NT:	ION	RAT	IONA	LE:	(If	appl	icable	e) / IN/	ADEQUAT ADEQUAT	'E 'E	[[]	
REMARKS:											-		-	-	

IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE. 400-

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	NT DATE: NT ID: A #:	: 1/01/ RCS-1 03-2F	1/01/88 NASA DATA: RCS-144 BASELINE [] 03-2F-101050-1 NEW [X]									
SUBSYSTE MDAC ID: ITEM:	M:	FRCS 144 GROUN	id ma	NUAL	ISOL	ATIO	N VAI	VE				
LEAD ANA	LYST:	C.D.										
ASSESSME	ASSESSMENT:											
	CRITICAL	LITY	R	EDUN	DANCY	SCR	EENS		CII	שרי זארי		
	HDW/F	JNC	A		В		c	•	± ± ±	21.1		
NASA IQA	[3 /3 [3 /3]]	[[]]	[[]]	[[]]	[[] *]		
COMPARE	[/]	[]	[]	Γ]	[]		
RECOMMEN	DATIONS	: (I	E dif	fere	ent fr	om N.	ASA)					
	[/]	C]	[]	[]] DD/I] DELETE)		
* CIL RE REMARKS: NO DIFFE	TENTION	RATIO	NALE:	(If	appl	icab	le) 7 IN7	DEQUATE DEQUATE	[[]]		

REPORT DATE 2/26/88

: =

.

-

-

_

;

.

.

,

-

ASSESS ASSESS NASA F	MEN MEN MEA	ENT DATE: 1/01/88 ENT ID: RCS-145 EA #: 03-2F-101050-									NASA DATA: BASELINE [] L NEW [X]								
SUBSYS MDAC I ITEM:	TEM D:	[:				FF 14 GF	CS 5 OUN	D M.	ANUAL	, ISOI	LATI	ON VAI	JVE						
LEAD A	NAI	JYS	ST	:		c.	D.	PRU	ST										
ASSESS	MEN	IT :	:																
	C	R	[T] F]	IC. LI	AL: GH'	CTY C]	REDUN	IDANCY	sci	REENS			CI IT	L EM	ſ		
		F	IDI	W/:	FUI	1C		4	A	E	3	C							•
NAS IO	A A	[[3 1	1	3 1]]		[[]]	[[]]	[[]]		[[х]	*	
COMPAR	E	[N	/1	N]		נ]	[]	Γ]		[N]		
RECOMM	ENC	A	CI(ON	s:		(If	di	ffere	nt fr	rom 1	NASA)							
		[1]		[]	C]	[]	(AI] /00/	DE] :LF	ETE)	
* CIL	REI	'EN	IT:	10	NI	RAT	ION	ALE	: (If	appl	ical	ole)			•				
												A INA	DEQU DEQU	ATE ATE	[[]]		
REMARK	S: 1 F	A	SEI		ON	H F		URE	TO R	EMAIN		EN"	тоа	NOW	ON	ST	DF	RS 1	THE
CREDIB	ĪLĪ	T	ζ	OF	TI	iIS	FA	ILU	RE MO	DE TC	BE	QUESI	IONA	BLE.	I	OA	Ē)OES	
NOT RE	GAR	D דר	TI I	HE	Al Al	BSE	NCE	OF	"FAI	LURE	TO I	REMAIN	OPE	N" IN	ז ד ו רידי יו	HE HŤ	: S		
FAILUR	EM	ioi)E	B	E	ADD	RES	SED	•	DUIL	010	ALCOP.					0		

REPORT DATE 2/26/88

ASSESSMI ASSESSMI NASA FMI	ENT ENT EA	D2 II #:	ATE: D:	1/0 RCS NON	1/88 -146 E				N	ASA I BASEI	DATA: LINE NEW	[[]	
SUBSYSTI MDAC ID: ITEM:	EM :			FRC 146 GRO	S UND MAN	NUAL	ISOLA	ATIC	N VAI	VE					
LEAD AN?	ALY:	ST	:	c.D	. PRUST	r							. –	-	-
ASSESSMI	ENT	:													
	CR	IT FI	ICAL LIGH	ITY T NC	R] A	EDUN	IDANCY B	SCR	REENS			C] I]	IL IEN	1	
ΝΛΟΧ	r		,,	1	r	ı	r	т	r	ı		г		1	*
IOA	l [1	/1]	[]	[]	ĺ	j		נ	X	j	
COMPARE	[N	/N]	Γ]	Γ]	[]		[N]	
RECOMMEN	1DA	TIC	ONS:	(If dif	fere	ent fro	om N	IASA)						
	נ	1	/1]	[]	ſ]	[]	(AI	[)D/	A 'DI] ELH	ETE)
* CIL R	ETE:	NT.	ION	RATI	ONALE:	(If	f appl:	icat	ole) // IN/	DEQU	ATE ATE	[]	

REMARKS:

1

NASA/RI DO NOT COVER THIS FAILURE MODE (STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE). THE SSM AGREED THAT THIS VALVE BODY SHOULD BE ADDED TO THE HELIUM LINE EXTERNAL LEAKAGE FMEA/CIL (03-2F-101013-1) WITH CORRESPONDING RETENTION RATIONALE. IOA ALSO RECOMMENDS THAT THIS FMEA INCLUDE PROP LEAKAGE EFFECTS (CORROSION, FIRE, EXPLOSION, EXPOSURE OF EVA AND GROUND CREWS).

REPORT DATE 2/26/88

ASSESSMI ASSESSMI NASA FMI	ENT DA ENT II EA #:	ATE: D:	1/01/8 RCS-14 03-2F	38 47 -1023	12-1			N	ASA DA' BASELI N	TA: NE [EW [x]	
SUBSYSTI MDAC ID: ITEM:	EM : :		FRCS 147 PROP	rk is	SOL VI	.vs 1	L/2 &	3/4	/5				
LEAD ANA	ALYST	:	C.D. 1	PRUSI	6								
ASSESSMI	ent:												
	CRITI	CALI LIGHT	TY	RI	EDUNDA	NCY	SCREE	ens		C I	IL TEI	শ	
	HDV	V/FUN	IC	A		В		С					
NASA IOA	[1 [1	/1 /1]	[[]	[[]]	[[]]	[[X X]]	*
COMPARE	[/]	[]	[]	[]	[]	
RECOMMEN	NDATIC	ons:	(If	diff	ferent	fro	om NAS	SA)					
	[1	/1]	[]	[']	[]] (ADD)	A /DI] Elf	ETE)
* CIL RI	ETENTI	ION R	RATION	ALE:	(If a	ppli	cable	≥) A INA	DEQUAT DEQUAT	E (E (]]	
ITTLINICIO (•										-		

THIS FMEA COVERS ONLY THE BELLOWS LEAKAGE FAILURE MODE FOR THE PROP TANK ISOL VALVES. IOA HAS NO ISSUE WITH THIS FAILURE MODE, HOWEVER DOES RECOMMEND THAT THE EFFECTS INCLUDE THE POSSIBLE EXPOSURE OF EVA AND GROUND CREWS TO PROP OR PROP VAPORS. NASA/RI DO NOT COVER STRUCTURAL FAILURE, RUPTURE, OR EXTERNAL LEAKAGE OF THE VALVE HOUSING ON THIS FMEA OR ELSEWHERE. THE SSM AGREED THAT THIS VALVE BODY SHOULD BE ADDED TO THE PROP LINE EXTERNAL LEAKAGE FMEA (03-2F-102108-1) WITH CORRESPONDING RETENTION RATIONALE. = ;

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-148 03-2F-102120-1	NASA DATA: BASELINE [] NEW [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 148 PROP TK ISOL VLVS 1/2 & 3	/4/5
LEAD ANALYST:	C.D. PRUST	
ASSESSMENT:		
CRITICAL	TY REDUNDANCY SCREEN	S CIL ITEM
HDW/FUN	NC A B	С
NASA [3 /1R IOA [1 /1] [P] [P] [] [] [] [] [P] []*] [X]
COMPARE [N /N] [N] [N] [N] [N]
RECOMMENDATIONS:	(If different from NASA)
[2 /1R] [P] [P] [F] [A] (ADD/DELETE)
* CIL RETENTION H	RATIONALE: (If applicable) I	ADEQUATE [] NADEQUATE []
REMARKS: IOA WITHDRAWS 1/3 FLOW TO A THRUST WITHDRAWS 1/1 ABO CAPABILITY DURING (BASED ON A POSS) IN THE FUTURE. IOA RECOMMENDS TH TO A 2/1R PPF AND FRCS PROP COULD IN VIOLATIONS OF ENSIGH	A CRIT, BUT MAINTAINS CONC ER COULD RESULT IN BURN-TH ORT ISSUE DUE TO LACK OF C G RTLS & TAL, HOWEVER RECO IBLE INCOMPLETE DUMP) IF S HAT THE RESTRICTED FLOW FA D PLACED ON THE CIL. INAB RESULT IN INABILITY TO PER IRY MASS PROPERTIES CONSTR	ERN THAT RESTRICTED ROUGH. IOA ALSO URRENT FRCS DUMP MMENDS A 1/1 ABORT CRIT UCH A CAPABILITY EXISTS ILURE MODE BE UPGRADED DILITY TO USE OR DEPLETE FORM ET SEP, OR AINTS AND LOSS OF LIFE N COULD AFFECT BOTH

VALVES SIMULTANEOUSLY. THE SSM AGREED WITH THE IOA ISSUE.

REPORT DATE 2/26/88

: :

-

1

-

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-149 03-2F-10	02120-2		NASA DATA BASELINE NEW	: []
SUBSYSTEM: MDAC ID: ITEM:	FRCS 149 PROP TK	ISOL VLV	1/2		
LEAD ANALYST:	C.D. PR	UST			
ASSESSMENT:					
CRITICAL	[TY r	REDUNDAN	CY SCREENS	5	CIL ITEM
HDW/FUN	NC	A .	В	с	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
NASA [3 /1R IOA [3 /3] [] [P][][NA] [] [P]]	[] * []
COMPARE [/N] [N] [м] [N]	[]
RECOMMENDATIONS:	(If d	ifferent	from NASA)	
[/] [] [] [] (AI	[] DD/DELETE)
* CIL RETENTION H	RATIONALI	E: (If ap)	plicable) Il	ADEQUATE NADEQUATE	
REMARKS: IOA AGREES WITH N	NASA/RI H	RATIONALE	FOR 3/1R	PNP ASSIGN	MENT.
		· · • • · •			· · · -
· · · • • •				-	

Ŧ

ii 7

T

REPORT DATE 2/26/88 C-54

a server a server as

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-1497 NONE	A			NASA DATA BASELINI NEV	A: E [V []]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 149 PROP TK	ISOL VI	V 1/2				
LEAD ANALYST:	C.D. PRU	JST		-			
ASSESSMENT:							
CRITICAL	ITY	REDUNDA	NCY S	CREENS	5	CIL TTE	M
HDW/FU	NC	A	в		с		
NASA [/ IOA [3 /3] [] []]	[] []	[[]]	[[] *]
COMPARE [N /N] []	[]	[]	[]
RECOMMENDATIONS:	(If d	ifferent	: from	NASA)			
[3 /1R] [P]	[NA]	[P] (2	[ADD/D] ELETE)
* CIL RETENTION	RATIONALI	E: (If a	pplic	able) IN	ADEQUATE IADEQUATE	[[]]
REMARKS: NASA/RI DO NOT C NOW CLASSIFIES T	OVER THIS HIS FAIL	S FAILUI URE AS A	RE MOD	E (INT PNP.	TERNAL LE	AKAGE OMMEN). IOA DS THAT

NOW CLASSIFIES THIS FAILURE AS A 3/1R PNP. IOA RECOMMENDS THAT THIS FAILURE MODE BE ADDED TO 03-2F-102120-2 (3/1R PNP). THIS IS A CREDIBLE FAILURE MODE WHICH SHOULD BE ADDRESSED.

REPORT DATE 2/26/88

.

=

.

-

_

÷

. -

•

.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-150 03-2F-102120-1	N	ASA DATA: BASELINE [] NEW [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 150 PROP TK ISOL VLV	1/2	
LEAD ANALYST:	C.D. PRUST		
ASSESSMENT:			
CRITICAL	TY REDUNDAN	CY SCREENS	CIL ITEM
HDW/FUN	IC A	B C	
NASA [3 /1R IOA [2 /1R] [P] [] [P] [P][P] P][P] [] *] [X]
COMPARE [N/] [] [] [] [N]
RECOMMENDATIONS:	(If different	from NASA)	
[2 /1R] [P] [P] [P] [A] (ADD/DELETE)
* CIL RETENTION H	RATIONALE: (If ap)	plicable) A) INA)	DEQUATE [] DEQUATE []
REMARKS: IOA WITHDRAWS 1/2 CAPABILITY DURING (BASED ON POSSIB) IN THE FUTURE. IOA RECOMMENDS TH FAILURE MODE BE U INABILITY TO USE TO PERFORM ET SEN CONSTRAINTS AND I	ABORT ISSUE DUE TRTLS & TAL, HOW LE INADEQUATE DUM HAT THE FAILED CLA UPGRADED TO 2/1R I OR DEPLETE FRCS I P, OR VIOLATIONS O LOSS OF LIFE OR VI	TO LACK OF EVER RECOMM P) IF SUCH A DSED AND FA PPP AND PLA PROP COULD A DF ENTRY MA EHICLE DURI	CURRENT FRCS DUMP ENDS A 1/1 ABORT CRIT A CAPABILITY EXISTS ILS TO REMAIN OPEN CED ON THE CIL. RESULT IN INABILITY SS PROPERTY NG ENTRY.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-151 03-2F-102	120-2		NASA DATA BASELINE NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 151 PROP TK I:	SOL VLV	3/4/5		
LEAD ANALYST:	C.D. PRUS	Т			
ASSESSMENT:					
CRITICAL FLIGH	ITY R F	EDUNDAN	CY SCREE	NS	CIL ITEM
HDW/FUI	NC A		В	С	
NASA [3 /1R IOA [3 /3] [P] [] [] [NA]]	[P] []	[]*
COMPARE [/N] [N] [N]	[N]	[]
RECOMMENDATIONS:	(If dif	ferent	from NAS	A)	
[/] [] []	[] (A	[] DD/DELETE)
* CIL RETENTION	RATIONALE:	(If ap	plicable) ADEQUATE INADEQUATE	[]
IOA AGREES WITH	NASA/RI RA	TIONALE	FOR 3/1	R PNP ASSIG	NMENT.

REPORT DATE 2/26/88 C-57

-

· =---

ः <u>सन्दर</u>

-

.

Hen- i

.

ASSESSMENT DATE:	1/01/88	NASA DATA:	
ASSESSMENT ID:	RCS-151A	BASELINE []
NASA FMEA #:	NONE	NEW []
SUBSYSTEM:	FRCS		
MDAC ID:	151		
ITEM:	PROP TK ISOL VLV 3/4/5		

LEAD ANALYST: C.D. PRUST

ASSESSMENT:

	CR	IT:	ICAL	JTY	I	REDUN	IDANCY	SCR	EENS		C: T	IL FEM	
]	HD	W/FU	NC	1	ł	E	3	C	3	• •• •		
NASA IOA	[נ	3	/ /3]]	[[]]	[[]]	[[]]	[]	*
COMPARE	[N	/N]	ľ]	۰ ٦]	[]]]	

RECOMMENDATIONS: (If different from NASA)

[3 /1R]	[P]	[NA]	[P]	[]
				(ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [] INADEQUATE [] - -

REMARKS:

NASA/RI DO NOT COVER THIS FAILURE MODE (INTERNAL LEAKAGE). IOA NOW CLASSIFIES THIS FAILURE AS A 3/1R PNP. IOA RECOMMENDS THAT THIS FAILURE MODE BE ADDED TO 03-2F-102120-2 (3/1R PNP). THIS IS A CREDIBLE FAILURE MODE WHICH SHOULD BE ADDRESSED.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-152 03-2F-102120-1	NASA DATA: BASELINE [] NEW [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 152 PROP TK ISOL VLV 3/4/5	
LEAD ANALYST:	C.D. PRUST	
ASSESSMENT:		
CRITICALI FLIGHT HDW/FUN	ITY REDUNDANCY SCR F NC A B	EENS CIL ITEM C
NASA [3 /1R IOA [2 /1R] [P] [P]] [P] [P]	[P] [X] [P] [X]
COMPARE [N /] [] []	[ז [א]
RECOMMENDATIONS:	(If different from N	ASA)
[2 /1R] [P] [P]	[P] [A] (ADD/DELETE)
* CIL RETENTION F	RATIONALE: (If applicab	le) ADEQUATE [] INADEOUATE []
REMARKS: IOA WITHDRAWS 1/1 CAPABILITY DURING (BASED ON POSSIBI IN THE FUTURE. IOA RECOMMENDS TH FAILURE MODE BE U INABILITY TO USE TO PERFORM ET SEN CONSTRAINTS AND I	1 ABORT ISSUE DUE TO LA 3 RTLS & TAL, HOWEVER R LE INADEQUATE DUMP) IF HAT THE FAILED CLOSED A UPGRADED TO 2/1R PPP AN OR DEPLETE FRCS PROP C P, OR VIOLATIONS OF ENT LOSS OF LIFE OR VEHICLE	CK OF CURRENT FRCS DUMP ECOMMENDS A 1/1 ABORT CRIT SUCH A CAPABILITY EXISTS ND FAILS TO REMAIN OPEN D PLACED ON THE CIL. COULD RESULT IN INABILITY TRY MASS PROPERTY DURING ENTRY.

.

- -- - -

= =

- -

: **1**

-

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-153 03-2F-10	02150-1		NASA DA BASELI N	ATA: NE [] NEW [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 153 MANIFOLI	0 1/2 F	'ILL & DRA	IN/PURGE C	COUPLING
LEAD ANALYST:	C.D. PR	JST			
ASSESSMENT:					
CRITICAL FLIGH HDW/FUI	[TY [1C	REDUND A	ANCY SCRE	ens C	CIL ITEM
NASA [2 /1R IOA [2 /1R] [F] P]	[F] [NA]	[P] [P]	[X]* [X]
COMPARE [/] [N]	[N]	[]	[]
RECOMMENDATIONS:	(If d	ifferen	t from NA	SA)	
[/] []	[]	[]	[] (ADD/DELETE)
* CIL RETENTION I	RATIONALI	2: (If	applicabl	e) ADEQUAI INADEQUAI	YE [] YE []
REMARKS: IOA AGREES WITH 1	NASA/RI I	FAILURE	OF A AND	B SCREENS	• • • • • • • • • • • • • • • • • • •

and the second second

=

-

Ē

REPORT DATE 2/26/88

.

-

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-154 03-2F-102	150-2		NASA DATA BASELINE NEW	: [
SUBSYSTEM: MDAC ID: ITEM:	FRCS 154 MANIFOLD	1/2 FILL	& DRAII	N/PURGE COU	PLING
LEAD ANALYST:	C.D. PRUS	Т			
ASSESSMENT:					
CRITICAL FLIGH	ITY R	EDUNDANCY	SCREE	NS	CIL ITEM
HDW/FU	NC A	Ē	3	С	
NASA [3 /3 IOA [3 /3] [] [] [] []]	[] []	[] * []
COMPARE [/] [] []	[]	[]
RECOMMENDATIONS:	(If dif	ferent fi	com NAS	A)	
[3/3] [] []	[] (A	[] .DD/DELETE)
* CIL RETENTION	RATIONALE:	(If app]	licable) ADEQUATE INADEQUATE	
REMARKS: IOA FAILURE MODE	S ON ANALY	SIS SHEET	SHOUL	D INCLUDE "	FAILS TO

IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE.

REPORT DATE 2/26/88

-

ASSESSMENT DATE: 1/01/88 ASSESSMENT ID: RCS-155 NASA FMEA #: 03-2F-102150-1					1	NASA DATA: BASELINE [] NEW [X]							
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 155 MANIF	OLD	3/4/	5 FIL	L &	DRAIN	I/PURG	GE CO	OUPI	LING	
LEAD ANA	LYST	:	c.p.	PRUS	ST								
ASSESSME	NT:												
CRITICALITY FLIGHT				Ē	REDUN		CIL ITEM						
	HD	W/FUI	NC	7	X	B		(]	-			
NASA IOA	[2 [2	/1R /1R]	[] []	7] 9]	[F [N] A]	[] []	?] ?]		[X [X	(] * []	;
COMPARE	[1]	[]	1]	[N]	Γ]		[]	
RECOMMEN	DATI	ons:	(If	dif	fere	nt fr	om N	IASA)					
	[/]	[]	[]	Ĺ	3	(AI	[DD/D] ELET	'E)
* CIL RE	TENT	ION I	RATION	ALE:	(If	appl	icab	ole) / IN/	ADEQUI ADEQUI	ATE ATE	[[]]	
IOA AGRE	ES W	ITH I	NASA/R	I FA	ILUR	E OF	A AN	ID B S	CREEN	IS.			

_

_

Ξ

.

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	1/01/8 RCS-15 03-2F-	NASA DATA: BASELINE [] NEW [X]								
SUBSYSTE MDAC ID: ITEM:	FRCS 156 MANIFO	FILL & DRAIN/PURGE COUPLING								
LEAD ANA	LYST:	C.D. F	C.D. PRUST							
ASSESSME	NT:									
	CRITICAL	ITY	RI	EDUND	ANCY	SCRE	CIL			
	FLIGH HDW/FU	NC A		В		С	С		11	
NASA IOA	[3 /3 [3 /3]]	[[]]	[[]]	[[]]	[[] *]
COMPARE	[/]	[1	[]	[]	[]
RECOMMEN	RECOMMENDATIONS: (If different from NASA)									
·	[3 /3]	[]	[]	[] (4	[ADD/D] ELETE)
* CIL RETENTION RATIONALE: (If applicable)										
							INA	DEQUATE	l []
REMARKS: IOA FAIL COUPLE"	REMARKS: IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTE									

COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE.

REPORT DATE 2/26/88

West of the

-

Rist.

.

=

ASSESSMENT DATE: 1/01 ASSESSMENT ID: RCS- NASA FMEA #: 03-2				/01/88 CS-157 3-2F-102110-2					NASA DATA: BASELINE [] NEW [X]					
SUBSYSTEM: FRO MDAC ID: 157 ITEM: MAN				RCS 57 IANIFOLD 1, ISOL VLV										
LEAD ANA	C.D.	C.D. PRUST												
ASSESSME	NT:													
CRITICALITY FLIGHT				R	EDUN	IDANCY	SCREENS				CIL ITEM			
	HC	W/FUI	1C	A		В			С					
NASA IOA	[3 [3	/1R /3]]	[P []]	[N2 [A]]	[[P]]		[[]]	*	
COMPARE	Γ	/N]	[N]	[N]	[N]		[]		
RECOMMEN	DATI	ONS:	(]	[f dif:	fere	ent fro	om N.	ASA)						
	[/]	[]	[]	[]	(AI	[DD/D])ELF	TE)	
* CIL RE	TENI	ION F	RATIC	ONALE:	(If	appl:	icab	le) IN	ADEQUA ADEQUA	TE TE	[[]]		
			13 0 3	/DT D3	TTON			/1D		CTCN	MEN	TTT	то	

=

-

-

....

...

IOA AGREES WITH NASA/RI RATIONALE FOR 3/1R PNP ASSIGNMENT. IOA RECOMMENDS THAT THE EFFECTS ON THIS FMEA INCLUDE PROP LEAKAGE EFFECTS (CORROSION, FIRE, EXPLOSION, EXPOSURE OF EVA AND GROUND CREWS).

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-158 03-2F-102110-1	NASA DATA: BASELINE [] NEW [X]							
SUBSYSTEM: MDAC ID: ITEM:	FRCS 158 MANIFOLD 1, ISOL VLV								
LEAD ANALYST:	C.D. PRUST								
ASSESSMENT:									
CRITICAL FLIGH	ITY REDUNDANCY SCREEN T	IS CIL ITEM							
HDW/FU	NC A B	C							
NASA [3 /1R IOA [2 /1R] [P] [P]] [P] [P]	P] []* P] [X]							
COMPARE [N /] [] [] [[] [И]							
RECOMMENDATIONS:	(If different from NAS)	A)							
[2 /1R] [P] [P]	[P] [A] (ADD/DELETE)							
* CIL RETENTION	* CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEONATE []								
REMARKS: IOA WITHDRAWS 1/ CAPABILITY DURIN (BASED ON POSSIB IN THE FUTURE. IOA RECOMMENDS T FAILURE MODES BE CERTAIN COMBINAT SIDE) COULD RESU VIOLATIONS OF EN OF LIFE OR VEHIC	1 ABORT ISSUE BASED ON LAG G RTLS & TAL, HOWEVER RECO LE INADEQUATE DUMP) IF SUG HAT THE FAILED CLOSED AND UPGRADED TO 2/1R PPP AND IONS OF TWO FAILURES (LOSS LT IN INABILITY TO DUMP FI TRY MASS PROPERTIES CONSTI- LE DURING ENTRY.	CK OF CURRENT FRCS DUMP DMMENDS A 1/1 ABORT CRIT CH A CAPABILITY EXISTS FAILS TO REMAIN OPEN PLACED ON THE CIL. S OF YAW JETS ON SAME RCS PROP AND POSSIBLE RAINTS LEADING TO LOSS							

-

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-159 03-2F-10	01080-1		NASA DATA BASELINE NEW	DATA: ELINE [] NEW [X]			
SUBSYSTEM: MDAC ID: ITEM:	FRCS 159 MANIFOLI	D 1, GRC	UND PURGE	DRAIN COUP	LING			
LEAD ANALYST:	C.D. PR	JST						
ASSESSMENT:								
CRITICAL: FLIGH	ITY F	REDUNDA	NS	CIL ITEM				
HDW/FUI	NC	A	В	С				
NASA [2 /1R IOA [2 /1R] [] [F] P]	[F] [NA]	[P] [P]	[X] * [X]			
COMPARE [/] [N]	[N]	[]	[]]			
RECOMMENDATIONS:	(If d	ifferent	from NAS	A)				
[2 /1R] [F]	[F]	[P] (Al	[A] DD/DELETE)			
* CIL RETENTION 1	RATIONAL	E: (If a	pplicable) ADEQUATE INADEOUATE				
REMARKS: IOA AGREES WITH 1	NASA/RI	RATIONAL	E FOR FAI	LURE OF A AL	ND B SCREE			

ه

;

.

IOA AGREES WITH NASA/RI RATIONALE FOR FAILURE OF A AND B SCREENS. IOA RECOMMENDS THAT "POPPET FAILS OPEN" BE ADDED AS A FAILURE MODE ON THIS FMEA/CIL. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE. IOA ALSO RECOMMENDS ADDING A STATEMENT TO THE EFFECTS ABOUT PROP LEAKAGE EFFECTS (CORROSION, FIRE, EXPLOSION, EXPOSURE OF EVA AND GROUND CREWS).

the second se

REPORT DATE 2/26/88

and the second second second
ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-160 03-2F-101	NASA DATA: BASELINE [] NEW [X]										
SUBSYSTEM: MDAC ID: ITEM:	FRCS 160 MANIFOLD	1, GROU	ND PURG	E/DRA	IN COUP	LING						
LEAD ANALYST:	C.D. PRUS	T										
ASSESSMENT:												
CRITICALITY REDUNDANCY SCREENS CIL												
HDW/FU	NC A	•	В	с			M					
NASA [3 /3 IOA [3 /3] [] [] [] []	[[]]	[[] *]					
COMPARE [/] [] []	[]	[]					
RECOMMENDATIONS:	(If dif	ferent	from NA	SA)								
[3 /3] [] []	[] (A] 10/00] ELETE)					
* CIL RETENTION	RATIONALE:	(If ap	plicabl	e)		•	_					
1 1				AI INAI	DEQUATE DEQUATE	[[]					
REMARKS: IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A												

CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE.

REPORT DATE 2/26/88

-

-

A . . .

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-161 03-2F-102110-2	/01/88 NASA DATA: CS-161 BASELINE 3-2F-102110-2 NEW									
SUBSYSTEM: MDAC ID: ITEM:	FRCS 161 MANIFOLD 2, IS	RCS 61 ANIFOLD 2, ISOL VLV									
LEAD ANALYST:	C.D. PRUST	.D. PRUST									
ASSESSMENT:											
CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM											
HDW/FUN	C A	В	С	· ·							
NASA [3 /1R IOA [3 /3] [P]] []	[NA] [[] [P]]	[] * []							
COMPARE [/N] [И]	[N] [N]	[]							
RECOMMENDATIONS:	(If differer	nt from NASA)								
[/] []	[]][] (Al	[] DD/DELETE)							
* CIL RETENTION H	ATIONALE: (If	applicable)	ADEOUATE	۲ J							
INADEQUATE []											
IOA AGREES WITH NASA/RI RATIONALE FOR 3/1R PNP ASSIGNMENT.											

=

= ;

•

REPORT DATE 2/26/88

C-68

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-162 03-2F-102110-1	: [] [X]									
SUBSYSTEM: MDAC ID: ITEM:	UBSYSTEM: FRCS DAC ID: 162 TEM: MANIFOLD 2, ISOL VLV										
LEAD ANALYST:	C.D. PRUST										
ASSESSMENT:											
CRITICAL FLIGH	ITY REDUNDAN T	ICY SCREENS	CIL ITEM								
HDW/FU	NC A	вс									
NASA [3 /1R IOA [2 /1R] [P] [] [P] [P] [P] P] [P]	[] * [X]								
COMPARE [N /] [·] [] []	[N]								
RECOMMENDATIONS:	(If different	from NASA)									
[2 /1R] [P] [[P] [P] (A	[A] DD/DELETE)								
* CIL RETENTION	RATIONALE: (If ap	plicable) ADEQUATE INADEOUATE	[] []								
REMARKS: IOA WITHDRAWS 1/ CAPABILITY DURIN (BASED ON POSSIB IN THE FUTURE. IOA RECOMMENDS T FATLURE MODES BE	1 ABORT ISSUE BAS G RTLS & TAL, HOW LE INADEQUATE DUM THAT THE FAILED CI UPGRADED TO 2/15	ED ON LACK OF CURRE VEVER RECOMMENDS A 1 (P) IF SUCH A CAPABI LOSED AND FAILS TO R R PPP AND PLACED ON	NT FRCS DUMP /1 ABORT CRIT LITY EXISTS EMAIN OPEN THE CIL.								
CERTAIN COMBINAT SIDE) COULD RESU	'IONS OF TWO FAILU ILT IN INABILITY T	IRES (LOSS OF YAW JE TO DUMP FRCS PROP AN TES CONSTRAINTS LEAD	TS ON SAME D POSSIBLE ING TO LOSS								

OF LIFE OR VEHICLE DURING ENTRY.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-163 03-2F-101	1080-1	NASA DATA: BASELINE [] NEW [X]							
SUBSYSTEM: MDAC ID: ITEM:	FRCS 163 MANIFOLD	RCS 63 ANIFOLD 2, GROUND PURGE/DRAIN COUPI								
LEAD ANALYST:	C.D. PRUS	ST								
ASSESSMENT:										
CRITICAL	ITY F	REDUNDANC	Y SCREENS	5	CIL					
HDW/FU	NC A	X	В	c						
NASA [2 /1R IOA [2 /1R] [F] [F	7] [9] [F] [NA] [P] P]	[X]* [X]					
COMPARE [/]· [N	1][м] []	[]					
RECOMMENDATIONS:	(If dif	fferent f	rom NASA)							
[2 /1R] [F	r] [F] (P] (AI	[A] DD/DELETE)					
* CIL RETENTION	RATIONALE:	(If app	licable) IN	ADEQUATE IADEQUATE	[]					
REMARKS: IOA AGREES WITH IOA RECOMMENDS T	NASA/RI RA HAT "POPPE	TIONALE ET FAILS	FOR FAILU OPEN" BE	IRE OF A AN ADDED AS A	ND B SCREENS. FAILURE					

MODE ON THIS FMEA/CIL. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER OD FMEAS. THE SSM AGREED WITH THE IOA ISSUE. IOA ALSO RECOMMENDS ADDING A STATEMENT TO THE EFFECTS ABOUT PROP LEAKAGE EFFECTS (CORROSION, FIRE, EXPLOSION, EXPOSURE OF EVA AND GROUND CREWS).

==

REPORT DATE 2/26/88

.

ASSESSMI ASSESSMI NASA FMI	ENT ENT EA	D I #:	ATE: D:	1/ RC 03	01/88 S-164 -2F-1	3 4 L0108	0-2			NASA BASI	DATA ELINE NEW	: [[]] x]
SUBSYSTI MDAC ID: ITEM:	JBSYSTEM: FRCS DAC ID: 164 FEM: MANIFOLD 2, GROUND PURGE/DRAIN CO											LING	3
LEAD ANA	LY	ST	:	c.	D. PH	RUST							
ASSESSMI	ENT	:											
CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM													
]	HD	W/FU	NC	-	A							
NASA IOA	[[3 3	/3 /3]]	((]	[נ]]	[[]		[[] *]
COMPARE	[/]	[]	[]	[]		[]
RECOMMEN	IDA!	FI (ONS:		(If d	liffe	rent	from	NASA)			
	נ	3	/3]	[]	[]	[]	(A	[DD/I] DELETE)
* CIL RE	TEI	T	ION	RAŤ	IONAI	LE: ()	If ap	plic	able) I	ADEQU NADEQU	ATE ATE	[[]]
IOA FAII	LEMARKS: IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO												

COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE.

REPORT DATE 2/26/88

Ë

- ----

-

ā

≣

—

-

.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	NZ E	ASA DATA: BASELINE NEW	[[X]						
SUBSYSTEM: MDAC ID: ITEM:	FRCS 165 MANIFOLD	CS 55 ANIFOLD 3, ISOL VLV								
LEAD ANALYST:	C.D. PRUS	D. PRUST								
ASSESSMENT:										
CRITICAL FLIGH HDW/FU	ITY R P NC A	EDUNDA	NCY SCREE B	ENS C		CIL ITEM	1			
NASA [3 /1R IOA [3 /3] [F] [)]	[NA] []	[P []	[[] *]			
COMPARE [/N] [N	[]	[N]	[N]	٢]			
RECOMMENDATIONS:	(If dif	ferent	from NAS	SA)						
[/] []	[]	[] (AI	[DD/DI] CLETE)			
* CIL RETENTION	RATIONALE:	(If a	pplicable	≥) Al INA	DEQUATE DEQUATE	[[]]			
REMARKS: IOA AGREES WITH	NASA/RI RA	TIONAL	E FOR 3/1	LR PI	NP ASSIGI	MENI	[

ASSESSMENT DATE ASSESSMENT ID: NASA FMEA #:	: 1/01/88 RCS-166 03-2F-1	NASA DATA BASELINE NEW	: [] [X]		
SUBSYSTEM: MDAC ID: ITEM:	FRCS 166 MANIFOL	D 3, ISOL	VLV		
LEAD ANALYST:	C.D. PR	UST			
ASSESSMENT:					
CRITICA	LITY	REDUNDAN	CY SCREE	NS	CIL ITEM
HDW/F	UNC	A	В	С	* * * **
NASA [3 /1 IOA [2 /1	R] [R] [P] [P] [P] P]	[P] [P]	[] * [X]
COMPARE [N /] [] []	[]	[N]
RECOMMENDATIONS	: (If d	lifferent	from NAS.	A)	· · · · · · · · · · · · · · · · · · ·
[2 /1	R] [[P] [P]	[P] (A	[A] DD/DELETE)
* CIL RETENTION	RATIONAL	E: (If ap)	plicable) ADEQUATE INADEQUATE	
REMARKS: IOA WITHDRAWS 1 CAPABILITY DURI (BASED ON POSSI IN THE FUTURE.	/1 ABORT NG RTLS & BLE INADE	ISSUE BASI TAL, HOWI QUATE DUMI	ED ON LA EVER REC P) IF SU	CK OF CURRE OMMENDS A 1 CH A CAPABI	NT FRCS DUMP /1 ABORT CRIT LITY EXISTS

IOA RECOMMENDS THAT THE FAILED CLOSED AND FAILS TO REMAIN OPEN FAILURE MODES BE UPGRADED TO 2/1R PPP AND PLACED ON THE CIL. CERTAIN COMBINATIONS OF TWO FAILURES (LOSS OF YAW JETS ON SAME SIDE) COULD RESULT IN INABILITY TO DUMP FRCS PROP AND POSSIBLE VIOLATIONS OF ENTRY MASS PROPERTIES CONSTRAINTS LEADING TO LOSS OF LIFE OR VEHICLE DURING ENTRY.

REPORT DATE 2/26/88

1 133

C-73 ·

ASSESSMENT DATE:	1/01/88	NASA DATA:
ASSESSMENT ID:	RCS-167	BASELINE []
NASA FMEA #:	03-2F-101080-1	NEW [X]
SUBSYSTEM:	FRCS	
MDAC ID:	167	1
ITEM:	MANIFOLD 3, GROUND	PURGE/DRAIN COUPLING

LEAD ANALYST: C.D. PRUST

ASSESSMENT:

CRITICALITY FLIGHT					REDUNDANCY SCREENS								CIL ITEM			
	HD	W/FUI	NC		A			В			С					
NASA IOA	[2 [2	/1R /1R]	[[F P]]	[[F NZ] A]	[[P P]]	[[x x]]	*
COMPARE	[/]	[N]	נ	N]	[]	[]	

RECOMMENDATIONS: (If different from NASA)

[2 /1R]	[F]	[F]	[P]	[A]
				(ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [] INADEQUATE []

.

... •

F T

. I

= :

REMARKS:

IOA AGREES WITH NASA/RI RATIONALE FOR FAILURE OF A AND B SCREENS. IOA RECOMMENDS THAT "POPPET FAILS OPEN" BE ADDED AS A FAILURE MODE ON THIS FMEA/CIL. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE. IOA ALSO RECOMMENDS ADDING A STATEMENT TO THE EFFECTS ABOUT PROP LEAKAGE EFFECTS (CORROSION, FIRE, EXPLOSION, EXPOSURE OF EVA AND GROUND CREWS).

. - And Age 1977년 전 전자 프로그램 및 1971년 - 1971년 - 1971년 1971년 1971년 - 1971년 - 1971년 - 1971년 - 1971년 1971년 - 1971년 - 1

REPORT DATE 2/26/88

. C-74

ASSESSME ASSESSME NASA FME	NT NT A #	DATE: ID: :	1/01/ RCS-1 03-21	/88 168 5-101	080-	: [[X]						
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 168 MANII	FOLD	3, G	LING	ţ						
LEAD ANA	LYS	ST:	C.D.	PRUS	т								
ASSESSME	NT:												
	CRI	TICAL	JITY T	R	EDUN	IDANCŸ	SCR	EENS			CIL	M	
	H	HDW/FU	INC	A		B	i	c	3		_ 		
NASA IOA	[[3 /3 3 /3]]	[[]]	[[]]	[[]]		[[] *]	ſ
COMPARE	[/]	[]	[]	[1		۵]	
RECOMMEN	DAI	TIONS:	(11	f dif	fere	ent fr	om N	ASA)					
1. J. J. N.	[3 /3]	[]	[]	[]	(A)] ELEI	ΞE)
* CIL RE	TEN	ITION	RATIO	NALE:	(If	appl [icab	ole) A INA	DEQU	ATE ATE	[[]	
REMARKS:												•	

IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE.

REPORT DATE 2/26/88

_

_

ASSES ASSES NASA	SMEN SMEN FMEA	T D2 T 11	ATE: D:	1/01/8 RCS-16 03-2F-	1/01/88 NASA RCS-169 BASE 03-2F-102110-2									ATA: INE NEW	[[X] ** *
SUBSY MDAC ITEM:	STEM ID:	:		FRCS 169 MANIFO	CS NIFOLD 4, ISOL VLV											
LEAD	ANAL	YST	:	C.D. H	RUS	ST										
ASSES	SMEN	T:														
	CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM															
		HD	V/FUI	IC	2	A	ал а Ала		В			С	 1912-5-1914	t uu p		
NA I	SA OA	[3 [3	/1R /3]	[] [P]	[[NA]	ן נ	P]	*	[[] *]
COMPA	RE	[/N]	[]	N]	[N]	[N]		[]
RECOM	MEND	ATI	SNS:	(If	di:	ff	erent		fro	m	NASA)					
		[/]	[]	נ]	[]	(AI	[DD/DI] Elete)
* CIL	RET	'ENT	ION I	RATIONA	LE	:	(If a	ap)	pli	lca	ble) IN	AD IAD	EQUA:	re re	[[]]
REMAR IOA A	KS: GREE	s W	ITH 1	NASA/RI	R	AT	IONAI	LE	FC	R	3/1R	PN	P ASS	SIGN	MENT	Γ.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-170 03-2F-102110-1	NASA DATA BASELINE NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 170 MANIFOLD 4, ISOL	VLV	
LEAD ANALYST:	C.D. PRUST		
ASSESSMENT:			
CRITICAL	ITY REDUNDAN	CY SCREENS	CIL
HDW/FU	NC A	B C	I I EM
NASA [3 /1R IOA [2 /1R] [P] [] [P] [P] [P] P] [P]	[] * [X]
COMPARE [N/] [] [] []	[N]
RECOMMENDATIONS:	(If different	from NASA)	
[2 /1R] [P] [P] [P] (A	[A] DD/DELETE)
* CIL RETENTION	RATIONALE: (If app	plicable) ADEQUATE INADEQUATE	[]
REMARKS: IOA WITHDRAWS 1/ CAPABILITY DURIN (BASED ON POSSIB IN THE FUTURE. IOA RECOMMENDS T	1 ABORT ISSUE BAS G RTLS & TAL, HOW LE INADEQUATE DUM HAT THE FAILED CL	ED ON LACK OF CURRE EVER RECOMMENDS A 1 P) IF SUCH A CAPABI OSED AND FAILS TO R	NT FRCS DUMP /1 ABORT CRIT LITY EXISTS EMAIN OPEN

IOA RECOMMENDS THAT THE FAILED CLOSED AND FAILS TO REMAIN OPEN FAILURE MODES BE UPGRADED TO 2/1R PPP AND PLACED ON THE CIL. CERTAIN COMBINATIONS OF TWO FAILURES (LOSS OF YAW JETS ON SAME SIDE) COULD RESULT IN INABILITY TO DUMP FRCS PROP AND POSSIBLE VIOLATIONS OF ENTRY MASS PROPERTIES CONSTRAINTS LEADING TO LOSS OF LIFE OR VEHICLE DURING ENTRY.

REPORT DATE 2/26/88

.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-171 03-2F-101080-1	NASA DATA: BASELINE NEW	[] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 171 MANIFOLD 4, GROUN	ID PURGE/DRAIN COUPI	ING
LEAD ANALYST:	C.D. PRUST		
ASSESSMENT:			
CRITICAL FLIGH HDW/FU	ITY REDUNDANC F NC A	EY SCREENS B C	CIL ITEM
NASA [2 /1R IOA [2 /1R] [F] [] [P] [F] [P] NA] [P]	[X] * [X]
COMPARE [/] [N][и] []	[]
RECOMMENDATIONS:	(If different f	rom NASA)	
[2 /1R] [F] [F] [P] (AD	[A] D/DELETE)
* CIL RETENTION 1	RATIONALE: (If app	olicable) ADEQUATE INADEQUATE	[]
REMARKS: IOA AGREES WITH D IOA RECOMMENDS T MODE ON THIS FME	NASA/RI RATIONALE HAT "POPPET FAILS A/CIL. THIS IS A	FOR FAILURE OF A AN OPEN" BE ADDED AS A CREDIBLE FAILURE MC	D B SCREENS. FAILURE DE AND IS

MODE ON THIS FMEA/CIL. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE. IOA ALSO RECOMMENDS ADDING A STATEMENT TO THE EFFECTS ABOUT PROP LEAKAGE EFFECTS (CORROSION, FIRE, EXPLOSION, EXPOSURE OF EVA AND GROUND CREWS).

REPORT DATE 2/26/88

.

ASSESSMI ASSESSMI NASA FMI	ENT ENT EA	D/ I] #:	ATE: D:	1/01/8 RCS-1 03-2F	38 72 -101(80-2			1	NASA DA BASELI N	TA: NE IEW	[[X]]	
SUBSYSTI MDAC ID ITEM:	EM : :			FRCS 172 MANIFO	OLD 4	I, GRO	OUND	PURGI	E/DI	RAIN CO	UPI	ING		
LEAD AND	ALY	ST	:	C.D.]	PRUSI	ſ								
ASSESSMI	ENT	:												
	CR	IT: F	ICAL	ITY T	RI	EDUND	ANCY	SCREI	ens			CIL ITE	м	
]	HD	W/FU	NC	A		В		(C				
NASA IOA	[[3 3	/3 /3]	[[]]	[[]	[[]]		[[]	*
COMPARE	[`] [/]	[]	[]	[]		[]	-
RECOMME	NDA	TI	ons:	(If	dif	feren	t fr	om NAS	SA)					
	Γ	3	/3]	[]	[]	[]	(AD	[)D/D] ELF	ETE)
* CIL R	etei	NT	ION	RATION	ALE:	(If	appl	icable	≥) INZ	ADEQUAJ ADEQUAJ	TE TE	[.]]	

REMARKS:

IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE.

REPORT DATE 2/26/88

ASSESSMENT DATE:	1/01/88	NASA DATA:
ASSESSMENT ID:	RCS-173	BASELINE []
NASA FMEA #:	03-2F-102170-2	NEW [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 173 MANIFOLD 5, ISOL VLV	

LEAD ANALYST: C.D. PRUST

ASSESSMENT:

	CRITICALITY FLIGHT					RI	EDUI	IDAN	CY	SCREENS			CII	С EM		
	1	HD	W/FUI	NC		A			в			С				
NASA IOA	[[3 3	/2R /3]]	[[P]]	[[P]]	[[P]]	[[]]	*
COMPARE	[/N]	[N]	[N]	[N]	[]	

RECOMMENDATIONS: (If different from NASA)

[3/1R] [P] [NA] [P] [] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [] INADEQUATE []

.

REMARKS:

IOA NOW CLASSIFIES "FAILS OPEN", AND "INTERNAL LEAKAGE" AS A 3/1R PNP.

IOA RECOMMENDS THAT THIS ITEM AND THESE FAILURE MODES BE UPGRADED TO 3/1R PNP. INABILITY TO ISOLATE A PROP LEAK COULD RESULT IN LOSS OF PROP FROM TANK AND PROP LEAKAGE EFFECTS (CORROSION, FIRE, EXPLOSION, EXPOSURE OF EVA AND GROUND CREWS). ANY LEAKAGE OF PROP IS A CRITICAL FAILURE PER NSTS-22206. INABILITY TO CONTROL A LEAK SHOULD, THEREFORE, BE A 1R.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA # :	1/01/88 RCS-174 03-2F-1023	170-1		NASA DATA BASELINE NEW	: [] [X]	
SUBSYSTEM: MDAC ID: ITEM:	FRCS 174 MANIFOLD 5	5, ISOL VI	LV			
LEAD ANALYST:	C.D. PRUST	ſ				
ASSESSMENT:						
CRITICAL	ITY RI	EDUNDANCY	SCREENS	;	CIL	
HDW/FU	NC A	В		с	1124	
NASA [2 /2 IOA [2 /2] [] [] [] [] [] []]	[X] [X]	*
COMPARE [/] []. [] []	[]	
RECOMMENDATIONS:	(If diff	ferent fro	om NASA)			
[/] [] [] [] (A	[] DD/DELE	TE)
* CIL RETENTION	RATIONALE:	(If appl:	icable) IN	ADEQUATE IADEQUATE	[] []	
REMARKS:	TAN DECOM	TENDS THAT	ים מעייי יי	FROMS INC	LUDE LO	55

NO DIFFERENCES. IOA RECOMMENDS THAT THE EFFECTS INCLUDE LOSS OF MISSION DUE TO HIGHER PROP CONSUMPTION USING PRIMARIES.

REPORT DATE 2/26/88 C-81

1

ASSESSMI ASSESSMI NASA FMI	ENT ENT EA #	DA ID ‡:		1/ RC 03	01/8 S-17 -2F-	88 75 -1(010	80-1	•					NZ F	ASA DA BASELI N	TA: NE EW	[]] {]	'	
SUBSYSTE MDAC ID: ITEM:	EM:			FR 17 MA	CS 5 NIFC	DLI	D 5	5, GR	201	JN	D	PURGI	E/I	DRA	AIN CO	UPL	INC	3		
LEAD ANZ	ALYS	ST:		c.	D. I	PRU	วรา													
ASSESSME	ENT :	:																		
	CRI	(TI FL	CALJ JGHT	TY C			RI	DUNE	A	٩C	Y	SCREI	ENS	3			CII ITI	L E M		
	E	IDW	/FUN	IC			Α				B			С						
NASA IOA	[[2 2	/1R /1R]		[[F P]			F NA]	[[P P]]		[]	() ()	*	1
COMPARE	[/]	-	[N]		[N]	[]		[]		
RECOMMEN	IDAI	rio	NS:		(If	đi	iff	iereņ	nt	f	rc	m NAS	SA)	ł						
	[2	/1R]		[F]		[F]	[P]	(AD	[] D/I	A] DEI	ET	'E)
* CIL RI	ETEN	ITI	ON F	RAT	IONA	LI	Ξ:	(If	aj	qq	li	cable) €	AI JAI)EQUAT)EQUAT	'E 'E	[[]		

REMARKS:

IOA AGREES WITH NASA/RI RATIONALE FOR FAILURE OF A AND B SCREENS. IOA RECOMMENDS THAT "POPPET FAILS OPEN" BE ADDED AS A FAILURE MODE ON THIS FMEA/CIL. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE. IOA ALSO RECOMMENDS ADDING A STATEMENT TO THE EFFECTS ABOUT PROP LEAKAGE EFFECTS (CORROSION, FIRE, EXPLOSION, EXPOSURE OF EVA AND GROUND CREWS).

C-82

REPORT DATE 2/26/88

ASSESSMI ASSESSMI NASA FMI	ENT ENT EA	D. I: #:	ATE: D:	1/0 RCS 03-	1/88 -176 2F-101	.080-	-2		N	iasa Basi	DATA ELINE NEW	: [[X] []		
SUBSYST MDAC ID ITEM:	EM: :			FRC 176 MAN	S	5, (GROUND	PUI	RGE/DF	RAIN	COUP	LING	;		
LEAD AND	ALY	ST	:	C.E	. PRUS	T									
ASSESSMI	ENT	:													
	CRITICALITY REDUNDAN FLIGHT HDW/FUNC A									CY SCREENS CIL ITEM B C					
NASA IOA	[[3 3	/3 /3]]	[[]]	ני נ]]	[[]]		[[]]	*	
COMPARE	[/]	C]	٢]	[]		[]		
RECOMME	NDA	TI	ons:	(If dif	fere	ent fr	om N	VASA)						
	[3	/3]	נ]	[]	[]	(A)] ELI	ETE)	
* CIL R	ETE	NT	ION	RATI	ONALE:	(11	f appl	icak	ole) A INA	DEQU	JATE JATE	[[]		

REMARKS:

IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE.

CLARENCE AND TO COMPANY AND ALLER

REPORT DATE 2/26/88

NASA DATA: ASSESSMENT DATE: 1/01/88 RCS-177A BASELINE [ASSESSMENT ID: NEW [X] 03-2F-102170-3 NASA FMEA #: FRCS SUBSYSTEM: MDAC ID: 177 MANIFOLD ISOL VLVS ITEM: LEAD ANALYST: C.D. PRUST ASSESSMENT: CIL CRITICALITY REDUNDANCY SCREENS FLIGHT ITEM Α В С HDW/FUNC IASA [1/1] [] IOA [1/1] [] [] [X] * [NASA [1 /1] [X] COMPARE [/] [] [] [] [] RECOMMENDATIONS: (If different from NASA) [1/1] [] [] [] [A] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [INADEQUATE [1

REMARKS:

THIS FMEA/CIL COVERS ONLY THE BELLOWS LEAKAGE FAILURE MODE FOR THE VERNIER MANIFOLD ISOLATION VALVE. IOA HAS NO ISSUE WITH THIS FAILURE MODE, HOWEVER DOES RECOMMEND THAT THE EFFECTS DISCUSS THE POSSIBLE EXPOSURE OF EVA AND GROUND CREWS TO PROP OR PROP VAPORS. NASA/RI DO NOT COVER STRUCTURAL FAILURE, RUPTURE, OR EXTERNAL LEAKAGE OF THE VALVE HOUSING ON THIS FMEA OR ELSEWHERE. THE SSM AGREED THAT THIS VALVE BODY SHOULD BE ADDED TO THE PROP LINE EXTERNAL LEAKAGE FMEA (03-2F-102108-1) WITH CORRESPONDING RETENTION RATIONALE.

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	NT NT A	D2 II #:	ATE: D:	1/0 RCS 03-	1/88 -177 2F-1021	.12-	-1		1	IASA BASE	DATA LINE NEW	: [[x]]	
SUBSYSTE MDAC ID: ITEM:	M:			FRC 177 MAN	S IFOLD J	soi	L VLVS								
LEAD ANA	LY	ST	:	c.D	. PRUSI	2									
ASSESSME	NT	:													
	CR	IT:		ITY	RI	DUN	IDANCY	SCI	REENS			CI	L		
	r'I HDI	V/FU	NC	A		В	-	(2		T T	EPI			
NASA IOA	[[1 1	/1 /1]]	[[]]	[[]]	[[]]		[[X X]	*
COMPARE			/]	ſ]	[]	[]		[<u>)</u>	
RECOMMEN	DA'	TI (ONS:	(If dif	fere	ent fr	om 1	NASA)						,
	[1	/1]	[]	[]	[]	(A)] DD/	A DE] LE'	TE)
* CIL RE	TE	NT	ION	RATI	ONALE:	(11	f appl	ical	ole) INI	ADEQU ADEQU	ATE ATE	[[]	
REMARKS:	ע /	CT.	т. сс	WERS		THE	BELLO	WS 1	LEAKA	GE FA	TLUR	ЕМ	(OD)	E	FOR

THIS FMEA/CIL COVERS ONLY THE BELLOWS LEAKAGE FAILURE MODE FOR THE PRIMARY MANIFOLD ISOLATION VALVE. IOA HAS NO ISSUE WITH THIS FAILURE MODE, HOWEVER DOES RECOMMEND THAT THE EFFECTS DISCUSS THE POSSIBLE EXPOSURE OF EVA AND GROUND CREWS TO PROP OR PROP VAPORS. NASA/RI DO NOT COVER STRUCTURAL FAILURE, RUPTURE, OR EXTERNAL LEAKAGE OF THE VALVE HOUSING ON THIS FMEA OR ELSEWHERE. THE SSM AGREED THAT THIS VALVE BODY SHOULD BE ADDED TO THE PROP LINE EXTERNAL LEAKAGE FMEA (03-2F-102108-1) WITH CORRESPONDING RETENTION RATIONALE.

- -

5

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-178 NONE	NASA DATA: BASELINE [] NEW []
SUBSYSTEM: MDAC ID: ITEM:	FRCS 178 MANIFOLD ISOL VLVS	
LEAD ANALYST:	C.D. PRUST	wa .
ASSESSMENT:		
CRITICAL FLIGH HDW/FU	ITY REDUNDANCY T NC A B	SCREENS CIL ITEM C
NASA [/ IOA [1 /1] [] [] [] [] [] [] *] [] [X]
COMPARE [N /N	J [] [] [] [И]
RECOMMENDATIONS:	(If different fr	om NASA)
[2/2	ן בייש בעריים בייש בייש בייש בייש בייש בייש בייש בייש] [] [A] (ADD/DELETE)
* CIL RETENTION 1	RATIONALE: (If appl	icable) ADEQUATE [] INADEQUATE []
REMARKS: NASA/RI DO NOT CO WITHDRAWS 1/1 CR A THRUSTER COULD ABORT ISSUE DUE T RTLS & TAL, HOWET POSSIBLE INCOMPLI FUTURE. IOA RECOMMENDS TH ON THE FMEA/CIL	OVER THIS FAILURE M IT, <u>BUT MAINTAINS C</u> CAUSE BURN-THROUGH TO LACK OF CURRENT VER RECOMMENDS A 1/ ETE DUMP) IF SUCH A HAT THE RESTRICTED THE SSM AGREED TH	ODE (RESTRICTED FLOW). IOA ONCERN THAT RESTRICTED FLOW TO . IOA ALSO WITHDRAWS 1/1 FRCS DUMP CAPABILITY DURING 1 ABORT CRIT (BASED ON A CAPABILITY EXISTS IN THE FLOW FAILURE MODE BE ADDRESSED AT THIS FAILURE MODE BE ADDRESSED AT THIS FAILURE MODE SHOULD BE

2

٥

= ;

03-2F-102170-1 (2/2) FOR VERNIER MANIFOLDS. HOWEVER, IOA RECOMMENDS A 2/1R FOR 03-2F-102110-1. SEE ASSESSMENT SHEETS RCS-158, 162, 166, & 170.

REPORT DATE 2/26/88

ASSESSMI ASSESSMI NASA FMI	ENT D ENT I EA #:	DATE:	1/01/ RCS-1 03-2F	88 79 -121	308-3	L		1	NASA I BASEI	DATA LINE NEW	: [[X]]
SUBSYSTI MDAC ID: ITEM:	e m : :		FRCS 179 JET A	LIGN	MENT	BELI	.ows,	PRI	MARY,	ALL	AXES	5
LEAD AND	ALYSI	:	C.D.	PRUS	Т							
ASSESSMI	ENT:											
	CRIT	ICAL	ITY	R	EDUNI	DANCY	SCR	EENS			CIL	ur.
	H	W/FU	NC	A		E	3	(2		1161	-1
NASA IOA	[] []	/1]]	[[]]	[[]]	[[]		[X [X] *]
COMPARE	[/]	[]	[]	[]	-	[]
RECOMMEN	NDATI	ONS:	(If	dif	ferei	nt fr	om N	IASA)				
	[/]	[]	[.]	ĩ]	(Al	[וס/סכ] ELETE)
* CIL RI	ETENI	NOI	RATION	ALE:	(If	appl	.icab	ole) INZ	ADEQU/ ADEQU/	ATE ATE	[]]
REMARKS	: DMMEN	IDS T	HAT TH	E "D	" EFI	FECTS	BE	REVIS	SED.	IOA	CON	SIDERS

LEAKAGE OF PROP TO BE CRITICAL AFTER ET SEP ALSO, AS WELL AS A HAZARD TO EVA AND GROUND CREWS. IOA ALSO RECOMMENDS THAT "ISOL VALVE RELIEF DEVICE FAILURE TO RELIEVE" AND "FAILURE OF LINE BELLOWS TO DEFLECT" BE ADDED AS CAUSES ON THIS FMEA.

•

 $|\rangle$

REPORT DATE 2/26/88

-

.....

Ξ

......

ASSESSMENT DATE: 1/01/88 NASA DATA: ASSESSMENT ID: RCS-180 BASELINE [] NASA FMEA #: NONE NEW [] SUBSYSTEM: FRCS MDAC ID: 180 ITEM: JET ALIGNMENT BELLOWS, PRIMARY, ALL AXES

LEAD ANALYST: C.D. PRUST

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC				F	REDUN	DANCY	SCR	EENS		C] I]	IL TEN	ſ	
					7	\	E	l -	C					
NASA IOA	[[1	/ /1]	[[]]	נ נ]]	[[]]] [x]]	*
COMPARE	[N	/N]	ſ]	נ]	[]	[N]	

RECOMMENDATIONS: (If different from NASA)

	[]	[] (ADD/DELETE)
--	-----	---------------------

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [INADEQUATE [1

1

E

REMARKS:

NASA/RI DO NOT COVER THIS FAILURE MODE (RESTRICTED FLOW). IOA NOW CONSIDERS THE CREDIBILITY OF RESTRICTED FLOW IN A BELLOWS TO BE QUESTIONABLE. IOA DOES NOT REGARD THE ABSENCE OF THIS FAILURE MODE IN THE FMEA/CIL TO BE AN OPEN ISSUE, BUT DOES RECOMMEND THAT THIS FAILURE MODE BE ADDRESSED.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-181 03-2F-121310-2	NASA DATA: BASELINE NEW	[] [X]
SUBSYSTEM: MDAC ID: ITEM:	SOLENOID VLV, PRIMAR	RY, ALL AXES	
LEAD ANALYST:	C.D. PRUST		
ASSESSMENT:			
CRITICAL FLIGH HDW/FU	ITY REDUNDA T NC A	NCY SCREENS B C	CIL ITEM
NASA [3 /1R IOA [1 /1] [F]] []	[P] [P] [] []	[X]* [X]
COMPARE [N /N] [N]	[И] [И]	[]]
RECOMMENDATIONS:	(If different	from NASA)	
[1 /1] []	[][](AI	[A] DD/DELETE)
* CIL RETENTION	RATIONALE: (If a	pplicable) ADEQUATE INADEQUATE	[] []

IOA FAILURE MODES ON ANALYSIS SHEET SHOULD NOT INCLUDE "FAILS ON". IOA RECOMMENDS THAT THE FAILED OPEN MODE BE UPGRADED TO A 1/1 BECAUSE IT RESULTS IN LEAKAGE OF PROP. PER NSTS 22206, ANY SINGLE FAILURE RESULTING IN PROP LEAKAGE SHOULD BE CLASSIFIED AS A 1/1. PROP LEAKAGE PRESENTS A HAZARD TO THE CREW, VEHICLE, AND GROUND CREW. FROM A LOSS OF THRUSTER STANDPOINT, IOA CONSIDERS THIS FAILURE TO BE A 2/1R FPP. SEE ASSESSMENT SHEET RCS-186.

REPORT DATE 2/26/88

- - - -

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-182 NONE			: [] []	
SUBSYSTEM: MDAC ID: ITEM:	FRCS 182 THRUSTER F	SIPROP SOI	ENOID	VLV, PRIMA	RY, ALL AXES
LEAD ANALYST:	C.D. PRUST				
ASSESSMENT:					
CRITICAL FLIGHT	LTY RE	DUNDANCY	SCREEN	S	CIL ITEM
HDW/FUN	NC A	В		С	
NASA [/ IOA [1 /1] [] [] [] [] []	[] * [X]
COMPARE [N /N] [] [] []	[N]
RECOMMENDATIONS:	(If diff	ferent fro	om NASA)	
[1 /1] [] [] [] (A)	[A] DD/DELETE)
* CIL RETENTION H	RATIONALE:	(If appli	.cable) T	ADEQUATE NADEOUATE	[] []
REMARKS:				~ ~ ~ ~ ~ ~	L J

= ;

NASA/RI DO NOT COVER THIS FAILURE MODE (STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE) FOR THE THRUSTER SOLENOID VALVE. THE SSM AGREED THAT THIS VALVE BODY SHOULD BE ADDED TO THE PROP LINE EXTERNAL LEAKAGE FMEA (03-2F-102108-1) WITH CORRESPONDING RETENTION RATIONALE.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-183 NONE		NASA DATA BASELINI NE	A: E [] W []
SUBSYSTEM: MDAC ID: ITEM:	FRCS 183 THRUSTER BIPRC	P SOLENOI	D VLV, PRIM	ARY, ALL AXES
LEAD ANALYST:	C.D. PRUST			
ASSESSMENT:				
CRITICAL	ITY REDUNE	ANCY SCRE	ENS	CIL TTEM
HDW/FU	NC A	В	C	
NASA [/ IOA [1 /1] []] []	[] []	[] []	[] * [X]
COMPARE [N /N] []	[]	[]	[и]
RECOMMENDATIONS:	(If differer	nt from NA	NSA)	
[2 /1R	.] [F]	[P]	[P] ([A] ADD/DELETE)
* CIL RETENTION	RATIONALE: (If	applicabl	.e) ADEQUATE INADEQUATE	[]
REMARKS: NASA/RI DO NOT C WITHDRAWS 1/1 CR A THRUSTER COULD ABORT ISSUE DUE DURING RTLS & TA A POSSIBLE INCOM FUTURE. IOA RECOMMENDS T ON THE FMEA/CIL. ADDED TO 03-2F-1 2/1R FPP FOR 03-	OVER THIS FAILU IT, BUT MAINTAN RESULT IN BURN TO LACK OF CURN L, HOWEVER RECO IPLETE DUMP) IF HAT THE RESTRIC THE SSM AGREN 21310-3 (3/1R M -2F-121310-3.	URE MODE (INS CONCER I-THROUGH. RENT FRCS DMMENDS A SUCH A CA SUCH A CA CTED FLOW ED THAT TH SPP). HOW SEE ASSESS	RESTRICTED IOA ALSO DUMP CAPABI 1/1 ABORT C APABILITY EX FAILURE MOD HIS FAILURE VEVER, IOA R SMENT SHEET	FLOW). IOA RICTED FLOW TO WITHDRAWS 1/1 LITY RIT (BASED ON ISTS IN THE E BE ADDRESSED MODE SHOULD BE ECOMMENDS A RCS-186

REPORT DATE 2/26/88 C-91

•

: 3

- -

23

ΞΞ

NASA DATA: ASSESSMENT DATE: 1/01/88 ASSESSMENT ID: RCS-184 BASELINE [1 NEW [X] NASA FMEA #: 03-2F-121310-3 SUBSYSTEM: FRCS MDAC ID: 184 THRUSTER BIPROP SOLENOID VLV, PRIMARY, -X AXIS ITEM: LEAD ANALYST: C.D. PRUST ASSESSMENT: REDUNDANCY SCREENS CIL CRITICALITY ITEM FLIGHT A B C HDW/FUNC [F] [P] [P] [P] [P] [P] (X) * NASA [3/1R][P] IOA [3/2R] COMPARE [/N] [N] []][N] **RECOMMENDATIONS:** (If different from NASA) [3/2R] [F] [P] [P] [A] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE Γ 1 INADEQUATE 1 Γ REMARKS: IOA AGREES WITH NASA/RI RATIONALE FOR FAILURE OF A SCREEN. IOA CONSIDERS THRUSTERS IN THE SAME AXIS TO BE REDUNDANT TO EACH OTHER. IOA CONSIDERS THE LOSS OF ALL -X THRUSTERS TO BE ONLY A 3/2R FPP. THE -X THRUSTERS ARE NOT REQUIRED FOR ET SEP OR FRCS PROP DUMPING. 03-2F-121310-3 INCLUDES THRUSTERS IN ALL AXES, AND THE CRITICALITY ASSIGNED IS FOR THE WORST-CASE AXIS. $\frac{1}{2} = \frac{1}{2} + \frac{1}$ ettica in the eligible centre of a site

REPORT DATE 2/26/88

C-92

in a second a second

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-185 03-2F-121310-	NASA DATA: BASELINE [] 1310-2 NEW [X]					
SUBSYSTEM: MDAC ID: ITEM:	FRCS 185 THRUSTER BIPI	ROP SOLENOID VLV,	PRIMARY, -X AXIS				
LEAD ANALYST:	C.D. PRUST		• ••• •• •				
ASSESSMENT:							
CRITICAL	ITY REDUI	NDANCY SCREENS	CIL ITEM				
HDW/FU	NC A	B C					
NASA [3 /1R IOA [1 /1] [F]] []	[P] [P] [] []	[X] * [X]				
COMPARE [N /N] [N]	[N] [N]	[]]				
RECOMMENDATIONS:	(If differe	ent from NASA)	and a second sec				
[1 /1] []	[][]	[A] (ADD/DELETE)				
* CIL RETENTION	RATIONALE: (I	f applicáble) ADE INADE	QUATE [] QUATE []				
REMARKS: IOA RECOMMENDS I TO A 1/1 BECAUSE ANY SINGLE FAILU AS A 1/1. PROP	HAT THE INTER IT RESULTS I RE RESULTING LEAKAGE PRESE	NAL LEAKAGE FAILU N LEAKAGE OF PROF IN PROP LEAKAGE S NTS A HAZARD TO T	RE MODE BE UPGRADED . PER NSTS-22206, HOULD BE CLASSIFIED HE CREW,				

AS A 1/1. PROP LEAKAGE PR VEHICLE, AND GROUND CREW.

FROM A LOSS OF THRUSTER STANDPOINT, IOA CONSIDERS THIS FAILURE TO BE A 3/2R FPP. SEE ASSESSMENT SHEET RCS-184. a and a second sec

REPORT DATE 2/26/88

· ----

ASSESSMENT DATE:	1/01/88	NASA	DATA:
ASSESSMENT ID:	RCS-186	BAS	ELINE []
NASA FMEA #:	03-2F-121310-3		NEW [X]
SUBSYSTEM:	FRCS		
MDAC ID:	186		
ITEM:	THRUSTER BIPROP	SOLENOID VLV,	PRIMARY, Y AXIS

LEAD ANALYST: C.D. PRUST

ASSESSMENT:

	CRITICALITY FLIGHT			REDUNDANCY SCREENS						CIL ITEM								
	1	HDI	V/FUI	NC		A				В			С					
NASA IOA	[[3 2	/1R /1R]]	([F P]		[[P P]	[נ	P P]_]	 [[X X]]	*
COMPARE	[N	/]	[N]		ן]	ſ]	[]	

RECOMMENDATIONS: (If different from NASA)

[2/1R] [F] [P] [P] [] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [] INADEQUATE []

REMARKS:

IOA AGREES WITH NASA/RI RATIONALE FOR FAILURE OF A SCREEN. IOA WITHDRAWS 1/1 ABORT CRIT DUE TO LACK OF CURRENT FRCS DUMP CAPABILITY DURING RTLS & TAL, HOWEVER IOA RECOMMENDS A 1/1 ABORT CRIT (BASED ON A POSSIBLE INADEQUATE DUMP) IF SUCH A CAPABILITY EXISTS IN THE FUTURE. IOA CONSIDERS THRUSTERS IN THE SAME AXIS TO BE REDUNDANT TO EACH OTHER. IOA RECOMMENDS THAT THE FAILED CLOSED FAILURE MODE FOR PRIMARY THRUSTERS IN THE Y AXIS BE UPGRADED TO A 2/1R FPP. LOSS OF BOTH +Y OR BOTH -Y JETS COULD RESULT IN INABILITY TO DUMP FRCS PROP, LEADING TO POSSIBLE VIOLATIONS OF ENTRY MASS PROPERTIES CONSTRAINTS AND LOSS OF LIFE OR VEHICLE DURING ENTRY. 03-2F-121310-3 INCLUDES THRUSTERS IN ALL AXES, AND THE CRITICALITY ASSIGNED IS FOR THE WORST-CASE AXIS.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-187 03-2F-121310-	NASA DATA: BASELINE [] 1310-2 NEW [X]								
SUBSYSTEM: MDAC ID: ITEM:	FRCS 187 THRUSTER BIPR	OP SOLENOID VLV, PRIM	ARY, Y AXIS							
LEAD ANALYST:	C.D. PRUST									
ASSESSMENT:										
CRITICAL FLIGH	ITY REDUN T	IDANCY SCREENS	CIL ITEM							
HDW/FU	NC À	B C								
NASA [3 /1R IOA [1 /1] [F]] []	[P] [P] [] []	[X] * [X]							
COMPARE [N /N] [N]	[N] [N]	[]							
RECOMMENDATIONS:	(If differe	ent from NASA)								
[1 /1] []		[] ADD/DELETE)							
* CIL RETENTION	RATIONALE: (If	applicable) ADEQUATE INADEOUATE								
REMARKS: IOA RECOMMENDS THAT THE INTERNAL LEAKAGE FAILURE MODE BE UPGRADED TO A 1/1 BECAUSE IT RESULTS IN LEAKAGE OF PROP. PER NSTS-22206, ANY SINGLE FAILURE RESULTING IN PROP LEAKAGE SHOULD BE CLASSIFIED AS A 1/1. PROP LEAKAGE PRESENTS A HAZARD TO THE CREW,										

VEHICLE, AND GROUND CREW. FROM A LOSS OF THRUSTER STANDPOINT, IOA CONSIDERS THIS FAILURE TO BE A 2/1R FPP. SEE ASSESSMENT SHEET RCS-186.

REPORT DATE 2/26/88

- -

11

ASSESSME ASSESSME NASA FME	NT DA NT II A #:	ATE: D:	1/0 RCS 03-	1/88 -188 2F-1	21:	310-3	NASA DATA: BASELINE [] 3 NEW [X]]		
SUBSYSTE MDAC ID: ITEM:	M:		FRC 188 THR	S USTE	R	BIPRO	ΟP	soi	LEN	IOID	v	LV, PF	RIMAF	RΥ,	Z	A	KIS
LEAD ANA	LYST	:	c.D). PR	US	r											
ASSESSME	NT:																
	CRIT: FI HDV	ICALI LIGHT W/FUN	CTY C IC		RI A	EDUNI	DAN	ICY B	sc	REE	NS	С		CI IT	L EM		
NASA IOA	[3 [3	/1R /2R]]	. ((F P]]	[P P]]		[]]	P] P]		[[X]	k
COMPARE	[/N]	[N]	۵]		[]	*	[N]	
RECOMMEN	DATI	ons:	((If d	lif	ferei	nt	fr	om	NAS	A)					-	
	[/]	[•]	[]		[]	(AI] /00/	DE] LE	FE)
* CIL RE	TENT	ION	RATI	[ONAI	E:	(If	aŗ	pl.	ica	able) IN	ADEQUI ADEQUI	ATE ATE	[[]]	
REMARKS:																	

 \equiv

-

-

53

==

IOA AGREES WITH NASA/RI RATIONALE FOR 3/1R FPP ASSIGNMENT FOR THRUSTERS IN THE Z AXIS. IOA CONSIDERS THRUSTERS IN THE SAME AXIS TO BE REDUNDANT TO EACH OTHER. 03-2F-121310-3 INCLUDES THRUSTERS IN ALL AXES, AND THE CRITICALITY ASSIGNED IS FOR THE WORST-CASE AXIS.

REPORT DATE 2/26/88

11

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-189 03-2F-121310-2	NASA DATA: BASELINE [] NEW [X]					
SUBSYSTEM: MDAC ID: ITEM:	FRCS 189 THRUSTER BIPROP SOLENOI	ID VLV, PRIMARY, Z AXIS					
LEAD ANALYST:	LEAD ANALYST: C.D. PRUST						
ASSESSMENT:							
CRITICAL	ITY REDUNDANCY SCRI	EENS CIL ITEM					
HDW/FU	NC A B	C					
NASA [3 /1R IOA [1 /1	[F] [P]] [] []	[P] [X] * [] [X]					
COMPARE [N /N] [И] [И]	[И] [И]					
RECOMMENDATIONS:	(If different from NA	ASA)					
[1 /1] [] []	[] [] (ADD/DELETE)					
* CIL RETENTION	RATIONALE: (If applicab)	le)					
		INADEQUATE []					
REMARKS: IOA RECOMMENDS I TO A 1/1 BECAUSE ANY SINGLE FAILU AS A 1/1. PROP	THAT THE INTERNAL LEAKAG IT RESULTS IN LEAKAGE (RE RESULTING IN PROP LEA LEAKAGE PRESENTS A HAZA)	E FAILURE MODE BE UPGRADED OF PROP. PER NSTS-22206, AKAGE SHOULD BE CLASSIFIED RD TO THE CREW,					

VEHICLE, AND GROUND CREW. FROM A LOSS OF THRUSTER STANDPOINT, IOA CONSIDERS THIS FAILURE TO BE A 3/1R FPP. SEE ASSESSMENT SHEET RCS-188.

REPORT DATE 2/26/88

E

=

_

-

≣

-

.

ASSESSME ASSESSME NASA FME	NT NT A	D2 I1 #:	ATE: D:	1/01/ RCS-1 NONE	88 90				ľ	iasa Base	DATA: LINE NEW	[[]]
SUBSYSTE MDAC ID: ITEM:	M:			FRCS 190 JET A	LIGN	IMENT	BELI	.ows ,	VERN	NIER,	ALL	AXE	S
LEAD ANA	LY	ST	:	C.D.	PRUS	ST							
ASSESSME	NT	:											
	CR	IT	ICAL	ITY	F	REDUN	DANCY	SCF	REENS			CIL	
	1	F) HDI	LIGH W/FU	r NC	A	. .	E	3	Ċ	3		TIE	M
NASA IOA	[[1	//1]	[[]	. [[]]	[[]]		[[x] *
COMPARE	[N	/N]	[]	[]	[]		[N]
RECOMMEN	DA'	FI (ONS:	(If	dif	fere	nt fr	om N	IASA)				
	[/]	[]	[]	נ]	(AI	[)D/D] ELETE)
* CIL RE	TE	NT:	ION	RATION	ALE:	(If	appl	icat	ole) // IN/	ADEQU	ATE ATE	[[]]
REMARKS: THERE AR LINES.	E	NO	ALI	GNMENI	BEI	LOWS	ON T	HE V	/ERNII	ER TH	RUSTE	R P	ROP

ASSESSME ASSESSME NASA FME	NT DATE: NT ID: A #:	1/01/0 RCS-19 NONE	N	ASA I BASEI	ATA: LINE NEW	[[]]			
SUBSYSTE MDAC ID: ITEM:	M:	FRCS 191 JET AI	RCS .91 VET ALIGNMENT BELLOWS, VERNIER, ALL							
LEAD ANALYST: C.D. PRUST										
ASSESSME	NT:									
	CRITICAL	LITY	RED	UNDANC	Y SCR	REENS			CIL	vr
	HDW/FU	JNC	A		В	с				.1
NASA IOA	[/ [1 /1]	[] []	[]	[[]]		[[X] *
COMPARE	[N/N]]	[]	[]	[]		[N]
RECOMMEN	DATIONS	: (If	diffe	rent f	from N	IASA)				
	[/	1	[]	ſ]	Γ]	(Al	[וס/סכ] ELETE)
* CIL RE	TENTION	RATION	ALE: (If app	licat	ole) A INA	DEQUA DEQUA	ATE ATE	[]
REMARKS: THERE AR	E NO AL	IGNMENT	BELLC	WS ON	THE V	/ERNIE	R THI	RUSTI	ER P	ROP

LINES.

.

---- ---

-

7 3

.

-

-

.

REPORT DATE 2/26/88

C-99

.

e e las

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #: SUBSYSTEM: MDAC ID: ITEM:			1/01/88 RCS-192 03-2F-131310-2				NASA DATA: BASELINE [] NEW [X]							
			FRCS 192 THRUSTER BIPROP SOLEN					LENOID VLV, VERNIH			ers,	ALL	AXES	
LEAD ANALYST:			C.D. PRUST											
ASSESSME	ENT	:												
CRITICAL				ITY REDUNDAN				NCY SCREENS				CIL		
	HDW/FUNC			NC	2 A		E	В		С		1164		
NASA IOA	[[2 1	/2 /1]]	[[]]	[[]]	[[]		[X [X] *]	
COMPARE	[N	/N]	[]	Γ	נ	[]		[]	
RECOMMEN	IDA:	FI C	ONS:	(If	dif	fere	nt fr	com N	ASA)					
	[1	/1]	נ ַ]	[]	[]	(Al	[נס/סס] ELETI	E)
* CIL RE	etei	NT:	ION	RATION	ALE:	(If	appl	licab	le) INZ	ADEQUI ADEQUI	ATE ATE	[]]	
IOA FAII	LURI	E 1	MODE	S ON A	NALY	SIS	SHEET	г зно	ULD 1	I TOF	NCLUI	DE "]	TAIL	3
ON". TO)A 1	REC	COMM	ENDS T	'HAT	THE	FAILE	ED OP	EN MO	DDE B	E UPO	GRADI	ED TO) A

ON". IOA RECOMMENDS THAT THE FAILED OPEN MODE BE UPGRADED TO A 1/1 BECAUSE IT RESULTS IN LEAKAGE OF PROP. PER NSTS 22206, ANY SINGLE FAILURE RESULTING IN PROP LEAKAGE SHOULD BE CLASSIFIED AS A 1/1. PROP LEAKAGE PRESENTS A HAZARD TO THE CREW, VEHICLE, AND GROUND CREW. FROM A LOSS OF VERNIER THRUSTER STANDPOINT, IOA AGREES WITH THE

NASA/RI 2/2 ASSIGNMENT. IOA ALSO RECOMMENDS THAT THE SUBASSEMBLY ITEMS INCLUDED ON THIS FMEA BE SEPARATED ONTO INDIVIDUAL FMEAS.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-193 03-2F-131310-1	NASA DATA: BASELINE [] NEW [X]						
SUBSYSTEM: MDAC ID: ITEM:	FRCS 193 THRUSTER BIPROF	SOLENOID VLV, VERNI	ERS, ALL AXES					
LEAD ANALYST:	C.D. PRUST							
ASSESSMENT:								
CRITICAL	ITY REDUNDA	CIL TTEM						
HDW/FU	NC A	ВС	1104					
NASA [2 /2 IOA [2 /2] []		[X] * [X]					
COMPARE [/] . []	[][]	[]					
RECOMMENDATIONS: (If different from NASA)								
] []	[] [] (A	[] DD/DELETE)					
* CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE []								
REMARKS: NO DIFFERENCES. IOA RECOMMENDS THAT THE SUBASSEMBLY ITEMS INCLUDED ON THIS FMEA BE SEPARATED ONTO INDIVIDUAL FMEAS.								

REPORT DATE 2/26/88 C-101

٦,

-

-

•

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-194 NONE		NA B	SA DATA: ASELINE NEW	[]				
SUBSYSTEM: MDAC ID: ITEM:	FRCS 194 THRUSTER B	IPROP SOL	ENOID VLV	, VERNIE	RS, ALL AXES				
LEAD ANALYST:	C.D. PRUST								
ASSESSMENT:									
CRITICAL FLIGH HDW/FU	ITY RE F IC A	DUNDANCY	SCREENS		CIL ITEM				
			•						
NASA [/ IOA [1 /1] [] [] [] [] [] []	[] * [X]				
COMPARE [N /N	J [J [J []	[N]				
RECOMMENDATIONS: (If different from NASA)									
[1 /1] [] [] [] (AD	[A] D/DELETE)				
* CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE [] REMARKS:									

4

NASA/RI DO NOT COVER THIS FAILURE MODE (STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE). THE SSM AGREED THAT THIS VALVE BODY SHOULD BE ADDED TO THE PROP LINE EXTERNAL LEAKAGE FMEA (03-2F-102108-1) WITH CORRESPONDING RETENTION RATIONALE.

REPORT DATE 2/26/88

4
ASSESSMEN ASSESSMEN NASA FMEA	T DATE: T ID: . #:	1/01/8 RCS-19 03-2F-	8 5 13131	.0-2		N	ASA DATA BASELINE NEW	: [[x]
SUBSYSTEM MDAC ID: ITEM:	[:	FRCS 195 THRUST	RCS 95 HRUSTER BIPROP SOLENOID VLV, VERNIERS, ALL A							ALL AXES
LEAD ANALYST: C.D. PRUST										
ASSESSMEN	T:									
с	RITICAL FLIGH	ITY T	RED	UNDANC	Y SCRI	EENS		CI IT	L EM	
	HDW/FU	NC	A		В	С				
NASA IOA	[2 /2 [1 /1]]	[] []	[[]]	[[]]	[[X X] *]
COMPARE	[N /N]	[]	[]	[]	[]
RECOMMEND	ATIONS:	(If	diffe	erent f	rom NA	ASA)				
	[1 /1]	[]	[]	[] (A] DD/	'DE] LETE)
* CIL RET	ENTION	RATIONA	LE: (If app	licabl	Le) A INA	DEQUATE DEQUATE	[[]

IOA RECOMMENDS THAT THE INTERNAL LEAKAGE FAILURE MODE BE UPGRADED TO A 1/1 BECAUSE IT RESULTS IN LEAKAGE OF PROP. PER NSTS 22206, ANY SINGLE FAILURE WHICH RESULTS IN PROP LEAKAGE SHOULD BE CLASSIFIED AS A 1/1. PROP LEAKAGE PRESENTS A HAZARD TO CREW, VEHICLE, AND GROUND CREW. FROM A LOSS OF VERNIER THRUSTER STANDPOINT, IOA AGREES WITH THE NASA/RI 2/2 ASSIGNMENT. IOA ALSO RECOMMENDS THAT THE SUBASSEMBLY COMPONENTS INCLUDED ON THIS FMEA BE SEPARATED ONTO INDIVIDUAL FMEAS.

REPORT DATE 2/26/88

-

ASSESSMI ASSESSMI NASA FMI	ENT DA ENT IA EA #:	ATE: D:	1/01/8 RCS-19 03-2F-	38 96 -1313	310-1			N2]	ASA DATA BASELINE NEW	: [[X]	
SUBSYSTE MDAC ID: ITEM:	5 M : ;		FRCS 196 THRUST	TER H	BIPRO	P SO	LENOII	D AFA	V, VERNI	ERS,	ALL A	XES
LEAD ANA	LYST	•	C.D. H	PRUST	r		-					
ASSESSME	ent:											
	CRIT F	ICAL LIGH W/FUI	ITY F NC	RI A	EDUND	ANCY B	SCREI	ens C	-,- ··	CIL ITE	м	
NASA IOA	[2 [1	/2 /1]]	[[]	[[]	[[]]	[X [X] *]	
COMPARE	[N	/N]	[]	[]	[]	[]	
RECOMMEN	IDATI	ons:	(If	diff	ferent	t fr	om NAS	SA)				
	[1]	[]	[]	[] (A	[DD/DD] ELETE)	
* CIL RI	TENT	ION	RATION	ALE:	(If a	appl	icable	∍) Al INAI	DEQUATE DEQUATE	[]	
REMARKS	:									-		

_

IOA WITHDRAWS 1/1 CRIT, BUT MAINTAINS CONCERN THAT RESTRICTED FLOW TO A THRUSTER COULD RESULT IN BURN-THROUGH. FROM A LOSS OF VERNIER THRUSTER STANDPOINT, IOA AGREES WITH THE NASA/RI 2/2 ASSIGNMENT.

IOA RECOMMENDS THAT THE SUBASSEMBLY ITEMS INCLUDED ON THIS FMEA BE SEPARATED ONTO INDIVIDUAL FMEAS.

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	NT D. NT I A #:	ATE: D:	1/01/ RCS-1 03-2F	88 97 -121	312-1			N	ASA I BASEI	DATA: LINE NEW	[}]		
SUBSYSTE MDAC ID: ITEM: PRIMARY,	M: All	AXE	FRCS 197 THRUS S	TER	COMBU	STIC	ON CH	AMBER	ORN	IOZZI	E I	XT]	ENSIC	эм,
LEAD ANA	LYST	:	C.D.	PRUS	т									
ASSESSME	NT:													
	CRIT F HD	ICAL LIGH W/FU	ITY T NC	R A	EDUND	DANCY E	SCR	EENS C			CII ITH	, M		
NASA IOA	[1 [1	/1 /1]]	[[]]	[[]]	[[]]		[]	[] []	*	
COMPARE	[/]	[]	[]	[]		C]		
RECOMMEN	DATI	ons:	(If	dif	feren	nt fr	om N	ASA)						
	[/]	[]	[]	· []	(AD	[0D/1])EL	ETE)	
* CIL RE	* CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE [] REMARKS:													
NO DIFFE	RENC	ES.	IOA R	ECOM	MENDS	THA	TTH	E FAI	LURE	MODE	s c	N !	THIS	

FMEA INCLUDE "STRUCTURAL FAILURE".

REPORT DATE 2/26/88

ņ :

::

* 7

ΞΞ ----

-

And in the

C-105

,

_

.

2

Ξ

Ī

=

,

ASSESSMENT DAT ASSESSMENT ID: NASA FMEA #:	TE: 1/01/88 RCS-197A 03-2F-12	1313-1		NASA DATA: BASELINE [] NEW [X]						
SUBSYSTEM: MDAC ID: ITEM: PRIMARY, ALL A	FRCS 197 THRUSTER AXES	COMBUST	ION CHAI	MBER OR N	IOZZLE H	EXTENSION				
LEAD ANALYST:	C.D. PRU	ST								
ASSESSMENT:										
CRITIC FLI	CALITY	REDUNDAN	CY SCRE	ENS	CII ITH	_ EM				
HDW/	FUNC	A	В	C						
NASA [1 / IOA [1 /	/1] [/1] [] [] []	[] []	[2	<pre><] *<</pre>				
COMPARE [/	′] [) []	[]	Ľ]				
RECOMMENDATION	NS: (If di	fferent	from NA	SA)						
[/	′) [] {]	[]	[(ADD/I] DELETE)				
* CIL RETENTIO	ON RATIONALE	: (If ap	plicabl	e) ADEQUA INADEQUA	ATE (ATE (]				
REMARKS: NO DIFFERENCES FMEA INCLUDE ' SUBASSEMBLY IT INDIVIDUAL FME	5. IOA RECO 'STRUCTURAL TEMS INCLUDE EAS.	MMENDS T FAILURE" D ON THI	HAT THE . IOA S FMEA	FAILURE ALSO RECO BE SEPARA	MODES (MMENDS ATED ONT	ON THIS THAT THE TO				

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	NT NT A #	DATE: ID: :	1/01 RCS- 03-2	/88 198 F-131	L310-	•4		1	IASA DAT. BASELIN NE	A: E [W []] []	
SUBSYSTE MDAC ID: ITEM: VERNIER,	M: AL	L AXE	FRCS 198 THRU S	STER	COME	USTIO	N CH	AMBER	R OR NOZ	ZLE I	XTENS	ION,
LEAD ANA	LYS	т:	C.D.	PRUS	ST							
ASSESSME	NT:											
	CRI	TICAL	ITY	I	REDUN	IDANCY	SCR	EENS		CII TTI	L M	
	H	DW/FU	NC	2	A	B	•	C	2			
NASA IOA	[[1 /1 1 /1]	[[]]	ן נ]]	[[]	[]	(] * (]	
COMPARE	נ	/]	[]	[]	[]	Γ]	
RECOMMEN	DAT	IONS:	(1	f di	fere	ent fr	om N	ASA)				
	נ	/]	[]	[]	[]] ADD/I] DELETE)
* CIL RE	TEN	TION	RATIC	NALE	(If	appl	icab	le) / IN/	ADEQUATE ADEQUATE	[[]]	
REMARKS:	יסדא	OFC	TO3	DECO	MENT		ໜີ ຫັນ	ו אים ים			<u>ឃ</u> ាំបារីរា	C

NO DIFFERENCES. IOA RECOMMENDS THAT THE FAILURE MODES ON THIS FMEA INCLUDE "STRUCTURAL FAILURE" AND "BURN-THROUGH". IOA ALSO RECOMMENDS THAT THE SUBASSEMBLY ITEMS INCLUDED ON THIS FMEA BE SEPARATED ONTO INDIVIDUAL FMEAS.

_

-

.

ASSESSME ASSESSME NASA FME	NT I NT] A #:	DATE: [D: ;	1/01 RCS- 03-2	/88 199 A-201	.010-	1		ł	IASA BASE	DATA: LINE NEW	[[X]]
SUBSYSTE MDAC ID: ITEM:	:M		ARCS 199 HELI	um si	ORAG	E TAN	K		-			
LEAD ANA	LYSI	:	C.D.	PRUS	T							
ASSESSME	NT:											
	CRIT	TICAL	ITY	F	REDUN	DANCY	SCR	EENS			CIL	M
	HI	W/FU	NC	7	L	E	5	C	2		110	
NASA IOA	[] []	/1 /1]]	[[]]	[[]]	[[]]		[X [X] *]
COMPARE	[1]	[]	[]	[]		[]
RECOMMEN	DATI	ons:	(I	f dif	fere	nt fr	om N	ASA)				
	[1]	[]	C]	[]	(AI	[00/01] ELETE)
* CIL RE	TENI	TION	RATIO	NALE:	(If	appl	icab	le) // IN/	DEQU.	ATE ATE	[[]
REMARKS: NO DIFFE	RENC	CES.	TOA	RECOM	MEND	S ADD	ING	A STA	TEME	NT ТС	TH	E EFFE

ECTS ABOUT POSSIBLE VIOLATIONS OF ORBITER ENTRY MASS PROPERTIES CONSTRAINTS AND/OR TANK LANDING WEIGHT CONSTRAINTS.

.

· · · · · ·

=

=

-

= :

= : •

. .

REPORT DATE 2/26/88 · C-108

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-200 03-2A-2	01070-1		NASA DATA BASELINE NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM:	ARCS 200 HELIUM	FILL COU	PLING		
LEAD ANALYST:	C.D. PR	UST	1.12.4.17	·	
ASSESSMENT:					
CRITICAL FLIGH	ITY T	REDUNDA	NCY SCREE	NS	CIL ITEM
HDW/FU	NC	A	В	С	
NASA [2 /1R IOA [2 /1R] [] [F] P]	[F] [NA]	[P] [P]	[X]* [X]
COMPARE [/	.] [N]	[N]	[]	[]
RECOMMENDATIONS:	(If d	ifferent	from NAS.	A)	
[2 /1R] [F]	[F]	[P] (A	[A] DD/DELETE)
* CIL RETENTION	RATIONAL	E: (If a	pplicable) ADEQUATE INADEQUATE	[] []
REMARKS: IOA AGREES WITH	NASA/RI	FAILURE	OF A AND	B SCREENS.	IOA

IOA AGREES WITH NASA/RI FAILURE OF A AND B SCREENS. IOA RECOMMENDS THAT "POPPET FAILS OPEN" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE.

REPORT DATE 2/26/88

-

ъ...:

-

١.

NASA DATA: ASSESSMENT DATE: 1/01/88 ASSESSMENT ID: RCS-201 BASELINE [] NEW [X] 03-2A-201070-2 NASA FMEA #: SUBSYSTEM: ARCS 201 MDAC ID: HELIUM FILL COUPLING ITEM: LEAD ANALYST: C.D. PRUST ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL ITEM FLIGHT В С HDW/FUNC A NASA [3 /3]]] [1] [[] Γ ι Ì. IOA [3 /3 [1 1 1] []] ſ COMPARE] **RECOMMENDATIONS:** (If different from NASA) [3/3] [] [] [] [(ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE I ٦ INADEQUATE 1 ſ **REMARKS:** IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO

IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE. REPORT DATE 2/26/88

ASSESSMENT DATE: 1/01/88 ASSESSMENT ID: RCS-202 NASA FMEA #: 03-2A-201020-2							NASA DATA: BASELINE [] NEW [X]									
SUBSYSTE MDAC ID: ITEM:	M:		ARCS 202 HE I	SOL	A	& B	VLV	s								
LEAD ANA	LYST	:	C.D.	PRU	JSI	?										
ASSESSME	NT:															
	CRIT		ITY		RE	DUN	DANC	Y	SCR	EEN	5				L RM	
	HD	W/FU	NC		A			в			С					
NASA IOA	[3 [3	/1R /1R]	[[P P]]	[[P P]	[[P P]		[[] *]	
COMPARE	C	/]	[]	[]	[]		[j	
RECOMMEN	DATI	ons:	(I	f di	iff	ere	nt f	ro	m N	ASA)					
	[3	/1R]	[P]	Γ	F]	[P]	(A	נ] ו/סס	A] DELET	E)
* CIL RE	TENT	ION	RATIO	NALE	Ξ:	(If	app	1i	cab	le) I	A A	DEQU.	ATE ATE	[[]	
REMARKS:	RECO	MMEN	DS TH	י ידא	гнт	εв	SCRE	EN	BE	FA	ILJ	ED A	ND T	- HAT	- THIS	I

IOA NOW RECOMMENDS THAT THE B SCREEN BE FAILED AND THAT THIS ITEM AND FAILURE MODE BE ADDED TO THE CIL. A FAILURE OF THE REDUNDANT SECONDARY REG IS NOT DETECTABLE DURING FLIGHT.

ċ-4

REPORT DATE 2/26/88

.

2

۲

ī,

•

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-202A NONE			NASA DATA BASELINE NEW	; []] []]			
SUBSYSTEM: MDAC ID: ITEM:	ARCS 202 HE ISOL	A & B V	/LVS					
LEAD ANALYST:	C.D. PRU	.D. PRUST						
ASSESSMENT:								
CRITICAL	ITY r	REDUNDA	NCY SCREI	ENS	CIL			
HDW/FU	NC	A	В	С				
NASA [/ IOA [3 /1R] [] [] P]	[] [P]	[] [P]	[] * []			
COMPARE [N /N] [м]	[N]	[и]	[]			
RECOMMENDATIONS:	(If di	fferent	from NAS	SA)				
[3 /1R] [P]	[F]	[P] (AI	[A] DD/DELETE)			
* CIL RETENTION	RATIONALE	: (If a	pplicable	e) ADEQUATE INADEQUATE				
REMARKS: NASA/RI DO NOT C SSM AGREED THAT 201020-2, WHICH A 3/1R PFP FOR 0	OVER THIS THIS FAIL IS CLASSI 3-2A-2010	FAILUR URE MOD FIED AS 20-2.	RE MODE (1 DE SHOULD S A 3/1R 1 SEE ASSES	INTERNAL LEAN BE ADDED TO PPP. IOA NOW SSMENT SHEET	(AGE). THE 03-2A- V RECOMMENDS RCS-202.			

REPORT DATE 2/26/88 C-112

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-203 03-2A-201020-3	NASA DAT BASELIN 1 NE	A: E [] W [X]
SUBSYSTEM: MDAC ID: ITEM:	ARCS 203 HE ISOL A & B	VLVS	
LEAD ANALYST:	C.D. PRUST		
ASSESSMENT:			
CRITICAL FLIGH HDW/FU	ITY REDUNI F	DANCY SCREENS	CIL ITEM
NASA [2 /1R IOA [2 /1R] [P]] [P]	[P] [P] [NA] [P]	[X]* [X]
COMPARE [/] []	[N] []	[]
RECOMMENDATIONS:	(If differen	nt from NASA)	
[/] []		[] ADD/DELETE)
* CIL RETENTION	RATIONALE: (If	applicable) ADEQUATE INADEQUATE	[] []

IOA AGREES WITH NASA/RI PASSAGE OF B SCREEN. IOA RECOMMENDS ADDING A STATEMENT TO THE EFFECTS ABOUT POSSIBLE VIOLATIONS OF ORBITER ENTRY MASS PROPERTIES CONSTRAINTS AND/OR PROP TANK LANDING WEIGHT CONSTRAINTS.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-204 03-2A-2010	013-1		NASA DATA: BASELINE NEW	[[X]
SUBSYSTEM: MDAC ID: ITEM:	ARCS 204 HE LINE, A	ALL EXCEPT	T ISOL V	VLV TO PRES	SS RI	EGULATOR
LEAD ANALYST:	C.D. PRUS	r				
ASSESSMENT:						
CRITICALI FLIGHT	ITY RI	EDUNDANCY	SCREENS	5	CIL ITEN	1
HDW/FUN	NC A	В		С		
NASA [1 /1 IOA [1 /1] [] [] [] [] [] []	[X [X] *]
COMPARE [/] [] [] []	[]
RECOMMENDATIONS:	(If dif:	ferent fro	om NASA)			. <u>.</u>
[/] [Ι [] [] (AI] ELETE)
* CIL RETENTION H	RATIONALE:	(If appli	icable) IN	ADEQUATE IADEQUATE	[[]]

NO DIFFERENCES. IOA RECOMMENDS ADDING A STATEMENT TO THE EFFECTS ABOUT POSSIBLE VIOLATIONS OF ORBITER ENTRY MASS PROPERTIES CONSTRAINTS AND/OR PROP TANK LANDING WEIGHT CONSTRAINTS. THIS FMEA SHOULD ALSO INCLUDE HELIUM COMPONENT BODIES IN THE ITEM LIST AND CORRESPONDING RETENTION RATIONALE. THE SSM AGREED THAT VALVE BODIES SHOULD BE ADDED.

REPORT DATE 2/26/88

.

C-114

ne general de la des

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-205 NONE	NASA DATA BASELINE NEW	: [] []
SUBSYSTEM: MDAC ID: ITEM:	ARCS 205 HE LINE, ALL EX	CEPT ISOL VLV TO PRES	5S REGULATOR
LEAD ANALYST:	C.D. PRUST		
ASSESSMENT:			
CRITICAL FLIGH HDW/FU	ITY REDUNDA T NC A	ANCY SCREENS B C	CIL ITEM
NASA (/			[]*
IOA [1/1	j č.j	i i i i	į́xj
COMPARE [N /N] []	[И] [И]	[N]
RECOMMENDATIONS:	(If different	from NASA)	
[/] []	[] [] (A)	[] DD/DELETE)
* CIL RETENTION	RATIONALE: (If a	applicable) ADEQUATE INADEQUATE	[] []

NASA/RI DO NOT COVER RESTRICTED FLOW IN A SEGMENT OF LINE DUE TO OBSTRUCTION OR DEFORMATION (CRIMPING). SUCH AN OCCURRENCE COULD RESULT IN 1/1 EFFECTS, HOWEVER THE CREDIBILITY OF SUCH AN OCCURRENCE IS QUESTIONABLE. ANY CONTAMINATION WOULD FLOW TO DOWNSTREAM FILTER OR COMPONENT. IOA RECOMMENDS THAT SUCH A FAILURE BE ADDRESSED ON THE FMEA/CIL, BUT DOES NOT REGARD THIS RECOMMENDATION AS AN OPEN ISSUE.

REPORT DATE 2/26/88

ASSESSMENT DATE:	1/01/88	NASA DATA:
ASSESSMENT ID:	RCS-206	BASELINE []
NASA FMEA #:	03-2A-201013-1	NEW [X]
SUBSYSTEM:	ARCS	
MDAC ID: ITEM:	HE LINE, ISOL VLV TO PRESS	REGULATOR

LEAD ANALYST: C.D. PRUST

ASSESSMENT:

	CRI	TICAL	ITY		REDUNDANCY SCREENS								CIL TTEM			
	H	DW/FU	NC		A			В			С		Ŧ	1 101	.1	
NASA IOA	[1 /1 2 /1R]	[[P]]	[נ	P]	[[P]	[[X X]]	*
COMPARE	[N /N]	[N]	נ	N]	[N]	[]	

RECOMMENDATIONS: (If different from NASA)

[1]	[]	[]	[]	[]
-	-	-	-	-	-				(ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [] INADEQUATE []

.

REMARKS:

IOA ORIGINALLY CONSIDERED THE PARALLEL LINE SEGMENTS OF THE ISOL VLV LEGS TO BE REDUNDANT. HOWEVER, IOA AGREES WITH THE NASA/RI CRIT 1/1 ASSIGNMENT. IOA RECOMMENDS ADDING A STATEMENT TO THE EFFECTS REGARDING POSSIBLE VIOLATIONS OF ORBITER ENTRY MASS PROPERTIES CONSTRAINTS AND PROP TANK LANDING WEIGHT CONSTRAINTS. THIS FMEA SHOULD ALSO INCLUDE HELIUM COMPONENT BODIES IN THE ITEM LIST AND CORRESPONDING RETENTION RATIONALE. THE SSM AGREED THAT VALVE BODIES SHOULD BE ADDED.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-207 NONE			NASA DATA BASELINE NEW	; [] []
SUBSYSTEM: MDAC ID: ITEM:	ARCS 207 HE LINE,	ISOL V	'LV TO PRE	SS REGULATO	R
LEAD ANALYST:	C.D. PRU	ST			
ASSESSMENT:					
CRITICAL FLIGH	ITY :	REDUNDA	NCY SCREE	INS	CIL ITEM
HDW/FU	NC .	A	В	С	
NASA [/ IOA [2 /1R] [] [] P]	[] [P]	[] [P]	[] * [X]
COMPARE [N /N	J [N]	[N]	[N]	[N]
RECOMMENDATIONS:	(If di	fferent	from NAS	SA)	
, , , , , , , , , , , , , , , , , , ,] []	[]	[] (A)	[] DD/DELETE)
* CIL RETENTION	RATIONALE	: (If a	opplicable	≥) ADEQUATE INADEQUATE	
REMARKS: NASA/RI DO NOT C	OVER REST	RICTED	FLOW IN A	A SEGMENT OF	LINE DUE

NASA/RI DO NOT COVER RESTRICTED FLOW IN A SEGMENT OF LINE DUE TO OBSTRUCTION OR DEFORMATION (CRIMPING). SUCH AN OCCURRENCE COULD RESULT IN 2/1R EFFECTS, HOWEVER THE CREDIBILITY OF SUCH AN OCCURRENCE IS QUESTIONABLE. ANY CONTAMINATION WOULD FLOW TO DOWNSTREAM FILTER OR COMPONENT. IOA RECOMMENDS THAT SUCH A FAILURE BE ADDRESSED ON THE FMEA/CIL, BUT DOES NOT REGARD THIS RECOMMENDATION AS AN OPEN ISSUE.

REPORT DATE 2/26/88

E:C

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-208 03-2A-201091-1	NASA DAT. BASELIN NE	A: E [] W [X]
SUBSYSTEM: MDAC ID: ITEM:	ARCS 208 HIGH PRESSURE	HELIUM TEST PORT COU	PLINGS A & B
LEAD ANALYST:	C.D. PRUST		 -
ASSESSMENT:			
CRITICALI FLIGHT	ITY REDUNI	DANCY SCREENS	CIL ITEM
HDW/FUN	IC A	B C	
NASA [3 /1R IOA [3 /1R] [F]] [P]	[F] [P] [NA] [P]	[X]* []
COMPARE [/] [N]	[N] []	[N]
RECOMMENDATIONS:	(If differer	nt from NASA)	
. [3 /1R] [F]	[F] [P] ()	[A] ADD/DELETE)
* CIL RETENTION H	RATIONALE: (If	applicable) ADEQUATE INADEQUATE	[]

REMARKS:

IOA AGREES WITH NASA/RI RATIONALE FOR FAILURE OF A AND B SCREENS. IOA RECOMMENDS THAT "POPPET FAILS OPEN" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON 03-2F-101070-1. THE SSM AGREED WITH THE IOA ISSUE. IOA ALSO RECOMMENDS ADDING A STATEMENT TO THE EFFECTS REGARDING POSSIBLE VIOLATIONS OF ORBITER ENTRY MASS PROPERTIES CONSTRAINTS AND PROP TANK LANDING WEIGHT CONSTRAINTS. THE QUANTITY ON THIS FMEA IS INCORRECT.

ASSESSME ASSESSME NASA FME	NT DA NT IA A #:	ATE: D:	1/01/ RCS-2 03-2A	88 09 -201	091-:	2		NASA DATA: BASELINE [] NEW [X]							
SUBSYSTE MDAC ID: ITEM:	M:		ARCS 209 HIGH	PRES	SURE	HELI	T MU	EST I	EST PORT COUPLINGS A & B						
LEAD ANA	LYST	:	C.D.	PRUS	т										
ASSESSME	NT:														
	CRIT	ICAL	ITY	R	EDUN	DANCY	SCR	EENS		C	IL TEM				
	HD	W/FU	NC	А		В		C	2	-	, ,				
NASA IOA	[3 [3	/3 /3]]	[[]]	ן נ]]	[[]	[[]]	*			
COMPARE	[/]	C]	[]	[]	[]				
RECOMMEN	DATI	ons:	(If	dif	fere	nt fr	om N	ASA)			4				
: • • •	[3	/3]	[]	[]	[]] (ADD] /DEL	ETE)			
* CIL RE	TENT	ION	RATION	IALE:	(If	appl	icab	le) / IN/	ADEQUA ADEQUA	ATE (ATE (]				
TOURSELLO .	REMARKS:														

IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE.

REPORT DATE 2/26/88

÷.

s____

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-210 03-2A-201030-1	NASA DATA: BASELINE [] NEW [X]
SUBSYSTEM: MDAC ID: ITEM:	ARCS 210 HELIUM PRESSURE REGU	JLATOR ASSEMBLY
LEAD ANALYST:	C.D. PRUST	
ASSESSMENT:		
CRITICAL	TY REDUNDANCY S	SCREENS CIL
HDW/FU	IC A B	C
NASA [3 /1R IOA [3 /1R] [P] [F]] [P] [NA]] [P] [X]*] [P] []
COMPARE [/] [] [М]	נ ז [א]
RECOMMENDATIONS:	(If different from	n NASA)
[/	3 [] []] [] [] (ADD/DELETE)
* CIL RETENTION H	ATIONALE: (If applic	cable) ADEQUATE []
REMARKS: IOA AGREES WITH M RECOMMENDS ADDING VIOLATIONS OF ORM	VASA/RI RATIONALE FOF A STATEMENT TO THE BITER ENTRY MASS PROF	INADEQUATE [] R FAILURE OF B SCREEN. IOA EFFECTS REGARDING POSSIBLE PERTIES CONSTRAINTS AND PROF

REPORT DATE 2/26/88 C-120

VIOLATIONS OF ORBITER ENINE TANK LANDING WEIGHT CONSTRAINTS.

.

i j

ASSESSMI ASSESSMI NASA FMI	ENT ENT EA	D# II #:	ATE: D:	1/ RC 03	01/8 S-21 -2A-	88 L1 -2(010)30-2	2					NZ I	ASA DA BASELI N	TA: NE EW	[[x]]	
SUBSYSTE MDAC ID: ITEM:	EM:			AF 21 HE	CS 1 LIUN	1	PRI	ຮຽນ	RE	F	REG	ULA	FOR	AS	SEMBL	Y				
LEAD AND	ALY:	ST	:	c.	D. I	PR	JSI	ſ												
ASSESSMI	ENT	:																		
	CR:	ITI Fl	ICALI LIGHI	CTY C IC			RI	EDUNI	DA	NC	CY B	SCRI	EEN	s c			C] I]	IL Fen	1	
			/101	,		-		-		-	5	-	-	Ţ	-		r	v	٦	ъ
NASA IOA	ן [2	/1R /1R]		L [P P]		Ľ	P NA	7]]	נ	r P]		נ	X]	~
COMPARE	[1]		۵]		[N]	٠ [N]		נ]	
RECOMMEN	NDA'	FIC	ons:		(If	d:	if	fere	nt	t	fro	om N2	ASA)						
	[2	/1R]		[P]		[F]	[F]	(AI] /D	/DI] ELI	ETE)
* CIL RI	ETE)	N T I	ION I	RAJ	NOI	ΔLI	E:	(If	a	pı	olj	.cab	le) I	A IA	DEQUAT DEQUAT	E E	[[]	

REMARKS:

IOA AGREES WITH NASA/RI FAILURE OF C SCREEN. HOWEVER, IOA RECOMMENDS THAT THE B SCREEN BE FAILED. A FAILED CLOSED REG WOULD NOT BE DETECTABLE DURING DUAL LEG OPERATION (ASCENT). IOA ALSO RECOMMENDS ADDING A STATEMENT TO THE EFFECTS ABOUT POSSIBLE VIOLATIONS OF ORBITER ENTRY MASS PROPERTIES CONSTRAINTS AND PROP TANK LANDING WEIGHT CONSTRAINTS.

REPORT DATE 2/26/88

=

-

= :

.

1

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-212 03-2A-201030-2	NASA DATA: BASELINE [] NEW [X]	
SUBSYSTEM: MDAC ID: ITEM:	ARCS 212 HELIUM PRESSURE REGULAT	TOR ASSEMBLY	
LEAD ANALYST:	C.D. PRUST	ta ga a sa	
ASSESSMENT:			
CRITICAL FLIGH	TY REDUNDANCY SCRI	EENS CIL ITEM	
HDW/FUI	NC A B	C	
NASA [2 /1R IOA [2 /1R] [P] [P]] [P] [NA]	[F] [X]* [P] [X]	
COMPARE [/	[и] []	[N] []	
RECOMMENDATIONS:	(If different from NA	ASA)	
[2 /1R] [P] [F]	[F] [] (ADD/DELETE)	
* CIL RETENTION I	RATIONALE: (If applicab)	le) ADEQUATE [] INADEQUATE []	

REMARKS:

IOA AGREES WITH NASA/RI FAILURE OF C SCREEN. HOWEVER, IOA RECOMMENDS THAT THE B SCREEN BE FAILED. A FAILED CLOSED REG WOULD NOT BE DETECTABLE DURING DUAL LEG OPERATION (ASCENT). IOA ALSO RECOMMENDS ADDING A STATEMENT TO THE EFFECTS ABOUT POSSIBLE VIOLATIONS OF ORBITER ENTRY MASS PROPERTIES CONSTRAINTS AND PROP TANK LANDING WEIGHT CONSTRAINTS.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-213 NONE	NASA DATA: BASELINE NEW	[]
SUBSYSTEM: MDAC ID: ITEM:	ARCS 213 HELIUM PRESSURE REGULATOR	ASSEMBLY	
LEAD ANALYST:	C.D. PRUST		
ASSESSMENT:			
CRITICAL FLIGH	ITY REDUNDANCY SCREENS		CIL ITEM
HDW/FU	NC A B	С	
NASA [/ IOA [2 /1R] [] [] [] [] [P] [P] [] P]	[] * [X]
COMPARE [N /N] [N] [N] [ן א	[N]
RECOMMENDATIONS:	(If different from NASA)		
[1 /1] [] [] []	[A] DD/DELETE)
* CIL RETENTION	RATIONALE: (If applicable) IN	ADEQUATE ADEQUATE	
REMARKS: NASA/RI DO NOT CO	OVER THIS FAILURE MODE (EXT	ERNAL LEAN	KAGE). TH

NASA/RI DO NOT COVER THIS FAILURE MODE (EXTERNAL LEAKAGE). THE SSM AGREED THAT THIS VALVE BODY SHOULD BE ADDED TO THE HELIUM LINE EXTERNAL LEAKAGE FMEA (03-2A-201013-1) WITH CORRESPONDING RETENTION RATIONALE. IOA ORIGINALLY CONSIDERED THE PARALLEL HELIUM FLOW PATHS TO BE REDUNDANT FOR THIS FAILURE (2/1R), BUT NOW CLASSIFIES THIS

FAILURE AS A 1/1.

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	ENT ENT EA	D2 II #:	ATE: D:	1/ RC NO	01/8 S-21 NE	8									NZ	ASA DAT BASELIN NI	ra: Ne Ew	[[]]	
SUBSYSTE MDAC ID: ITEM:	EM:			AR 21 HE	CS 4 LIUM	[]	PRI	essi	JRE	F	REC	GUL	LATO	R	PI	RIMARY	SE	NS	IN	IG	PORT
LEAD ANA	LY	ST	:	c.	D. P	R	JSI	2													
ASSESSME	ENT	:																			
	CR	IT FI HDV	ICALI LIGHI N/FUI	LTY F NC			RI A	EDUI	ADA	łC	ey B	SC	REEI	NS	c			CI I1	'EM	ł	
NASA IOA	[[2	/ /1R]]		[[P]]			₽]]		[[P]]		[[x]]	*
COMPARE	[N	/N]		[N]	[N]	l	[N]		[N]	
RECOMMEN	IDA'	FI C	ONS:		(If	d:	if	fere	ent	f	rc	m	NASA	A)							
	[3	/2R]		נ	P]	[F]	I	[₽]	(AD] D/	A DE] :LF	ETE)
* CIL RE	TE	NT:	ION I	RAT	IONA	L	Ξ:	(I:	far	pp)]j	lca	ble))			_	_	•	-	

ADEQUATE [] INADEQUATE [] ۳.

_

-

REMARKS:

NASA/RI DO NOT COVER THIS FAILURE MODE (EXTERNAL LEAKAGE THROUGH SENSING PORT). HOWEVER, THIS FAILURE MODE IS COVERED BY NASA/RI IN THE OMS SUBSYSTEM ON FMEA 03-3-1004-3 (3/2R PFP). IOA RECOMMENDS THAT THIS FAILURE MODE ALSO BE COVERED FOR THE RCS REGULATOR WITH THE SAME RATIONALE USED IN OMS. IOA WITHDRAWS 2/1R PPP CRIT.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-215 NONE	NASA DATA: BASELINE [] NEW []
SUBSYSTEM: MDAC ID: ITEM:	ARCS 215 HELIUM PRESSURE REGULATO	R PRIMARY SENSING PORT
LEAD ANALYST:	C.D. PRUST	
ASSESSMENT:		
CRITICAL FLIGH HDW/FU	ITY REDUNDANCY SCREE T NC A B	NS CIL ITEM C
NASA [/ IOA [2 /1R] [] []] [P] [P]	[] [] * [P] [X]
COMPARE [N /N] [N] [N]	[N] [N]
RECOMMENDATIONS:	(If different from NAS	SA)
[/] [] []	[] [] (ADD/DELETE)
* CIL RETENTION	RATIONALE: (If applicable) ADEQUATE [] INADEQUATE []

THIS FAILURE MODE (BLOCKAGE OF SENSING PORT) IS ADEQUATELY ADDRESSED ON FMEAS 03-2A-201030-1 AND 201030-2, WHICH LIST CONTAMINATION OF PILOT FILTERS, RESTRICTOR ORIFICES, AND SENSE PORTS AS CAUSES FOR THE REGULATOR FAILURES COVERED. AN ADDITIONAL FMEA IS UNNECESSARY.

REPORT DATE 2/26/88

.

_

<u>C-125</u>

.

=

-

- ,

.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-216 03-2A-201091-3	NASA BAS 1	DATA: Eline [] New [X]
SUBSYSTEM: MDAC ID: ITEM: COUPLING	ARCS 216 HELIUM PRESSUI	RE REGULATOR OUTL	ET TEST PORT
LEAD ANALYST:	C.D. PRUST		
ASSESSMENT:			
CRITICAL FLIGH HDW/FU	ITY REDUNI T NC A	DANCY SCREENS B C	CIL ITEM
NASA [3 /1R IOA [2 /1R] [F]] [P]	[F] [P] [NA] [P]	[X]* [X]
COMPARE [N /] [N]	[N][]	[]
RECOMMENDATIONS:	(If differen	nt from NASA)	
[3 /1R] [F]	[F] [P]	[A] (ADD/DELETE)
* CIL RETENTION	RATIONALE: (If	applicable) ADEQ INADEO	UATE [] UATE []
REMARKS: IOA AGREES WITH IDENTIFIED THIS RECOMMENDS THAT THIS FMEA. THIS 03-2F-101070-1. RECOMMENDS ADDIN VIOLATIONS OF EN LANDING WEIGHT C INCORRECT.	NASA/RI 3/1R F) -0032 COUPLING "POPPET FAILS (IS A CREDIBLE THE SSM AGREEN G A STATEMENT (TRY MASS PROPEN ONSTRAINTS. TH	FP ASSIGNMENT. I AS A -0018 COUPL OPEN" BE ADDED AS FAILURE MODE AND D WITH THE IOA IS FO THE EFFECTS AB RTIES CONSTRAINTS HE QUANTITY ON TH	OA ORIGINALLY ING. IOA A FAILURE MODE ON IS ADDRESSED ON SUE. IOA ALSO OUT POSSIBLE AND PROP TANK IS FMEA IS

REPORT DATE 2/26/88 . C-126

....

ASSESSME ASSESSME NASA FME	NT NT A	DA II #:	TE:	1/01 RCS- 03-2	L/88 -217 2A-201	.091-	·2		Ņ	IASA BASE	DATA LINE NEW	: [[x]
SUBSYSTE MDAC ID: ITEM: COUPLING	M:			ARCS 217 HELI	S IUM PR	ESSU	IRE RE	GULA	TOR C	OUTLE	T TE	ST	PORT
LEAD ANA	LY	ST:		C.D.	PRUS	т							
ASSESSME	NT	:											
	CR	ITI FI	CAL	ITY T	F	IDANCY	SCR	EENS			CI TT	L EM	
]	HDW	/FU	NC	A		E	3	C	2			
NASA IOA	[[3 3	/3 /3]]	[[]]	[[]]	[[]]		[[] *]
COMPARE	[/]	[]	[]	[]		[]
RECOMMEN	'DA'	FIC	NS:	(]	(f dif	fere	ent fr	om N	ASA)				
	[3	/3]	[]	.]	[]	(A] DD/] DELETE)
* CIL RE	TE	ITN	ON	RATIC	ONALE:	(If	appl	icab.	ole) // IN/	ADEQU ADEQU	ATE ATE	[[]]
IOA FAIL	UR	EM	IODE	S ON	ANALY	SIS	SHEET	SHO	ULD]	INCLU	DE "	FAI	LS TO

COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE.

REPORT DATE 2/26/88

= :

• a

=

=

ASSESSMENT DATH ASSESSMENT ID: NASA FMEA #:	: 1/01/88 RCS-218 03-2A-2	01095-1		NASA DATA BASELINE NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM:	ARCS 218 QUAD CH	ECK VAL	VE ASSEMB	LX	e e constante
LEAD ANALYST:	C.D. PR	UST			
ASSESSMENT:					
CRITICA FLIC HDW/I	LITY HT UNC	REDUND. A	ANCY SCRE B	ens C	CIL ITEM
NASA [3 /3 IOA [2 /3	R] [] P]	[] [F]	[] [P]	[] * [X]
COMPARE [N /N	ן ני	N]	[N]	[N]	[N]
RECOMMENDATIONS	: (If d	ifferen	t from NA	SA)	
[2/1	.R] [P]	[F]	[P] (A	[A] .DD/DELETE)
* CIL RETENTION	RATIONAL	E: (If a	applicabl	e) ADEQUATE INADEQUATE	[]
REMARKS: IOA RECOMMENDS 2/1R PFP AND PI	THAT THIS ACED ON T	ITEM AN HE CIL.	ND FAILUR WITH SE	E MODE BE UP RIES POPPETS	GRADED TO FAILED OP

j (

= :

IOA RECOMMENDS THAT THIS ITEM AND FAILURE MODE BE UPGRADED TO A 2/1R PFP AND PLACED ON THE CIL. WITH SERIES POPPETS FAILED OPEN, THE CONTAMINATION OF UPSTREAM COMPONENTS BY PROP OR PROP VAPORS COULD RESULT IN LOSS OF PROP TANK REPRESS CAPABILITY AND INABILITY TO USE OR DEPLETE ARCS PROP. THIS COULD RESULT IN LOSS OF ET SEP CONTROL, LOSS OF ENTRY CONTROL, AND POSSIBLE VIOLATIONS OF ENTRY MASS PROPERTIES CONSTRAINTS AND PROP TANK LANDING WEIGHT CONSTRAINTS. FAILURE OF ONE POPPET IS UNDETECTABLE DURING FLIGHT.

REPORT DATE 2/26/88

C-128

ASSESSMI ASSESSMI NASA FMI	ENT ENT EA	D2 II #:	ATE: D:	1/ RC 03	01/ S-2 -2A	88 19 -2(010	95-2					NZ I	ASA DA BASELI N	ATA: INE IEW	[[x]]	
SUBSYSTI MDAC ID ITEM:	EM : :			AR 21 QU	CS 9 AD	CHI	ECK	VAL	VE	AS	SSEME	LY						
LEAD AND	ALYS	ST	:	c.	D.	PRI	JST	ļ										
ASSESSM	ENT	:																
	CR	IT: F	ICALI LIGHI	LTY F			RE	DUND	ÂŃ	CY	SCRE	EN	5			CIL ITE	м	
	1	HD	W/FUI	NC.			Α			В			С					_
NASA IOA	[[2 2	/1R /1R]]		[[P P]]	[[F F]]	[[F P]]		[X [X	י <u>[</u>]	k .
COMPARE	[/]		[]	נ]	[N]		[]	
RECOMME	NDA'	FI (ons:		(If	đ	iff	eren	t	fro	om NA	SA)	Ξ.	а,	···. ·		
	[1]		[]	[]	[]	(AD	[D/ D] ELE:	ΓE)
* CIL R	ETEI	NT:	ION	RAT	ION	ALI	Ξ:	(If	ap	pl:	icabl	e) I	AI NAI	DEQUAI DEQUAI	re re	[[]]	

REMARKS:

1

192

IOA AGREES WITH NASA/RI FAILURE OF C SCREEN. IOA RECOMMENDS ADDING A STATEMENT TO THE EFFECTS REGARDING POSSIBLE VIOLATIONS OF ORBITER ENTRY MASS PROPERTIES CONSTRAINTS AND PROP TANK LANDING WEIGHT CONSTRAINTS.

REPORT DATE 2/26/88

Č-129

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-220 03-2A-201091-1	NASA DATA: BASELINE [] NEW [X]	
SUBSYSTEM: MDAC ID: ITEM:	ARCS 220 QUAD CHECK VALVE TEST	PORT COUPLINGS A & B	
LEAD ANALYST:	C.D. PRUST	· ·	
ASSESSMENT:			
CRITICAL: FLIGH	ITY REDUNDANCY SC	REENS CIL ITEM	

	F	LIGH	T										I.	ren	1	
	HD	W/FU	NC		A			В		С						
NASA IOA	[3 [3	/18 /18]]	F P]]	[[F] NA]	[P P]]]]	X]	*
COMPARE	[/]	נ	N]	[N]	[]	•	[N]	

RECOMMENDATIONS: (If different from NASA)

[3 /1R]	[F]	[F]	[P]	[A]
				(ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [] INADEQUATE []

_

1

REMARKS: IOA AGREES WITH NASA/RI FAILURE OF A AND B SCREENS. IOA RECOMMENDS THAT "POPPET FAILS OPEN" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON 03-2F-101070-1. THE SSM AGREED WITH THE IOA ISSUE. IOA ALSO RECOMMENDS ADDING A STATEMENT TO THE EFFECTS ABOUT POSSIBLE VIOLATIONS OF ENTRY MASS PROPERTIES CONSTRAINTS AND PROP TANK LANDING WEIGHT CONSTRAINTS. THE QUANTITY ON THIS FMEA IS INCORRECT.

REPORT DATE 2/26/88

ASSESSMI ASSESSMI NASA FMI	ENT D. ENT I EA #:	ATE: D:	1/01 RCS- 03-2	./88 ·221 :A-201	-2		1	NASA I BASEI	DATA LINE NEW	: [[}	(]		
SUBSYSTI MDAC ID ITEM:	EM : :		ARCS 221 QUAE	CHEC	K VA	LVE TI	est	PORT	COUP	LING	S A	& B	
LEAD AN	ALYST	:	c.d.	PRUS	т								
ASSESSMI	en t :												
	CRIT	ICAL	ITY	R	EDUN	IDANCY	SCI	REENS			CII		
	HD	W/FU	NC	A		В		C	2		T 1 1	111	
NASA IOA	[3 [3	/3 /3]]	[[]]	[[]]	[[]]		[[] *]	
COMPARE	[/	1	[]	[]	[]		[]	
RECOMMEN	NDATI	ons:	(1	f dif	fere	ent fro	om 1	NASA)					
	[3	/3]	C]	C]	[]	(A)	[DD/I] DELETE;	ļ
* CIL R	ETENT	ION	RATIC	NALE:	(Ïf	appl:	icał	ole) /	ADEQU	ATE	[]	
REMARKS IOA FAII	: LURE 1	MODE	s on	ANALY	SIS	SHEET	SHO	DULD]	INCLU	DE "	l FAII	J LS TO	
COUPLE"	AND	"RES	TRICI	'ED FL	OW".	IOA	REC	COMMEN	IDS TI	HAT '	"RES	STRICTI	j

COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE.

C-131

REPORT DATE 2/26/88

а а

= ---

.

ASSESS ASSESS NASA F	MEN MEN MEA	T T #	DA ID :	TE:	1/01/8 RCS-22 03-2A-	38 22 -211:	110-1			NZ I	ASA DATA: BASELINE NEW	[[X]	
SUBSYS MDAC I ITEM:	D:	[:			ARCS 222 PROPEI	LLAN	T TANI	ĸ						
LEAD A	NAL	YS	T:		C.D. 1	PRUS	Г							
ASSESS	MEN	T :												
	C	RI	TI FI	CAL	ITY	R	EDUNDA	ANCY	SCREE	ens		CIL ITEN	1	
		H	DW	I/FUI	NC	A		В		С				
NAS IC	SA DA	[[1 1	/1 /1]	[[]	[[]	[[]]	[X [X	; []	k
COMPAR	Æ	[/]	Ľ]	[]	[]	[]	
RECOM	iend	AT	IC	NS:	(If	dif	feren	t fro	om NAS	SA)				
		[/]	[]	ľ]	נ] (A)	[נס/סס] ELE:	ſE)
* CIL	REI	EN	TI		RATION	ALE:	(If a	appl	icable	≥) Al INA	DEQUATE DEQUATE	[[]]	
REMARI NO DII EFFECT EVA AI	INADEQUATE [] INADEQUATE [] O DIFFERENCES. IOA RECOMMENDS THAT THE EFFECTS DISCUSS THE FFECTS OF PROP LEAKAGE (CORROSIVE, FIRE/EXPLOSIVE, EXPOSURE OF TVA AND GROUND CREWS).													

=

____ =

-

_ -

_

_

-

REPORT DATE 2/26/88 C-132

NASA DATA: ASSESSMENT DATE: 1/01/88 BASELINE [ASSESSMENT ID: RCS-223 NEW [X] NASA FMEA #: 03-2A-202108-1 ARCS SUBSYSTEM: MDAC ID: 223 ITEM: PROP LINES, ALL LEAD ANALYST: C.D. PRUST ASSESSMENT: REDUNDANCY SCREENS CÌĹ CRITICALITY ITEM FLIGHT С В HDW/FUNC Α] [X]* NASA [1 /1 [[]] [[[] 1 1 IOA [1/1]]]]] 1 [1 COMPARE] RECOMMENDATIONS: (If different from NASA)] Γ 1 (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [INADEQUATE ſ 1 **REMARKS:**

IOA RECOMMENDS THAT "FAILURE OF LINE BELLOWS TO DEFLECT" BE ADDED AS A CAUSE ON THIS FMEA/CIL. IOA CONSIDERS THIS TO BE A CREDIBLE FAILURE WHICH SHOULD BE ADDRESSED ON THE FMEA/CIL. THIS FMEA SHOULD INCLUDE VALVE BODIES IN THE ITEM LIST AND CORRESPONDING RETENTION RATIONALE. IOA ALSO RECOMMENDS THAT THE EFFECTS DISCUSS THE POSSIBLE EXPOSURE OF EVA AND GROUND CREWS TO PROP OR PROP VAPORS.

REPORT DATE 2/26/88

ASSESSM ASSESSM NASA FM	ENT ENT EA	D2 II #:	ATE: D:	1/01/3 RCS-23 NONE	88 24]	NASA BASE	DATA: LINE NEW	[[]
SUBSYST MDAC ID ITEM:	EM:			ARCS 224 PROP	LINES	5, ALI	J						
LEAD AN	ALY	ST	:	C.D.	PRUST	?				-	-		
ASSESSM	ENT	:											
	CR	IT	CAL	ITY	RE	DUNDA	NCY	SCREE	ens			CII	J
	1	HDV	V/FUI	NC NC	A		В		(с		TILE	M
NASA IOA	[[1	/ /1]	[]	[[]]	[[]]		([X] * []
COMPARE	[N	/N]	[]	[]	[]		[N	[] -
RECOMME	NDA	FI C	ons:	(If	diff	erent	fro	om NAS	SA)		· • •		
	נ		/]	[]	[]	[]	(AD	[D/C] DELETE)
* CIL R	ETEI	N T I	ION I	RATION	ALE:	(If a	ppli	cable	e) INZ	ADEQUI ADEQUI	ATE ATE	[[]]
REMARKS NASA/RI	: DO	NC	OT CO	OVER R	ESTRI	CTED	FLOW	INA	S	EGMEN'	r of	LIN	E DUE

_

-

NASA/RI DO NOT COVER RESTRICTED FLOW IN A SEGMENT OF LINE DUE TO OBSTRUCTION OR DEFORMATION (CRIMPING). SUCH AN OCCURRENCE COULD RESULT IN 1/1 EFFECTS, HOWEVER THE CREDIBILITY OF SUCH AN OCCURRENCE IS QUESTIONABLE. ANY CONTAMINATION WOULD FLOW TO DOWNSTREAM FILTER OR COMPONENT. IOA RECOMMENDS THAT SUCH A FAILURE BE ADDRESSED ON THE FMEA/CIL, BUT DOES NOT REGARD THIS RECOMMENDATION AS AN OPEN ISSUE.

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	150-	-1					NZ I	ASA BASE	DAT LIN NE	A: E (W (x]]									
SUBSYSTE MDAC ID: ITEM:	M:			ARC 225 PRC	CS 5 0P	FI	LL,	/VEN	T	СС	DUF	LINC	3								
LEAD ANA	LYS	5T:	:	c.1).	PR	JSI	r													
ASSESSME	NT :	;																			
	CRI	[T] FI	ICAL LIGH	ITY T			RI	EDUN	IDA	NC	22	SCRI	EENS	s_		-	C I	IL TEI	м		
	ł	ŧD₩	V/FU	NC			A				В			С							
NASA IOA	[[2 2	/1R /1R]] [F P].]] [F NA]	[[P P]		[[X X]	*	
COMPARE	[/	<u>ן</u>		[N]		[N]	[]		[]		
RECOMMEN	DAJ	CIC	ONS:	((If	đ	if	fere	ent	: 1	fro	om N2	ASA)							
	[/]		[]		[]	[]	(2] ADD	/DI] Elf	ETE)	
* CIL RE	TEN	1TI	ION	RATI	ION	ALI	E:	(If	: a	p	oli	.cab]	Le) I	AI NAI	DEQU DEQU	ATE ATE	[[]]		
REMARKS: IOA AGRE	ES	W]	TH	NASA	A/R	I	RA.	TION	IAI	E	FC	RF	1II	URI	E OF	A	AND	в	sc	REE	ŀ

IOA AGREES WITH NASA/RI RATIONALE FOR FAILURE OF A AND B SCREENS. IOA RECOMMENDS ADDING A STATEMENT TO THE EFFECTS REGARDING POSSIBLE VIOLATIONS OF ORBITER ENTRY MASS PROPERTIES CONSTRAINTS AND PROP TANK LANDING WEIGHT CONSTRAINTS.

-

•

REPORT DATE 2/26/88

- -

Ξ.

= 7

-

-

-

ASSESSME ASSESSME NASA FME	NT NT A	D2 I1 #:	ATE: D:	1/ RC 03	01/ S-2 -2A	88 26 -2021	L50-2			1	NASA DA BASELI N	TA: NE EW	[[X]]	
SUBSYSTE MDAC ID: ITEM:	:M			AR 22 PR	CS 6 OP	FILL,	/VENT	COU	PLING		-				
LEAD ANA	LY	ST	:	c.	D.	PRUST	r								
ASSESSME	NT	:													
	CR	IT		ITY		RI	EDUND	ANCY	SCREE	ens			CIL	л	
]	HDV	V/FU	NC		A		В		Ċ	2		TTCI	1	
NASA IOA	[[3 3	/3 /3]		[[]]	[[]]	[[]		[[]	*
COMPARE	[/]		[]	נ]	۵]		[]	
RECOMMEN	IDA'	TIC	ONS:		(If	dif	feren	t fr	om NAS	SA)					
	נ	3	/3]		[]	[]	[]	(AD	[נס/ספ] Elf	ETE)
* CIL RE	TE	NTI	ION 1	RAT	ION	ALE:	(If	appl	icable	≥) / IN/	ADEQUAT ADEQUAT	E E	[]	

-

_

REMARKS: IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE.

REPORT DATE 2/26/88

ŗ

ASSESSMENT DATE: 1/01/88 NASA DATA: ASSESSMENT ID: RCS-227 BASELINE [NEW [X] 03-2A-211110-2 NASA FMEA #: ARCS SUBSYSTEM: MDAC ID: 227 PROP CHANNEL SCREENS ITEM: LEAD ANALYST: C.D. PRUST ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL ITEM FLIGHT A ВС HDW/FUNC NASA [1/1] [] [] [X]* IOA [1/1][X] ſ] COMPARE [/] 1 RECOMMENDATIONS: (If different from NASA) [(ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE I INADEQUATE [1 **REMARKS:**

IOA RECOMMENDS THAT THE P.A.D. COMPONENTS INCLUDED ON THIS FMEA BE ITEMIZED IN THE ITEM LIST OR FUNCTIONAL DESCRIPTIONS SECTIONS TO SHOW SPECIFICALLY WHAT IS COVERED ON THIS FMEA. THE SSM AGREED WITH THE IOA ISSUE.

C-137

ASSESSME ASSESSME NASA FME	NT NT A	D2 I1 #:	ATE: D:	1/01/88 RCS-228 NONE						NASA DATA BASELINE NEW	.: ; [7 []		
SUBSYSTE MDAC ID: ITEM:			ARCS 228 PROP FEEDOUT TUBE								* _ * - <u>*-</u>	12 17 12		
LEAD ANA	ST	:	C.D. PRUST											
ASSESSME	:									= (
	CR	IT:	ICAL	TY REDUNDANCY SCREENS							CIL	CIL		
	HDW/FU				IC A			В		C .	11.6	14		
NASA IOA	[[1	/ /1]]	[[]	[[]]	[[]]	[[X] *]		
COMPARE	[N	/N]	٢]	[]	[]	[N]		
RECOMMENDATIONS: (If different from NASA)														
. .]		/]	[]	[]	[] (A	[.DD/D] ELETI	E)	
* CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE []														
NASA/RI NOW CONS	REMARKS: NASA/RI DO NOT COVER THIS FAILURE MODE (RESTRICTED FLOW). IOA NOW CONSIDERS RESTRICTED FLOW IN THIS SECTION OF TUBE TO BE													

_

Ξ

÷

= :

. .

NOW CONSIDERS RESTRICTED FLOW IN THIS SECTION OF TUBE TO BE QUESTIONABLE. IOA DOES NOT REGARD THE ABSENCE OF THIS FAILURE MODE IN THE FMEA/CIL TO BE AN OPEN ISSUE, BUT DOES RECOMMEND THAT THIS FAILURE MODE BE ADDRESSED.

REPORT DATE 2/26/88
ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-229 03-2A-20	01090-1	L	NASA DAT. BASELIN NE	A: E [] W [X]
SUBSYSTEM: MDAC ID: ITEM: COUPLING	ARCS 229 PROP TK	UPPER	Compartmen	IT CHANNEL	CHECK-OUT
LEAD ANALYST:	C.D. PR	UST			
ASSESSMENT:					
CRITICAL FLIGH HDW/FU	ITY T NC	REDUNI A	DANCY SCREE B	C C	CIL ITEM
NASA [3 /1R IOA [3 /1R] [] [F] P]	[F] [NA]	[P] [P]	[X]* []
COMPARE [/] [N]	[И]	[]	[N]
RECOMMENDATIONS:	(If d	ifferer	nt from NAS	SA)	
[3 /1R] [F]	[F]	[P]	[A] ADD/DELETE)
* CIL RETENTION	RATIONAL	E: (If	applicable	≥) ADEQUATE INADEQUATE	
REMARKS: IOA AGREES WITH	NASA/RI	RATION	ALE FOR FAI	LURE OF A	AND B SCREE

IOA AGREES WITH NASA/RI RATIONALE FOR FAILURE OF A AND B SCREENS. IOA RECOMMENDS THAT "POPPET FAILS OPEN" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE. IOA ALSO RECOMMENDS ADDING A STATEMENT TO THE EFFECTS REGARDING POSSIBLE FIRE/EXPLOSION HAZARD AND HAZARD TO GROUND AND EVA CREWS.

REPORT DATE 2/26/88

i. 🔤

_

_

•

ASSESSME ASSESSME NASA FME	ENT DATE ENT ID: EA #:	: 1/01 RCS- 03-2	1/01/88 NASA DATA: RCS-230 BASELINE [] 03-2A-201090-2 NEW [X]									
SUBSYSTE MDAC ID: ITEM: COUPLING	CM:	ARCS 230 PROP	RCS 30 ROP TK UPPER COMPARTMENT CHANNEL CHECK-OUT									
LEAD ANA	D ANALYST: C.D. PRUST											
ASSESSME	ENT:											
CRITICALITY REDUNDANCY SCREENS CIL												
	HDW/F	UNC	2	A	В		С	:			111	
NASA IOA	[3 /3 [3 /3]]	[[]]	[[]]	[[]]		[[] *]	
COMPARE	[/]	[]	ן נ]	Ţ]		[]	
RECOMMEN	DATIONS	: (I	fdi	ffere	nt fro	om N	NASA)		•			
	[3 /3]]]	C]	[1	(AI] ELETE	:)
* CIL RE	TENTION	RATIO	NALE	: (If	appl	icak	ole)	DEAT		ŗ		
						-	A INA	DEQUA	ATE ATE	L []	
REMARKS: IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS.												

REPORT DATE 2/26/88

.

.

THE SSM AGREED WITH THE IOA ISSUE.

ASSESSMEN ASSESSMEN NASA FME <i>I</i>	NT DATE NT ID: A #:	: 1/01/88 RCS-231 03-2A-2	8 1 202150-1		NASA DATA BASELINE NEW	A: C [] Z [X]			
SUBSYSTEN MDAC ID: ITEM:	М:	ARCS 231 PROP TH	K LOWER	COMPARTMEN	T CHANNEL E	SLEED COUPLING			
LEAD ANAI	LYST:	C.D. PH	RUST						
ASSESSMENT:									
CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM									
	HDW/F	UNC	A	В	С	11EM			
NASA IOA	[2 /1 [2 /1	R] R]	[F] [P]	[F] [NA]	[P] [P]	[X]* [X]			
COMPARE	[/]	[N]	[N]	[]	[]			
RECOMMENI	DATIONS	: (If a	differen	t from NAS	A)				
	[/] [] [] [] [] (ADD/DELETE)								
* CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE []									
REMARKS: IOA AGREES WITH NASA/RI RATIONALE FOR FAILURE OF A AND B SCREENS. IOA RECOMMENDS ADDING A STATEMENT TO THE EFFECTS REGARDING									

POSSIBLE VIOLATIONS OF ORBITER ENTRY MASS PROPERTIES CONSTRAINTS AND PROP TANK LANDING WEIGHT CONSTRAINTS.

REPORT DATE 2/26/88 C-141

÷

ASSESSMI ASSESSMI NASA FMI	ENT I ENT I EA #:	DATE:	1/01/ RCS-2 03-22	/01/88 <u>NASA DATA</u> CS-232 BASELINE 3-2A-202150-2 NEW						ATA: INE [NEW [}	:: [] / [X]		
SUBSYSTI MDAC ID ITEM:	EM : :		ARCS 232 PROP	TK 1	LOWER	COM	PARTM	IENT (CHANNE	L BLEEI) COI	UPLING	
LEAD AND	ALYSI	:	C.D.	PRUS	ST				1890 II				
ASSESSM	ENT:												
	CRIT	ICAL	ITY	I	REDUNI	DANC	Y SCR	EENS		CII	M		
	H	W/FU	NC	1	A]	В	(2	***	14.1		
NASA IOA	[3 [3	/3 /3]]	[[]	[[]	[[]	[[]	*	
COMPARE	C	1]	[]	[]	[]	[]		
RECOMME	NDATI	ons:	(I:	f di	ffere	nt fi	rom N	IASA)					
	[3	3 /3]	[. 1	ָ]	[]	[(ADD/I] DELE	FE)	
* CIL R	ETENI	TION	RATIO	NALE	: (If	app:	licab	ole) INZ	ADEQUA ADEQUA	TE [TE []]		
REMARKS IOA FAI COUPLE"	: LURE AND	MODE "RES	S ON A	ANALY ED FI	YSIS : LOW".	SHEE IO	I SHO A REC	ULD OMMEI	INCLUD	E "FAII AT "RES	S TO	CTED	

-

COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-233 03-2A-20	/01/88 NASA DATA: CS-233 BASELINE [] 3-2A-201090-1 NEW [X]										
SUBSYSTEM: MDAC ID: ITEM:	ARCS 233 PROP TK	ro,	WER (COM	PARTMEN	IT	CHECK-O	UT	СС	DUI	PLI)	NG
LEAD ANALYST:	C.D. PRU	JST										
ASSESSMENT:												
CRITICAL: FLIGH HDW/FUI	ITY F NC	RE A	נסאטס	ANC.	Y SCREE B	ENS	S C		C] []	IL IEN	1	
NASA [3 /1R IOA [3 /1R] [] [F P]	[]	F] NA]	[[P] P]		[[X]	*
COMPARE [/] [N]	[]	и]	נ]		[N]	
RECOMMENDATIONS:	(If d	iff	erent	t f:	rom NAS	SA))					
[3 /1R] [F]	[F]	[P]	(AI] /D/	A ′DI] SLE	TE)
* CIL RETENTION N	RATIONALI	E :	(If a	app	licable	≥) Il	ADEQUAT	E	[]]	
REMARKS:												

IOA AGREES WITH NASA/RI RATIONALE FOR FAILURE OF A AND B SCREENS. IOA RECOMMENDS THAT "POPPET FAILS OPEN" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE. IOA ALSO RECOMMENDS ADDING A STATEMENT TO THE EFFECTS REGARDING POSSIBLE FIRE/EXPLOSION HAZARD AND HAZARD TO GROUND AND EVA CREWS.

REPORT DATE 2/26/88

: ==

ASSESSI ASSESSI NASA FI	MEN' MEN' MEA	r D r I #:	ATE: D:	1/01/ RCS-2 03-2A	88 34 -2010	090-2	2			NASA DAT. BASELIN NE	A: E [W [}] K]	 = 1. 111
SUBSYS MDAC I ITEM:	TEM: D:	:		ARCS 234 PROP	TK L	OWER	COMP	ARTMEI	NT	CHECK-OU	T COU	JPLI	NG
LEAD A	NAL	IST	:	C.D.	PRUS	Г							
ASSESS	MEN	r:											
	CI	RIT F	ICAL LIGH	ITY T	RI	EDUNI	DANCY	SCREI	ENS	5	CII ITH	EM	
		HD	W/FU	NC	A		. В			C			
NAS. IO	A A	[3 [3	/3 /3]]	[[]	[[]]	[[]	[[]	*
COMPAR	E	[1]	[]	ſ]	[]	[]	
RECOMM	END	ATI	ons:	(If	dif	ferer	nt fro	om NAS	SA)	I			
		[3	/3]	[]	[]	[]	[ADD/I] DELE	TE)
* CIL :	RETI	ENT	ION	RATION	ALE:	(If	appli	icable	e) IN	ADEQUATE IADEQUATE	[]]	
REMARK	s:												

IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE. _____

-

.

2

REPORT DATE 2/26/88

n mint at sins a scalar and mini

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-235 03-2A-201090-3	L	NASA DATA BASELINE NEW	; ; [] ; [X]
SUBSYSTEM: MDAC ID: ITEM:	ARCS 235 PROP TK PLENUI	1 SCREEN C	HECK-OUT COU	PLING
LEAD ANALYST:	C.D. PRUST			
ASSESSMENT:				
CRITICAL FLIGH	ITY REDUNI T	DANCY SCRE	ENS	CIL ITEM
HDW/FU	NC A	В	С	
NASA [3 /1R IOA [3 /1R] [F]] [P]	[F] [NA]	[P] [P]	[X]* []
COMPARE [/] [N]	[N]	[]	[N]
RECOMMENDATIONS:	(If differe	nt from NA	SA)	
[3 /1R] [F]	[F]	[P] (#	[A] ADD/DELETE)
* CIL RETENTION	RATIONALE: (If	applicabl	e) ADEQUATE INADEQUATE	[]
REMARKS:			TLUPE OF & Z	ND B SCREEN

IOA AGREES WITH NASA/RI RATIONALE FOR FAILURE OF A AND B SCREENS. IOA RECOMMENDS THAT "POPPET FAILS OPEN" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE. IOA ALSO RECOMMENDS ADDING A STATEMENT TO THE EFFECTS REGARDING POSSIBLE FIRE/EXPLOSION HAZARD AND HAZARD TO GROUND AND EVA CREWS.

REPORT DATE 2/26/88

ASSESSM ASSESSM NASA FM	ENT ENT EA	D2 II #:	ATE: D:	1/01/ RCS-2 03-2A	88 36 -203	1090-2				NASA DA BASELI I	ATA: INE NEW	[[x]]	
SUBSYST MDAC ID ITEM:	EM: :			ARCS 236 PROP	TK I	PLENUM	SCRI	EEN	CHEC	K-OUT	COUP	LINC	5	
LEAD AN	ALY	ST	:	C.D.	PRUS	ST								
ASSESSM	ENT	:												
	CR	IT:	ICAL	ITY	1	REDUND	ANCY	SCR	EENS			CIL	r	
	1	HDV	V/FUI	NC NC	1	A	В		;	с		1101	1	
NASA IOA	[[3 3	/3 /3]	[[]	[[]]	[[]		[[]	*
COMPARE	[/]	[]	[]	[]		[]	
RECOMME	NDA	TIC	ONS:	(If	di	fferent	: fro	om N	ASA)					
	[3	/3]	[1	[]	[]	(AD	[D/DE] ELE	TE)
* CIL R	ete:	NT	ION I	RATION	ALE	: (If a	appl	icab	le) IN	ADEQUA: ADEQUA:	re re	[[]	

REMARKS:

IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE.

.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-237 03-2A-202150	NA B -1	SA DATA: ASELINE [] NEW [X]							
SUBSYSTEM: MDAC ID: ITEM:	ARCS 237 PROP TK ENTRY	Y SUMP BLEED COU	PLING							
LEAD ANALYST:	LEAD ANALYST: C.D. PRUST									
ASSESSMENT:										
CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM										
HDW/FU	NC A	B C								
NASA [2 /1R IOA [2 /1R] [F]] [P]	[F] [P [NA] [P] [X]*] [X]							
COMPARE [/] [N]	[N] [] []							
RECOMMENDATIONS:	(If differ	ent from NASA)								
ι /] []	[][] [] (ADD/DELETE)							
* CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE []										
REMARKS: IOA AGREES WITH NASA/RI RATIONALE FOR FAILURE OF A AND B SCREENS. IOA RECOMMENDS ADDING A STATEMENT TO THE EFFECTS REGARDING POSSIBLE VIOLATIONS OF ORBITER ENTRY MASS PROPERTIES CONSTRAINTS AND PROP TANK LANDING WEIGHT CONSTRAINTS.										

REPORT DATE 2/26/88

Š.

= :

•

Ξ.

.

ASSESSM ASSESSM NASA FM	ENT ENT EA	D2 I1 #:	ATE: D:	1/01/3 RCS-2 03-2A	88 38 -2021	150-2	:			NASA DAT BASELIN NE	PA: IE [W [x]	
SUBSYST MDAC ID ITEM:	EM : :			ARCS 238 PROP	TK EN	ITRY	SUMP	BLEEI	DC	OUPLING			
LEAD AN	ALYS	ST	:	C.D.	PRUSI	ſ							t.
ASSESSM	ENT	:											
	CR	IT:	ICAL	[TY r	RI	EDUNE	ANCY	SCREI	ENS	;	C T	IL FEM	
	J	HD	N/FUI	1C	A		В			с	-		
NASA IOA] Ţ	3 3	/3 /3]]	[[]	[[]	[[]]	[[]	*
COMPARE	[/]	[]	[]	[່ງ	[]	
RECOMME	NDA	FI	ons:	(If	diff	feren	t fro	om NAS	SA)				
	[3	/3]	[]	[]	[] (] ADD,] / DELE'	TE)
* CIL R	ETEI	NT:	ION I	RATION	ALE:	(If	appli	icable	∍) IN	ADEQUATE ADEQUATE	[[]	
REMARKS	:										-	-	

IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE.

 \equiv

-

REPORT DATE 2/26/88

C-148

1.1.1.1.1.1.1

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-239 03-2A-21112	0-1	NASA DATA BASELINI NEV	A: E [] V [X]
SUBSYSTEM: MDAC ID: ITEM:	ARCS 239 GIMBAL BELLA	OWS		
LEAD ANALYST:	C.D. PRUST			
ASSESSMENT:				
CRITICAL	ITY RED	UNDANCY SCF	EENS	CIL
HDW/FU	NC A	В	С	T T W L
NASA [1 /1 IOA [1 /1] []] []	[] []	[] []	[X]* [X]
COMPARE [/] []	[]	[]	[]
RECOMMENDATIONS:	(If diffe	rent from N	IASA)	
] []	[]	[] (2	[] ADD/DELETE)
* CIL RETENTION	RATIONALE: (If applicat	ole) ADEQUATE INADEQUATE	
REMARKS:			-	

IOA RECOMMENDS THAT "FAILURE OF BELLOWS TO DEFLECT" AND "ISOLATION VALVE RELIEF DEVICE FAILURE TO RELIEVE" BE ADDED AS CAUSES ON THIS FMEA. IOA ALSO RECOMMENDS THAT THE EFFECTS INCLUDE POSSIBLE EXPOSURE OF EVA AND GROUND CREWS TO PROP OR PROP VAPORS.

REPORT DATE 2/26/88

-

: 1

ASSESSMENT D ASSESSMENT I NASA FMEA #:	DATE: 1/01, D: RCS-2 NONE	/88 240		NASA D BASEL	ATA: INE [] NEW []
SUBSYSTEM: MDAC ID: ITEM:	ARCS 240 GIMBA	AL BELLO	ŴS		
LEAD ANALYST	: C.D.	PRUST			
ASSESSMENT:					
CRIT	ICALITY	REDUI	NDANCY SCR	EENS	CIL ITEM
HC	W/FUNC	Α	В	С	
NASA [IOA [1	/] /1]	[] []	[] []	[] []	[] * [X]
COMPARE [N	/N]	[]	[]	[]	[N]
RECOMMENDATI	ONS: (II	f differe	ent from N	ASA)	
ſ	/]	[]	[]	[]	[] (ADD/DELETE)
* CIL RETENT	'ION RATION	NALE: (I:	f applicab	le) ADEQUA INADEQUA	FE []
REMARKS:				THIDLYON	

NASA/RI DO NOT COVER THIS FAILURE MODE (RESTRICTED FLOW). IOA NOW CONSIDERS THE CREDIBILITY OF RESTRICTED FLOW IN A BELLOWS TO BE QUESTIONABLE. IOA DOES NOT REGARD THE ABSENCE OF THIS FAILURE MODE IN THE FMEA/CIL TO BE AN OPEN ISSUE, BUT DOES RECOMMEND THAT THIS FAILURE MODE BE ADDRESSED. Ì

.

REPORT DATE 2/26/88

o so estar se seconda a consecutor en

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-241 NONE		NASA DATA: BASELINE NEW	[] []
SUBSYSTEM: MDAC ID: ITEM:	ARCS 241 PRESSURE R	RELIEF ASSEMBLY		
LEAD ANALYST:	C.D. PRUST	۶ _.		
ASSESSMENT:				
CRITICAI FLIGH HDW/FU	ITY RE T NC A	EDUNDANCY SCREE B	ns C	CIL ITEM
NASA [/ IOA [2 /1F] [] [P] []] [F]	[] . [P]	[]* [X]
COMPARE [N /N] [И] [N]	[N]	[N]
RECOMMENDATIONS:	(If diff	ferent from NAS	A)	
[2 /1F] [P] [F]	[P] (AI	[A] DD/DELETE)
* CIL RETENTION	RATIONALE:	(If applicable) ADEQUATE INADEQUATE	[]
NASA/RI DO NOT C LEAKAGE). IOA C	OVER THIS F	FAILURE MODE (E HIS FAILURE MOD	URST DISK IN DE TO BE CREI	NTERNAL DIBLE AND

RECOMMENDS IT BE ADDED TO 03-2A-201060-5. THE FAILURE HISTORY OF THE BURST DISK INCLUDES THIS FAILURE. THE SSM AGREED WITH THE IOA ISSUE.

REPORT DATE 2/26/88

ASSESSMI ASSESSMI NASA FMI	ent i Ent j Ea #:	DATE: [D:	1/01/ RCS-2 03-22	/88 241A A-20:	L060-	5	NASA DATA: BASELINE [] NEW [X]								
SUBSYSTI MDAC ID: ITEM:	em : :		ARCS 241 PRESS	SURE	RELI	EF ASS	SEME	LY							
LEAD AND	ALYST	C:	C.D.	PRUS	ST										
ASSESSMI	ENT :														
	CRIT H HI	FICAL FLIGH	ITY F NC	1	REDUN	DANCY B	SCR	EENS	с		CIL ITEN	ฬ			
NASA IOA	[2	/1R 2 /1R 2 /1R]	[]	9] 9]	[F [F]]	[[P] P]		[X [X]]	*		
COMPARE	ľ	1]	[]	ľ]	[]		[]			
RECOMMEN	NDATI	cons:	(11	E di:	ffere	nt fro	om N	ASA)							
	[/]	[]	[]	[]	(AI] וס/סכ] ELE	TE)		
* CIL RI	ETENJ	TION 1	RATIO	NALE	: (If	appli	lcab	le) IN	ADEQUA ADEQUA	TE	[[]	·		
REMARKS	: PDFN/	ידכ		2 70 0	INTENT	וחחג פ	INC	CULA	FMENTS	ΤO	тиг	ਸਸ	ፑፑሮ		

NO DIFFERENCES. IOA RECOMMENDS ADDING STATEMENTS TO THE EFFECTS REGARDING POSSIBLE VIOLATIONS OF PROP TANK LANDING WEIGHT AND ORBITER ENTRY MASS PROPERTIES CONSTRAINTS, AND HAZARD TO GROUND AND EVA CREWS FROM LEAKAGE OF PROP OR PROP VAPORS. REPORT DATE 2/26/88

.

NASA DATA: ASSESSMENT DATE: 1/01/88 BASELINE [ASSESSMENT ID: RCS-242 1 NEW [X] NASA FMEA #: 03-2A-201060-3 SUBSYSTEM: ARCS MDAC ID: 242 PRESSURE RELIEF ASSEMBLY ITEM: LEAD ANALYST: C.D. PRUST ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL ITEM FLIGHT HDW/FUNC В С Α IASA [3 /1R] IOA [1 /1] [F] [] [NA] [] [X] * NASA [P] [X] ſ 1 COMPARE [N /N] [] RECOMMENDATIONS: (If different from NASA) (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE [1 **REMARKS:**

IOA AGREES WITH NASA/RI RATIONALE FOR 3/1R FNP ASSIGNMENT. IOA ORIGINALLY CONSIDERED THE PRESS RELIEF ASSY TO BE AN EMERGENCY SYSTEM.

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	NT NT A #		ATE:):	1/ RC 03	01/8 S-24 -2A-	38 121 -2(4 D1(060 [.]	-4	NASA DATA: BASELINE [] NEW [X]								-	
SUBSYSTE MDAC ID: ITEM:	Μ:			AF 24 PF	CS 2 ESSI	JRI	E I	REL	IEF	A	SSE	MBLY	÷.						
LEAD ANA	LYS	T:	1	c.	D. 1	PRI	JSI	C											
ASSESSME	NT:																		
	CRI	T] FI	CAL	נידע ר			RI	EDUI	NDA	NC	Y S	CREEN	s			C: I'	IL Fei	M	
	H	[DW	I/FUI	1C			A				в		С						
NASA IOA	[[3 1	/1R /1]		[[P]]		[[NA]]	[[P]		[[x]]	*
COMPARE	[N	/N]		נ	N]		[N]	[N]		[N]	
RECOMMEN	DAI	'IC	ONS:		(If	đ	ifi	fer	ent	f	ron	NASA)						
	[1]		[]		[]	[]	(A] .DD,	/DI] ELE	ETE)
* CIL RE	TEN	IT]	ION I	RAT	ION	ALI	2:	(I:	f aj	pp	lic	able) I	AI NAI	ΟΕς ΟΕς	QUATE QUATE	[]]	
REMARKS: IOA AGRE	ES	WJ	TH 1	IAS	A/RI	[]	RAJ		NAL	E	FOR	3/1R	Pł	1P	ASSIG	NMI	ENT	г.	IC

_

i i

T

IOA AGREES WITH NASA/RI RATIONALE FOR 3/1R PNP ASSIGNMENT. IOA ORIGINALLY CONSIDERED THE PRESS RELIEF ASSY TO BE AN EMERGENCY SYSTEM.

C-154

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-243 03-2A-2010	91-1		NASA DATA: BASELINE [] NEW [X]						
SUBSYSTEM: MDAC ID: ITEM:	ARCS 243 RELIEF VAL	VE TEST	PORT COU	PLING						
LEAD ANALYST:	C.D. PRUST									
ASSESSMENT:										
CRITICAL FLIGH	ITY RE F	DUNDANCY	SCREENS	-	CIL ITEM					
HDW/FU	NC A	E	3	С						
NASA [3 /1R IOA [3 /1R] [F]] [P] [F] [N	'][IA][P] P]	[X]* []					
COMPARE [/] [М] [N	r] []	[N]					
RECOMMENDATIONS:	(If diff	erent fr	om NASA)	· .						
[3 /1R] [F][F	r) [P j (Al	[] DD/DELETE)					
* CIL RETENTION	RATIONALE:	(If appl	icable) IN	ADEQUATE IADEQUATE	[]					

REMARKS:

IOA AGREES WITH NASA/RI FAILURE OF A AND B SCREENS. IOA RECOMMENDS THAT "POPPET FAILS OPEN" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE FAILURE MODE AND IS ADDRESSED ON 03-2F-101070-1. THE SSM AGREED WITH THE IOA ISSUE. IOA ALSO RECOMMENDS ADDING A

STATEMENT TO THE EFFECTS ABOUT POSSIBLE VIOLATIONS OF ENTRY MASS PROPERTIES CONSTRAINTS AND PROP TANK LANDING WEIGHT CONSTRAINTS. THE QUANTITY ON THIS FMEA IS INCORRECT.

=

ک

•

.

-

= :

.

-----÷

ASSESSMENT DATE:	1/01/88		NASA DATA:								
ASSESSMENT ID:	RCS-244	091-2		BASE	LINE	[r x]				
NADA TILLA #•	UJ ZA ZUI				11211	L **	1				
SUBSYSTEM: MDAC ID: ITEM:	ARCS 244 RELIEF VA	LVE TES	T PORT (COUPLING							
LEAD ANALYST:	C.D. PRUS	Т									
ASSESSMENT:											
CRITICAL	ITY R	EDUNDAN	CY SCREE	INS		CIL					
HDW/FU	IC A	A B C									
NASA [3 /3 IOA [3 /3] [] [] []]	[] []	·	[[] *]				
COMPARE [/] [] [נ	[]		[]				
RECOMMENDATIONS:	(If dif	ferent	from NAS	SA)							
[3 /3] [] []	[]	(AD	[D/DE] LETE)				
* CIL RETENTION I	RATIONALE:	(If ap	plicable	2)							
	·	(<u>F</u>	_	ADEQUA	ATE ATE	[]				
REMARKS:						•	-				
IOA FAILURE MODES	S ON ANALY	SIS SHE	ET SHOUL	D INCLU	DE "F	AILS	TO				
COUPLE" AND "RES	RICTED FL	UW". I	ON THIS	IMENDS TI	HAT " Putc	REST	RICLED				
CREDIBLE FAILURE	MODE AND	IS ADDR	ESSED ON	OTHER (D FM	EAS.					

REPORT DATE 2/26/88 C-156

THE SSM AGREED WITH THE IOA ISSUE.

٦.

.

73

ASSESSME ASSESSME NASA FME	NT DAT NT ID: A #:	E: 1/01 RCS- 03-1	L/88 -245 2A-2010	50-1		N	ASA DATA BASELINI NEV	A: E [W [}] (]
SUBSYSTE MDAC ID: ITEM:	M:	ARCS 245 GROU	S JND MAN	UAL IS	OLATIC	N VAI	VE		
LEAD ANA	LYST:	C.D	. PRUST	I					
ASSESSME	NT:								
	CRITIC	ALITY	RE	DUNDAN	CY SCF	REENS		CII	ב זער:
	HDW/	FUNC	A		В	c	:	111	2141
NASA IOA	[3/ [3/	3] 3]	[[] [] []]	[[]]	[[] *]
COMPARE	[/]	ſ] []	[]	C]
RECOMMEN	DATION	i s: (:	If diff	erent	from N	IASA)			
	[/]	C] . []	[] (2	[ADD/I] DELETE)
* CIL RE	TENTIC	ON RATIO	ONALE:	(If ap	plicat	ole) / IN/	DEQUATE	[[41]]
NO DIFFE	RENCES	·							

REPORT DATE 2/26/88

-

_

-

.

_ -.

.

ग्रेस ग 100 E

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-246 03-2A-201	050-1		NASA E BASEI	DATA: LINE [] NEW [X]
SUBSYSTEM: MDAC ID: ITEM:	ARCS 246 GROUND MA	NUAL IS	SOLATION	VALVE	
LEAD ANALYST:	C.D. PRUS	т			
ASSESSMENT:					
CRITICAL	ITY R	EDUNDAI	NCY SCREI	ENS	CIL
HDW/FU	NC A		В	С	t i dm
NASA [3 /3 IOA [1 /1] [] []		[] []	[] * [X]
COMPARE [N /N] [] [[]	[]	[N]
RECOMMENDATIONS:	(If dif	ferent	from NAS	SA)	• · · · · · ·
[/] - []	[]]	[]	[] (ADD/DELETE)
* CIL RETENTION	RATIONALE:	(If ap	oplicable	≥) ADEQUA INADEQUA	TE [] TE []
REMARKS: IOA 1/1 BASED ON CREDIBILITY OF T	"FAILURE HIS FAILUR	TO REMA E MODE	IN OPEN' TO BE QU	. IOA N JESTIONAE	OW CONSIDERS DLE. IOA DOES

THE NOT REGARD THE ABSENCE OF "FAILURE TO REMAIN OPEN" IN THE FMEA/CIL TO BE AN OPEN ISSUE, BUT DOES RECOMMEND THAT THIS FAILURE MODE BE ADDRESSED.

REPORT DATE 2/26/88 C-158

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-247 NONE	N.	ASA DATA BASELINI NEV	A: E [W []]		
SUBSYSTEM: MDAC ID: ITEM:	ARCS 247 GROUND MA	NUAL ISC	LATIO	N VAL	VE		
LEAD ANALYST:	C.D. PRUS	т					
ASSESSMENT:							
CRITICAI FLIGH	ITY R T	EDUNDANC	Y SCRI	EENS		CIL ITEM	
HDW/FU	NC A		В	С			
NASA [/ IOA [1 /1] [] [] []]	[[]	[[X] *]
COMPARE [N /N] [] []	[]	[N]
RECOMMENDATIONS:	(If dif	ferent f	rom N2	ASA)			
[1 /1] [] []	Į] ()	[A ADD/DE] LETE)
* CIL RETENTION	RATIONALE:	(If app	licab	le)		_	_
				A INA	DEQUATE DEQUATE	[[]
REMARKS: NASA/RI DO NOT C SSM AGREED THAT LINE EXTERNAL LE RETENTION RATION	OVER THIS THIS VALVE AKAGE FMEA ALE.	FAILURE BODY SH (03-2A-	MODE OULD 20101	(EXTE BE AD 3-1)	RNAL LEA DED TO 1 WITH COI	AKAGE) THE HE RRESPO	. THE LIUM NDING
IOA ALSO RECOMME	NDS THAT T	HE POSSI	BLE PI	ROP L	EAKAGE I	EFFECT	S OF

THIS FAILURE BE INCLUDED IN THE EFFECTS (CORROSION, FIRE, EXPLOSION, EXPOSURE OF EVA AND GROUND CREWS).

REPORT DATE 2/26/88 C-159

۰.

ASSESSMENT DATE: 1/01/88 NASA DATA: ASSESSMENT ID: RCS-248 BASELINE [] NASA FMEA #: 03-2A-202112-1 NEW [X] SUBSYSTEM: ARCS MDAC ID: 248 ITEM: PROP TANK ISOL VLVS 1/2 & 3/4/5

LEAD ANALYST: C.D. PRUST

ASSESSMENT:

	CRITICALITY FLIGHT	REL	UNDANCY	CIL ITEM		
	HDW/FUNC	Α	E	3	С	
NASA IOA	[1 /1] [1 /1]	[] []	[[] []]	[X]* [X]
COMPARE	[/]	[]	C] []	[]

RECOMMENDATIONS: (If different from NASA)

[1 /1]	ſ]	[]	[]	[A]
								(ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [] INADEQUATE []

REMARKS:

THIS FMEA COVERS ONLY THE BELLOWS LEAKAGE FAILURE MODE FOR THE PROP TANK ISOL VALVES. IOA HAS NO ISSUE WITH THIS FAILURE MODE, HOWEVER DOES RECOMMEND THAT THE EFFECTS INCLUDE THE POSSIBLE EXPOSURE OF EVA AND GROUND CREWS TO PROP OR PROP VAPORS. NASA/RI DO NOT COVER STRUCTURAL FAILURE, RUPTURE, OR EXTERNAL LEAKAGE OF THE VALVE HOUSING ON THIS FMEA OR ELSEWHERE. THE SSM AGREED THAT THIS VALVE BODY SHOULD BE ADDED TO THE PROP LINE EXTERNAL LEAKAGE FMEA (03-2A-202108-1) WITH CORRESPONDING RETENTION RATIONALE.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-249 NONE	·	NASA DATA: BASELINE NEW	: [] []
SUBSYSTEM: MDAC ID: ITEM:	ARCS 249 PROP TANK ISOL	VLVS 1/2 &	3/4/5	
LEAD ANALYST:	C.D. PRUST			<u>.</u>
ASSESSMENT:				
CRITICAL	ITY REDUND	ANCY SCREEN	S	CIL
HDW/FU	NC A	В	C	1154
NASA [/ IOA [1 /1] []] []]	[] * [X]
COMPARE [N /N] []	[]][]	[N]
RECOMMENDATIONS:	(If differen	t from NASA	.)	
[3 /1R] [P]	[₱] [P] (AD	[A] DD/DELETE)
* CIL RETENTION H	RATIONALE: (If a	applicable)		<i>r</i> ,
DEMADKS .	97 · · · ·	I	ADEQUATE NADEQUATE	
IOA ITEM LIST SHO NOT COVER THIS FA ISSUE, BUT MAINTA THRUSTER COULD RH THE SSM AGREED TH FMEA/CIL. IOA RH RESTRICTED FLOW OF FLOW THROUGH THE	OULD NOT INCLUD AILURE MODE (RE AINS CONCERN THA ESULT IN BURN-THAT HAT THIS FAILUR ECOMMENDS A 3/11 DF THE PROP TAN 1/2 VALVE WOUL	THE 3/4/5 STRICTED FL AT RESTRICT HROUGH. MODE SHOU R PPP, 1/1 X ISOL 1/2 D RESULT IN	VALVES. N OW). IOA W ED FLOW OF LD BE ADDRE ABORT FMEA VALVES. LC THE LOSS C	NASA/RI DO VITHDRAWS 1/1 PROP TO A SSED ON THE AND CIL FOR OSS OF PROP

ONE +X THRUSTER USED TO DUMP ARCS PROP DURING RTLS & TAL ABORTS. INABILITY TO COMPLETE A PLANNED ARCS DUMP COULD RESULT IN VIOLATIONS OF ENTRY MASS PROPERTIES CONSTRAINTS AND TANK LANDING WEIGHT CONSTRAINTS.

-

C-161

1.6.1.1.1.1.

6

-

3

=

.

ASSESSM ASSESSM NASA FM	IEN' IEN' IEA	r r #	DA II :	ATE:):	1/0 RC: 03·	/01/88 CS-250 3-2A-202110-3										NA E	SA BAS	D7 EL] N	ATA: INE IEW	: [[x] -	
SUBSYSI MDAC II ITEM:	EM	:			AR(25) PR(CS D DP 7	[A]	1K	IS	ΟĽ	VI	.V.	1/	2									· -
LEAD AN	IAL	YS	T:	:	c. 1	D. 1	PRI	JSI	2														
ASSESSM	IEN	T:																					
	C	RI	TJ	CAL	ITY			RI	EDUI	NDA	NC	CY	sc	REE	NS	5				CI TT	L NEW	r	
		H	IDV	V/FU	NC			A	ż	:]		B		-1		С	÷		: <u>,</u>			-	
NASA IOA	<u> </u>	[[2 3	/2 /2R]		[[P]		[[P]]		[[P]	-		[[X X]]	*
COMPARE	2	נ	N	/N]		נ	N]		[N]		[N]			[]	
RECOMM	END	AΊ	'IC	ons:		(If	đ	if	fer	ent	: 1	Êrd	DM	NAS	SA)	ł							
		[/]		[]		[]		[ן י		(Al	[DD/	′DE] :LF	TE)
* CIL I	RET	EN	IT:	ION	RAT	ION	AL	E:	(I	fa	pp	21 :	ica	able	e) Il	IA IAI	DEÇ	UA' UA'	re Fe	[[]]	
REMARKS	S: REE	S	W.	ITH	NAS	A/R	I	RA!	FIO	NAI	ĿE	F	OR	2/2	2,	1,	/1	AB	ORT	AS	\$\$]	GN	IMENT
11 I.			·;	and constant										2				. ruest					
		·								.		-											
		·	 	. 711			÷ +																

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-251 03-2A-202	110-1	NAS BA	A DATA: SELINE [] NEW [X]
SUBSYSTEM: MDAC ID: ITEM:	ARCS 251 PROP TANK	ISOL VLV	1/2	
LEAD ANALYST:	C.D. PRUS	T		
ASSESSMENT:				
CRITICAL FLIGH HDW/FU	ITY R I NC A	REDUNDANCY	SCREENS	CIL ITEM
			Ŭ	
NASA [3 /1R IOA [2 /1R] [P]	P] [P]] [P]] [P]	[] * [X]
COMPARE [N /] [] [] []	[N]
RECOMMENDATIONS:	(If dif	ferent fro	m NASA)	and the second
[3 /1R] [P	9] [P] [P]	[A] (ADD/DELETE)
* CIL RETENTION	RATIONALE:	: (If appli	.cable)	

ADEQUATE [] INADEQUATE []

REMARKS:

> IOA RECOMMENDS THAT THIS FAILURE MODE FOR THE PROP TANK ISOL 1/2 VALVE BE UPGRADED TO A 3/1R PPP, 1/1 ABORT AND PLACED ON THE CIL. LOSS OF FLOW THROUGH THE 1/2 VALVE WOULD RESULT IN THE LOSS OF ONE +X THRUSTER USED TO DUMP ARCS PROP DURING RTLS & TAL ABORTS. INABILITY TO COMPLETE A PLANNED ARCS DUMP COULD RESULT IN VIOLATIONS OF ENTRY MASS PROPERTIES CONSTRAINTS AND PROP TANK LANDING WEIGHT CONSTRAINTS.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-252 03-2A-202110	-3	NASA DATA BASELINI NEV	A: 5 [] 7 [X]
SUBSYSTEM: MDAC ID: ITEM:	ARCS 252 PROP TANK IS	OL VLV 3/4,	/5/ A & B	
LEAD ANALYST:	C.D. PRUST			
ASSESSMENT:				- ,
CRITICAL	ITY REDU	NDANCY SCRI	EENS	CIL
HDW/FUN	IC A	В	С	1154
NASA [2 /2 IOA [2 /2] []	[] []	[] []	[X]* [X]
COMPARE [/] []	[]	[].	[]
RECOMMENDATIONS:	(If differ	ent from NA	ASA)	
[/] []	[].	[]	[] ADD/DELETE)
* CIL RETENTION H REMARKS: NO DIFFERENCES.	RATIONALE: (I	f applicab]	le) ADEQUATE INADEQUATE	[]

Ī

۳

i i

.

.

. = ;

- :

.

e an e cana a mara a construction de la construction de la construction de la construction de la construction d

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-253 03-2A-20	./01/88 NASA DA CS-253 BASELI 03-2A-202110-1 N								
SUBSYSTEM: MDAC ID: ITEM:	ARCS 253 PROP TAN	K ISOL	VLV 3/4	/5/ A & B						
LEAD ANALYST:	C.D. PRU	ST								
ASSESSMENT:										
CRITICAL FLIGH HDW/FU	ITY T NC	REDUND A	ANCY SCR B	eens C	CIL ITEM					
NASA [3 /1R IOA [3 /1R] [P] P]	[P] [NA]	[P] [P]	[] * []					
COMPARE [/] []	[N]	[]	[]]					
RECOMMENDATIONS:	(If di	fferen	t from N	ASA)						
[/] []	[]	[] ([] ADD/DELETE)					
* CIL RETENTION : REMARKS:	RATIONALE	: (If	applicab	le) ADEQUATE INADEQUATE						
NO DIFFERENCES F	JR THE 3/	4/ J VA	LVE, HOW	EVER IOA REC	UMMENDS A 3/					

'1R PPP, 1/1 ABORT FOR THE 1/2 VALVE WHICH IS ALSO COVERED ON THIS FMEA. SEE ASSESSMENT SHEET RCS-251. n na na anti-aragina anti-ar Anti-aragina anti-aragina anti-aragina anti-aragina anti-aragina anti-aragina anti-aragina anti-aragina anti-ar

a a de las sus de

.

REPORT DATE 2/26/88 C-165

1.3

B11-18

____ -

100

Sec.

1.17

ASSESSMEI ASSESSMEI NASA FMEI	NT DATE: NT ID: A #:	1/01/88 RCS-254 03-2A-2	010	80-1		NASA DATA: BASELINE NEW	[] [X]
SUBSYSTE MDAC ID: ITEM:	M:	ARCS 254 MANIFOI	נםי	./2 GF	ROUND PU	RGE COUPLING	
LEAD ANA	LYST:	C.D. PR	USI	2			
ASSESSME	NT:						· · · ·
	CRITICAL FLIGH HDW/FU	ITY F NC	RI A	DUNDA	NCY SCR B	REENS	CIL ITEM
NASA IOA	[2 /1R [2 /1R] [F P]]	[F] [NA]	[P] [P]	[X] * [X]
COMPARE	[/] [N]	[И]	[]	[]
RECOMMEN	DATIONS:	(If d	lifi	ferent	: from N	IASA)	
	[2 /1R] [F]	[F]	[P] (A)	[A] DD/DELETE)
* CIL RE	TENTION	RATIONAI	LE:	(If a	applicat	ole) ADEQUATE INADEQUATE	[] []
TITTTTTTTTTTT			-				ND B CODEE

IOA AGREES WITH NASA/RI RATIONALE FOR FAILURE OF A AND B SCREENS. IOA RECOMMENDS THAT "POPPET FAILS OPEN" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE. IOA ALSO RECOMMENDS ADDING STATEMENTS TO THE EFFECTS REGARDING FIRE/EXPLOSION HAZARD AND HAZARD TO GROUND AND EVA CREWS. THE QUANTITY ON THIS FMEA APPEARS TO BE INCORRECT.

REPORT DATE 2/26/88

.

аналад деша тшене з

ASSESSMENT DA ASSESSMENT ID NASA FMEA #:	E: 1/01/88 RCS-255 03-2A-2	/01/88 NASA DATA: CS-255 BASELINE [] /3-2A-201080-3 NEW [X]									
SUBSYSTEM: MDAC ID: ITEM:	ARCS 255 MANIFOI	RCS 55 ANIFOLD 1/2 GROUND PURGE COUPLING									
LEAD ANALYST:	C.D. PI	C.D. PRUST									
ASSESSMENT:											
CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM											
HDW,	FUNC	A B C									
NASA [3 , IOA [3 ,	3] 3]		[[]]	[[]]	[[] *]			
COMPARE [,]	[]]	[]	[]	[]			
RECOMMENDATIO	IS: (If o	lifferen	t fro	om NAS	SA)						
[3,	3]	[]]	[]	[]] ELETI	E)		
* CIL RETENTIO	N RATIONAL	LE: (If	appl	icable	≥)	DEOUNDE	r	٦			
					INA	DEQUATE	l []			
REMARKS: IOA FAILURE MO COUPLE" AND "I FLOW" BE ADDE CREDIBLE MODE	DES ON ANA RESTRICTED AS A FAIL AND IS AD	ALYSIS S FLOW". LURE MOD DRESSED	HEET IOA E ON ON OT	SHOUI RECOI THIS THER (LD II MMENI FME 2D FI	NCLUDE ' DS THAT A. THIS MEAS.	'FAII "RES 5 IS	S TO TRIC A	FED		

THE SSM AGREED WITH THE IOA ISSUE.

THE QUANTITY ON THIS FMEA APPEARS TO BE INCORRECT.

REPORT DATE 2/26/88

-

1

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-256 03-2A-20	01080-1		NASA DATA BASELINE NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM:	ARCS 256 MANIFOLI	0 3/4/5	GROUND PU	RGE COUPLING	G
LEAD ANALYST:	C.D. PRU	JST			
ASSESSMENT:					
CRITICAL	ITY	REDUNDA	NCY SCREE	NS	CIL
HDW/FU	NC	A	B	C	LIEM
NASA [2 /1R IOA [2 /1R] [] [F] P]	[F] [NA]	[P] [P]	[X]* [X]
COMPARE [/] [N]	[И]	[]	[]
RECOMMENDATIONS:	(If di	fferent	from NAS	A)	
[2 /1R] [F]	[F]	[P] (Al	[A] DD/DELETE)
* CIL RETENTION 1	RATIONALE	E: (If a	pplicable) ADEQUATE INADEQUATE	
REMARKS: IOA AGREES WITH I	NASA/RI F	ATIONAL	E FOR FAI	LURE OF A AN	ND B SCREE

三

_ ,

IOA AGREES WITH NASA/RI RATIONALE FOR FAILURE OF A AND B SCREENS. IOA RECOMMENDS THAT "POPPET FAILS OPEN" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE. IOA ALSO RECOMMENDS ADDING STATEMENTS TO THE EFFECTS REGARDING FIRE/EXPLOSION HAZARD AND HAZARD TO GROUND AND EVA CREWS. THE QUANTITY ON THIS FMEA APPEARS TO BE INCORRECT.

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	NT NT A		ATE: D:	1/(RCS 03-	01/88 5-257 -2A-201	1/88 NASA DATA: -257 BASELINE [] 2A-201080-3 NEW [X]								
SUBSYSTE MDAC ID: ITEM:	м:			AR(257 MAI	RCS 57 ANIFOLD 3/4/5 GROUND PURGE COUPLING									
LEAD ANA	LYS	ST	:	с.1	D. PRUS	т								
ASSESSMENT:														
CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM														
	1	HD	W/FU	NC	A B C									
NASA IOA	[[3 3	/3 /3]	[[]]	[[]]	[[]]		[[]	*
COMPARE	נ		/]	ſ]	[]	[]		[]	
RECOMMEN	DA'	FI	ons:		(If dif	fere	nt fr	om N	IASA)				eta inter T	
	[3	/3]	[]	[]	[]	(A] 1\DD.] DELE	TE)
* CIL RE	TE	NT	ION	RAT	IONALE:	(If	appl	icak	ole)	DEOI	73 0013	<i>r</i>	,	
									INA	DEQU	JATE	l []	
REMARKS: IOA FAIL COUPLE" FLOW" BE CREDIBLE	UR AN A		MODE "RES ED A E AN	S O TRI S A ID I	N ANALY CTED FI FAILUF S ADDRE	SIS OW". E MC SSED	SHEET IOA DE ON ON O	SHO REC THI	OULD I COMMEN IS FME R QD F	INCLU IDS 7 EA. TMEAS	JDE " THAT THIS	FAII "RES IS	LS T STRI A	o CTED

THE SSM AGREED WITH THE IOA ISSUE. THE QUANTITY ON THIS FMEA APPEARS TO BE INCORRECT.

REPORT DATE 2/26/88 C-169

¥ -

t" 📼 🚽

. .

=

-

ASSESSME ASSESSME NASA FME	NT NT A	D/ I) #:	ATE D:	: 1/0 RCS NON	1/88 -258 E				1	IASA BASI	DATA ELINE NEW	: []]]	
SUBSYSTE MDAC ID: ITEM:	:M:			ARC 258 RCS	S CROSS	FEEI	O VLV	1/2	OR 3/	4/5					
LEAD ANA	LY	ST	:	c.D	PRUS	т									
ASSESSME	NT	:													
	CR	IT: F)	ICA: LIGI	LITY HT	R	EDUN	NDANCY	SC	REENS			C] I]	IL CEN	4	
]	HD	W/F	JNC	А		В		C	2				-	
NASA IOA	[[1	/ /1]]	[[]	[[]	[[]]		[[x]]	*
COMPARE	[N	/N]	ſ]	[]	[]		[N]	
RECOMMEN	DA!	FI C	ONS	: (If dif	fere	ent fr	om	NASA)						
	[2	/2]	[]	ſ]	[ן ן	(Al] DD/	A ′DF] SLE	TE)
* CIL RE	TE	NT:	ION	RATI	ONALE:	(If	f appl	ica	ble) A INA	DEQU	JATE JATE	[[]	
REMARKS: NASA/RI	DO	N(TH) TC דעד	COVER	THIS	FAII FLC	LURE MO		(RESI		TED FI	LOW FA	/). 		THE E M

SSM AGREED THAT RESTRICTED FLOW SHOULD BE ADDED AS A FAILURE MODE ON 03-2A-202111-2 (2/2, 1/1 ABORT). IOA AGREES WITH A 2/2, 1/1 ABORT FOR RESTRICTED FLOW. IOA WITHDRAWS 1/1 CRIT ISSUE, BUT MAINTAINS CONCERN THAT RESTRICTED FLOW OF PROP TO A THRUSTER COULD RESULT IN BURN-

RESTRICTED FLOW OF PROP TO A THRUSTER COULD RESULT IN BURN-THROUGH.

REPORT DATE 2/26/88

ASSESSMENT DATE ASSESSMENT ID: NASA FMEA #:	: 1/01/88 RCS-259 03-2A-202	2112-1		NASA DATA: BASELINE [] NEW [X]							
SUBSYSTEM: MDAC ID: ITEM:	ARCS 259 RCS CROSS	RCS 59 .CS CROSSFEED VLV 1/2 OR 3/4/5									
LEAD ANALYST:	C.D. PRUS	ST									
ASSESSMENT:											
CRITICA	LITY F	EDUND	ANCY	SCREI	ens			CII	, 		
HDW/F	UNC A	· ·	В		с			TTE	LTEM		
NASA [1 /1 IOA [1 /1] []]	[[]]	[[]]		[X [X]]	*	
COMPARE [/] [] ·	[]	[]		[]		
RECOMMENDATIONS	: (If dif	ferent	t fro	om NAS	SA)						
[1 /1] []	[]	[]	(AE	[A D/D] ELF	ETE)	
* CIL RETENTION	RATIONALE:	(If a	appli	cable	e) A INA	DEQUAT DEQUAT	'E 'E	[[]		
REMARKS: THIS FMEA COVER: CROSSFEED VALVE:	S ONLY THE S. IOA HAS	BELLOV NO IS	NS LE SSUE	AKAGE WITH	E FA THI	ILURE S FAIL	MOD URE	DE F MO	ÓR DE,	THE	

CROSSFEED VALVES. IOA HAS NO ISSUE WITH THIS FAILURE MODE, HOWEVER DOES RECOMMEND THAT THE EFFECTS INCLUDE THE POSSIBLE EXPOSURE OF EVA AND GROUND CREWS TO PROP OR PROP VAPORS. NASA/RI DO NOT COVER STRUCTURAL FAILURE, RUPTURE, OR EXTERNAL LEAKAGE OF THE VALVE HOUSING ON THIS FMEA OR ELSEWHERE. THE SSM AGREED THAT THIS VALVE BODY SHOULD BE ADDED TO THE PROP LINE EXTERNAL LEAKAGE FMEA (03-2A-202108-1) WITH CORRESPONDING RETENTION RATIONALE.

WHO IS

•

.

=

=

_

_

-

ASSESSMEN ASSESSMEN NASA FMEN	VT DAT VT ID: A #:	YE: 1/ R(01	/01/88 CS-260 3-2A-2	021	.11-1			N	ASA DAT BASELIN NE	'A: IE [W [X]
SUBSYSTEM MDAC ID: ITEM:	4:	AI 20 R(RCS 50 CS CRC	SSF	EED	VLV :	1/2				
LEAD ANA	LYST:	C	.D. PR	USI							
ASSESSME	NT:										
(CRITIC FLI HDW/	CALITY GHT	Y .	RE	DUND	ANCY B	SCREI	ENS C	!	CIL ITE	м
NASA IOA	[3 /	/1R] /2]	[P]	[P []	[F [']]	[[X] *]
COMPARE	[N/	רא]	[N	1	[N]	[N	[]	[N]
RECOMMEN	DATION	1S :	(If d	liff	eren	t fr	om NAS	SA)			
	[/	′)	(]	[]	ָ נ]	[[ADD/D] ELETE)
* CIL RE	TENTIC	ON RA'	TIONAI	E:	(If	appl	icable	≥) A INA	DEQUATI DEQUATI	5 [5 []]
T/111 10 10/1/(0) 1							//			1 1007	ANTRETONIC

IOA AGREES WITH NASA/RI RATIONALE FOR 3/1R PPP CRIT ASSIGNMENT.

REPORT DATE 2/26/88

ASSESSMENT DATE ASSESSMENT ID: NASA FMEA #:	: 1/01/88 RCS-261 03-2A-203	2111-2		NASA DATA: BASELINE [] NEW [X]							
SUBSYSTEM: MDAC ID: ITEM:	ARCS 261 RCS CROS	RCS 61 CS CROSSFEED VLV 1/2									
LEAD ANALYST:	C.D. PRU	D. PRUST									
ASSESSMENT:					•						
CRITICA FLIG	LITY I HT	REDUNDA	ANCY SCRE	ENS	CIL ITEM						
HDW/F	UNC	A	В	С							
NASA [2 /2 IOA [2 /2	.] [²	P]]	[P] []	[P] []	[X]* [X]						
COMPARE [/) []	N]	[И]	[N]	[]]						
RECOMMENDATIONS	: (If di	fferent	: from NA	SA)							
[/] []	[]	[]]	[] ADD/DELETE)						
* CIL RETENTION	RATIONALE	: (If a	applicabl	.e) ADEQUATE	[]						
REMARKS: NO DIFFERENCES.				INADEQUATE	LJ						

REPORT DATE 2/26/88

ASSESSMEI ASSESSMEI NASA FMEI	NT DA NT II A #:	ATE: D:	1/01/8 RCS-26 03-2A-	88 52 -2021	.11-1		NASA DATA: BASELINE [] NEW [X]					
SUBSYSTE MDAC ID: ITEM:	м:		ARCS 262 RCS CF	Rossi	FEED	VLV :	3/4/5		-			, <u>, , , , , , , , , , , , , , , , , , </u>
LEAD ANA	LYST	:	C.D. H	PRUST	:			,				
ASSESSME	N T:											
,	CRIT F HD	ICALI LIGHT W/FUN	[TY [1C	RI A	DUND	ANCY B	SCREI	ens C			CIL ITEI	M
NASA IOA	[3 [2	/1R /2]	[P []	[P []]	[P []		[[x] *]
COMPARE	[N	/N]	[N]	[N]	[N]		[N]
RECOMMEN	DATI	ons:	(If	diff	eren	t fr	om NAS	SA)				
	C	/]	נ]	[]	[]	(AI	[נס/סמ] ELETE)
* CIL RE	TENT	ION 1	RATION	ALE:	(If	appl	icable	e) A INA	DEQUAT DEQUAT	E	[[]
REMARKS :											-	-

=

IOA ACCEPTS NASA/RI RATIONALE FOR 3/1R PPP CRIT ASSIGNMENT. HOWEVER, IOA MAINTAINS CONCERN REGARDING DETECTABILITY OF INTERNAL LEAKAGE DURING FLIGHT. IOA ACCEPTS SSM POSITION THAT A LEAKAGE LARGE ENOUGH TO CAUSE ANY PROBLEMS WOULD BE DETECTABLE. LEAKAGES TOO SMALL TO DETECT ARE OF NO CONSEQUENCE.

REPORT DATE 2/26/88

C-174

a second second second
ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-263 03-2A-202	111-2		NASA DAT BASELIN NE	A: E [] W [X]						
SUBSYSTEM: MDAC ID: ITEM:	ARCS 263 RCS CROSS	ARCS 263 RCS CROSSFEED VLV 3/4/5 C.D. PRUST									
LEAD ANALYST:	C.D. PRUS	т									
ASSESSMENT:											
CRITICAL	ITY R	EDUNDA	ANCY SCR	EENS	CIL						
HDW/FU	FLIGHT DW/FUNC A B C										
NASA [2 /2 IOA [2 /2] [P]]		[P] []	[P] []	[X]* [X]						
COMPARE [/] [N]	[N]	[N]	[].						
RECOMMENDATIONS:	(If dif	ferent	: from N	ASA)							
[/.] []	[]	[]	[] ADD/DELETE)						
* CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE [] REMARKS:											
NO DIFFERENCES.											

REPORT DATE 2/26/88

-

-

.

ASSESSM ASSESSM NASA FM	ENT ENT EA	D2 II #:	ATE: D:	1/01/8 RCS-26 NONE	38 54				N	IASA BASE	DATA: LINE NEW	[]]	
SUBSYST MDAC ID ITEM:	EM: :			ARCS 264 CROSSI	FEED	LINES	5								
LEAD AN	ALYS	ST:	:	C.D. 1	PRUSI							-			
ASSESSM	ENT	:													
	CR	TT:	ICAL	LTY P	RE	DUND	NCY	SCREE	INS			CI	L FM	r	
	I	HD	W/FUN	1C	A		В		c					•	
NASA IOA	[[1	/ /1]]	[[]	[[]	[[]]		[[х]	*
COMPARE	[N	/N]	[]	[]	[]	•	[N]	
RECOMME	NDA	FI C	ONS:	(If	diff	erent	: fro	om NAS	SA)						
	[/]	<u>ַ</u>]	[]	[]	(AD	[D/	DE] :LE	TE)
* CIL R	etei	NT:	ION I	RATION	ALE:	(If a	appli	cable	e) A INA	DEQU	ATE ATE	[[]	

REMARKS:

NASA/RI DO NOT COVER RESTRICTED FLOW IN A SEGMENT OF LINE DUE TO OBSTRUCTION OR DEFORMATION (CRIMPING). SUCH AN OCCURRENCE COULD RESULT IN 2/2, 1/1 ABORT EFFECTS, HOWEVER THE CREDIBILITY OF SUCH AN OCCURRENCE IS QUESTIONABLE. ANY CONTAMINATION WOULD FLOW TO DOWNSTREAM FILTER OR COMPONENT. IOA RECOMMENDS THAT SUCH A FAILURE BE ADDRESSED ON THE FMEA/CIL, BUT DOES NOT REGARD THIS RECOMMENDATION AS AN OPEN ISSUE.

REPORT DATE 2/26/88

C-176

.

ASSESSME ASSESSME NASA FME	NT DA NT II A #:	ATE: D:	1/01/ RCS-2 03-2A	1		N	ASA DA BASELI N	TA NE EW	; [[x]			
SUBSYSTE MDAC ID: ITEM:	M:		ARCS 265 CROSS	FEED	LIN	ES								
LEAD ANA	LYST	:	C.D.	PRUS	т									
ASSESSME	NT:													
	CRIT	ICAL	ITY	R	EDUN	DANCY	SCRE	ens			CI	L FM		
	HD	W/FU	NC	A		В		С	с					
NASA IOA	[1 [1	/1 /1]	[[]	[[]]	[[]]		[]	X X]	*
COMPARE	[/]	[Ĵ	[]	[]		[]	
RECOMMEN	DATI	ONS:	(If	dif	fere	nt fr	om NA	SA)						
	[/]	C]	[]	[]	(AI	[DD/1	DE] LE	TE)
* CIL RE	TENT	ION	RATION	ALE:	(If	appl	icabl	e) A INA	DEQUAT DEQUAT	E E	[[]	
REMARKS:													-	

IOA RECOMMENDS THAT "FAILURE OF LINE BELLOWS TO DEFLECT" BE ADDED AS A CAUSE ON THIS FMEA/CIL. IOA CONSIDERS THIS TO BE A CREDIBLE FAILURE WHICH SHOULD BE ADDRESSED ON THE FMEA/CIL. THIS FMEA SHOULD INCLUDE VALVE BODIES IN THE ITEM LIST AND CORRESPONDING RETENTION RATIONALE. IOA ALSO RECOMMENDS THAT THE EFFECTS DISCUSS THE POSSIBLE EXPOSURE OF EVA AND GROUND CREWS TO PROP OR PROP VAPORS.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-266 03-2A-202120-1	NASA DATA: BASELINE [] NEW [X]						
SUBSYSTEM: MDAC ID: ITEM:	ARCS 266 MANIFOLD 1, ISOL VLV							
LEAD ANALYST:	C.D. PRUST							

ASSESSMENT:

	CRIT	TCAL	ITY T		RED	CIL ITEM							
	HI	W/FU	NC		A		В		С				
NASA IOA	[3	/1R /3]	[[P]]	[[NA]]	[[P]	[[]]	*
COMPARE	[/N	J	[N]	[N]	[N]	[]	

RECOMMENDATIONS: (If different from NASA)

ſ	1]	ſ]	[]	[]	[]
									(ADD/DELETE)

ing a particular second and a second s

* CIL RETENTION RATIONALE: (If applicable)

.

ADEQUATE [] INADEQUATE []

Ξ.

REMARKS:

IOA AGREES WITH NASA/RI RATIONALE FOR 3/1R PNP ASSIGNMENT.

REPORT DATE 2/26/88

ASSESSMENT DATE: 1/01/88 NASA DATA: BASELINE [ASSESSMENT ID: RCS-267 NEW [X] NASA FMEA #: 03-2A-202120-3 SUBSYSTEM: ARCS 267 MDAC ID: MANIFOLD 1, ISOL VLV ITEM: LEAD ANALYST: C.D. PRUST ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL ITEM FLIGHT HDW/FUNC Α В C NASA [3 /1R] [P] [P] [P]] * [[P] [P] [P] [X] IOA [3/1R][N] COMPARE 1 **RECOMMENDATIONS:** (If different from NASA) [3/1R] [P] [P] [P] [A] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE INADEQUATE 1

REMARKS:

IOA RECOMMENDS THAT THIS ITEM AND FAILURE MODE BE UPGRADED TO A 3/1R PPP, 1/1 ABORT AND PLACED ON THE CIL. LOSS OF ALL THRUSTERS ON ONE MANIFOLD MAY RESULT IN THE INABILITY TO COMPLETE ADEQUATE OMS OR ARCS DUMPS DURING RTLS OR TAL, RESULTING IN POSSIBLE VIOLATIONS OF ENTRY MASS PROPERTIES CONSTRAINTS OR PROP TANK LANDING WEIGHT CONSTRAINTS.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-268 03-2A-201080-1	NASA DATA: BASELINE [NEW [x]
SUBSYSTEM: MDAC ID: ITEM:	ARCS 268 MANIFOLD 1, GROUND PURGE/	DRAIN COUPLIN	ĩG
LEAD ANALYST:	C.D. PRUST		
ASSESSMENT:			
CRITICALI FLIGHI HDW/FUN	TY REDUNDANCY SCREEN	S CI IT C	IL TEM
NASA [2 /1R IOA [2 /1R] [F] [F] [] [P] [NA] [P][P][X] * X]
COMPARE [/] [N] [N] [] []
RECOMMENDATIONS:	(If different from NASA)	
[2 /1R] [F] [F] [P][A] (DELETE)
* CIL RETENTION F	ATIONALE: (If applicable)	ADEQUATE [NADEQUATE []]

IOA AGREES WITH NASA/RI RATIONALE FOR FAILURE OF A AND B SCREENS. IOA RECOMMENDS THAT "POPPET FAILS OPEN" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE. IOA ALSO RECOMMENDS ADDING STATEMENTS TO THE EFFECTS REGARDING FIRE/EXPLOSION HAZARD AND HAZARD TO GROUND AND EVA CREWS. THE QUANTITY ON THIS FMEA APPEARS TO BE INCORRECT.

.

REPORT DATE 2/26/88

ASSESSMENT DATE ASSESSMENT ID: NASA FMEA #:	: 1/01/88 RCS-269 03-2A-201	.080-3		NASA DATA BASELINE NEW	: [] [X]								
SUBSYSTEM: MDAC ID: ITEM:	ARCS 269 MANIFOLD	1, GROUND	PURGE/	DRAIN COUP	LING								
LEAD ANALYST:	C.D. PRUS	T											
ASSESSMENT:													
CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM													
FLIGHT ITEM HDW/FUNC A B C													
NASA [3 /3 IOA [3 /3] [] [] [] [] [] []	[] * []								
COMPARE [/] [] [] []	[]								
RECOMMENDATIONS	: (If dif	ferent fr	om NASA)									
[3 /3] [] [] [] · (A)	[] DD/DELETE)								
* CIL RETENTION	RATIONALE:	(If appl	icable)		r 7								
			I	ADEQUATE NADEQUATE									
REMARKS: IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE MODE AND IS ADDRESSED ON OTHER OD EMEAS													

THE SSM AGREED WITH THE IOA ISSUE. THE QUANTITY ON THIS FMEA APPEARS TO BE INCORRECT.

REPORT DATE 2/26/88

ŝ. - e

ASSESS ASSESS NASA F	SMEN SMEN FMEA	T I T I . #:	DATE:	1/01/8 RCS-27 03-2A-	/01/88 CS-270 3-2A-202120-1								ASA BASI	DATA ELINE NEW	: [X]]	
SUBSYS MDAC I ITEM:	STEM [D:	:		ARCS 270 MANIFO	ARCS 270 MANIFOLD 2, ISOL VLV C.D. PRUST												
LEAD A	NAL	YSI	::	C.D. 1	PRU	ISI	•										
ASSESS	SSESSMENT:																
CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM																	
		H	W/FU	NC		A			В			С				-	
NAS IC	SA DA	[3 [3	/1R /3]]	[[P]	(N	A]]	[[P]]		[[]]	*
COMPAR	RE	נ	/N]	[N]	(N]	ľ	N]	÷	[]	
RECOM	IEND	ATI	ons:	(If	di	ff	eren	t	fr	on	NASA)					
		[1]	[]	(]	. []	(Al	[וס/סס] ELE	TE)
* CIL	CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE []																
REMARI	EMARKS: DA AGREES WITH NASA/RI RATIONALE FOR 3/1R PNP ASSIGNMENT.																

.

1

.

The function of the state of th

REPORT DATE 2/26/88 C-182

ASSESSMENT DATE: 1/01/88 NASA DATA: ASSESSMENT ID: RCS-271 BASELINE [NEW [X] NASA FMEA #: 03-2A-202120-3 SUBSYSTEM: ARCS MDAC ID: 271 ITEM: MANIFOLD 2, ISOL VLV LEAD ANALYST: C.D. PRUST ASSESSMENT: REDUNDANCY SCREENS CRITICALITY CIL FLIGHT ITEM HDW/FUNC Α В С NASA [3/1R][P] [P] [P] [IOA [3/1R][P] [P] ΓΡĴ [X] COMPARE [/] [N] **RECOMMENDATIONS:** (If different from NASA) [3/1R] [P] [P] [P] [A] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE ſ INADEQUATE **REMARKS:** IOA RECOMMENDS THAT THIS ITEM AND FAILURE MODE BE UPGRADED TO A 3/1R PPP, 1/1 ABORT AND PLACED ON THE CIL. LOSS OF ALL THRUSTERS

ON ONE MANIFOLD MAY RESULT IN THE INABILITY TO COMPLETE ADEQUATE OMS OR ARCS DUMPS DURING RTLS OR TAL, RESULTING IN POSSIBLE VIOLATIONS OF ENTRY MASS PROPERTIES CONSTRAINTS OR PROP TANK LANDING WEIGHT CONSTRAINTS.

REPORT DATE 2/26/88

C-183.

ASSESSME ASSESSME NASA FME	NT D NT I A #:	ATE: D:	1/01/8 RCS-27 03-2A-	8 2 20	10	80-1		NASA DATA: BASELINE [] NEW [X]									
SUBSYSTE MDAC ID: ITEM:	M:		ARCS 272 MANIFO	RCS 72 ANIFOLD 2, GROUND PURGE/DRAIN									PL	IN	G		
LEAD ANA	LYST	:	C.D. F	RU	SI												
ASSESSME	NT:																
	CRIT F	LIGHT	TY C		RE	DUNE	AN	CY	SCREI	ENS	з С		(CI IT	L EM	[
	HD	W/FUI	NC		A			D			C						
NASA IOA	[2 [2	/1R /1R]	[[F P]	[[F N2] ¥]	[[P P]		[[X X]	*
COMPARE	[1]	[N]	נ	N	1	[]		[]	
RECOMMEN	DATI	ONS:	(If	di	.ff	ferer	it :	fr	om NA	SA)						
	[2	2 /1R]	נ	F]		F]	[P] (AD	[D/	A DE] :LE	TE)
* CIL RE	TENI	TION I	RATION	LE	:	(If	ap	pl.	icabl	e) Il	AI NAI	DEQUATE DEQUATE		[[]]	
REMARKS:															_		

IOA AGREES WITH NASA/RI RATIONALE FOR FAILURE OF A AND B SCREENS. IOA RECOMMENDS THAT "POPPET FAILS OPEN" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE. IOA ALSO RECOMMENDS ADDING STATEMENTS TO THE EFFECTS REGARDING FIRE/EXPLOSION HAZARD AND HAZARD TO GROUND AND EVA CREWS. THE QUANTITY ON THIS FMEA APPEARS TO BE INCORRECT.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-273 03-2A-20			NZ I	ASA DATA BASELINE NEW	: [x]					
SUBSYSTEM: MDAC ID: ITEM:	ARCS 273 MANIFOLI	UND	PURGE	e/dri	AIN COUP	LING						
LEAD ANALYST:	C.D. PR	UST										
ASSESSMENT:												
CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM												
HDW/FU	NC	В		С								
NASA [3 /3 IOA [3 /3] [] []	[[]	[[]	[[] *]				
COMPARE [/] []	[]	[]	[]				
RECOMMENDATIONS:	(If d	ifferent	fro	om NAS	SA)							
[3 /3] []	[]	[] (A] DD/D] ELETE)				
* CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE []												
REMARKS: IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE MODE AND IS ADDRESSED ON OTHER QD FMEAS.												

THE SSM AGREED WITH THE IOA ISSUE. THE QUANTITY ON THIS FMEA APPEARS TO BE INCORRECT.

REPORT DATE 2/26/88

=

~

NASA DATA: ASSESSMENT DATE: 1/01/88 · · ·] ASSESSMENT ID: RCS-274 BASELINE [NEW [X] 03-2A-202120-1 NASA FMEA #: SUBSYSTEM: ARCS 274 MDAC ID: MANIFOLD 3, ISOL VLV ITEM: LEAD ANALYST: C.D. PRUST ASSESSMENT: REDUNDANCY SCREENS CIL CRITICALITY ITEM FLIGHT С HDW/FUNC A В [P] [NA] [P] NASA [3 /1R] [] 1 IOA [3/3] []] Γ 1 COMPARE [/N] [N] [N] [] **RECOMMENDATIONS:** (If different from NASA)] [/] [(ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE [] **REMARKS:**

2

IOA AGREES WITH NASA/RI RATIONALE FOR 3/1R PNP ASSIGNMENT.

REPORT DATE 2/26/88

C-186

NASA DATA: ASSESSMENT DATE: 1/01/88 BASELINE [ASSESSMENT ID: RCS-275 1 NASA FMEA #: 03-2A-202120-3 NEW [X] ARCS SUBSYSTEM: 275 MDAC ID: MANIFOLD 3, ISOL VLV ITEM: LEAD ANALYST: C.D. PRUST ASSESSMENT: REDUNDANCY SCREENS CIL CRITICALITY ITEM FLIGHT C В HDW/FUNC Α [P] NASA [3 /1R] [P] [P] ſ] * į x j [P] [P] IOA $\begin{bmatrix} 3 / 1R \end{bmatrix}$ [P]] [] [] [N] COMPARE Ι RECOMMENDATIONS: (If different from NASA) [3/1R] [P] [P] [P] [A] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE INADEQUATE Γ 1 **REMARKS:** IOA RECOMMENDS THAT THIS ITEM AND FAILURE MODE BE UPGRADED TO A

3/1R PPP, 1/1 ABORT AND PLACED ON THE CIL. LOSS OF ALL THRUSTERS ON ONE MANIFOLD MAY RESULT IN THE INABILITY TO COMPLETE ADEQUATE OMS OR ARCS DUMPS DURING RTLS OR TAL, RESULTING IN POSSIBLE VIOLATIONS OF ENTRY MASS PROPERTIES CONSTRAINTS OR PROP TANK LANDING WEIGHT CONSTRAINTS.

REPORT DATE 2/26/88

Ξ

三

: =

ASSESSMI ASSESSMI NASA FMI	ent Ent Ea ‡	DZ II #:	ATE: D:	1/01/8 RCS-27 03-2A-	38 76 -2(010	80-1					NZ H	ASA DA BASELI N	TA: NE EW	[[x]]	
SUBSYSTI MDAC ID: ITEM:	EM : :			ARCS 276 MANIFO)LI	5 3	, GR	วบ	ND	PURG	E/I	DR	AIN CO	UPL	IN	īG		
LEAD ANZ	ALYS	ST :	:	C.D. 1	PRI	JSI												
ASSESSMI	ENT :	:																
	CRI	T] FI	CALI LIGHI	TY C		RI	DUND	AN	CY	SCREI	ENS	5			CI II	IL IEN	1	
	F	١D٧	/FUN	IC		A			В	-		С						
NASA IOA	[[2 2	/1R /1R]	[[F P]	[[F Nž] A]	[[P P]]		[[X X]].	*
COMPARE	[/]	[N]	[N]	נ]		I]	
RECOMMEN	IDAJ	ric	ONS:	(If	đ	Ĺſſ	erent	t	fro	om NAS	SA)							
	[2	/1R]	[F]	[F]	[P]	(AD	[D/	A 'DF] LE	ETE)
* CIL RH	ETEN	ITI	ION F	ATIONA	LI	2:	(If a	ap	p1 :	icable	€) IN	AI IAI)EQUAT)EQUAT	E E	[]	

REMARKS:

IOA AGREES WITH NASA/RI RATIONALE FOR FAILURE OF A AND B SCREENS. IOA RECOMMENDS THAT "POPPET FAILS OPEN" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE. IOA ALSO RECOMMENDS ADDING STATEMENTS TO THE EFFECTS REGARDING FIRE/EXPLOSION HAZARD AND HAZARD TO GROUND AND EVA CREWS. THE QUANTITY ON THIS FMEA APPEARS TO BE INCORRECT.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-277 03-2A-20108	80-3		NASA DATA BASELINE NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM:	ARCS 277 MANIFOLD 3	, GROUND	PURGE/	DRAIN COUP	LING
LEAD ANALYST:	C.D. PRUST				
ASSESSMENT:					
CRITICAL FLIGH	ITY REI T	DUNDANCY	SCREEN	rs _	CIL ITEM
HDW/FU	NC A	В		С	
NASA [3 /3 IOA [3 /3] [] [] [] [] []	[]*
COMPARE [/] [] [] (]	[]
RECOMMENDATIONS:	(If diff	erent fro	om NASA	7)	
[3/3] [] [] [] (A	[] .DD/DELETE)
* CIL RETENTION	RATIONALE:	(If appli	cable)	ADEQUATE	[]
REMARKS:			1	NADEQUATE	LJ

IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE. THE QUANTITY ON THIS FMEA APPEARS TO BE INCORRECT.

REPORT DATE 2/26/88

ASSESSMENT DATE: 1/01/88 NASA DATA: BASELINE [1 ASSESSMENT ID: RCS-278 NEW [X] NASA FMEA #: 03-2A-202120-1 SUBSYSTEM: ARCS 278 MDAC ID: MANIFOLD 4, ISOL VLV ITEM: LEAD ANALYST: C.D. PRUST ASSESSMENT: REDUNDANCY SCREENS CIL CRITICALITY ITEM FLIGHT HDW/FUNC С В A NASA [3 /1R] IOA [3 /3] [P] [NA] [] [] [P] [1 * [٦ 1 COMPARE [/N] [N] [N] [] RECOMMENDATIONS: (If different from NASA) [1 (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE [1 **REMARKS:**

IOA AGREES WITH NASA/RI RATIONALE FOR 3/1R PNP ASSIGNMENT.

REPORT DATE 2/26/88

C-190

ASSESSMENT DATE: 1/01/88 NASA DATA: BASELINE [] ASSESSMENT ID: RCS-279 NEW [X] NASA FMEA #: 03-2A-202120-3 ARCS SUBSYSTEM: MDAC ID: 279 MANIFOLD 4, ISOL VLV ITEM: LEAD ANALYST: C.D. PRUST ASSESSMENT: REDUNDANCY SCREENS CIL CRITICALITY ITEM FLIGHT С HDW/FUNC Α В [P] [P] [P] NASA [3/1R][P] [P] [X] [P] IOA [3/1R][N]] [COMPARE [] [] RECOMMENDATIONS: (If different from NASA) [3/1R] [P] [P] [P] [A] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE INADEQUATE 1 **REMARKS:** IOA RECOMMENDS THAT THIS ITEM AND FAILURE MODE BE UPGRADED TO A

3/1R PPP, 1/1 ABORT AND PLACED ON THE CIL. LOSS OF ALL THRUSTERS ON ONE MANIFOLD MAY RESULT IN THE INABILITY TO COMPLETE ADEQUATE OMS OR ARCS DUMPS DURING RTLS OR TAL, RESULTING IN POSSIBLE VIOLATIONS OF ENTRY MASS PROPERTIES CONSTRAINTS OR PROP TANK LANDING WEIGHT CONSTRAINTS.

REPORT DATE 2/26/88

 $\Xi = \Xi$

ASSESSMEI ASSESSMEI NASA FMEI	NT E NT I A #:	DATE:	1/01/ RCS-2 03-2A	/88 80 -20	10	80-1					N7 E	ASA D BASEL	ATA: INE NEW	[[x]]	
SUBSYSTEM MDAC ID: ITEM:	4:		ARCS 280 MANIF	OLD	4	, gr	ou	ND	PURGI	E/I	DRA	AIN C	OUPI	JN	G		
LEAD ANA	LYSI	::	C.D.	PRU	ST	1											
ASSESSMEI	T:																
(CRII F	ICALI LIGH	ETY C		RE	DUNE	ANG	CY	SCREI	ENS	3			CI IT	L EM	ſ	
	HC	W/FUI	1C		Α			в	-		С						
NASA IÓA	[2 [2	/1R /1R]] נ	F P]	[[F NZ]	[[P P]]		[[X X]]	*
COMPARE	[/]	נ	N]	[N]	[]		[]	
RECOMMEN	DATI	ons:	(If	di	ff	eren	it :	fro	om NAS	5A)	ł						
	[2	/1R]	[F]	[F]	[P]	(AE	[D/	A DE] LE	TE)
* CIL RE	rent	ION I	RATION	ALE	:	(If	apı	j li	cable	(∈ 11	AI JAI	DEQUA DEQUA	TE TE	[[]]	
IOA AGRE	es W	ITH 1	NASA/R	IR	AT	IONA	LE	FC	R FA	ĽĽ	JRE	OF	A AN		B	sc	REE

ENS. IOA RECOMMENDS THAT "POPPET FAILS OPEN" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE MODE AND IS ADDRESSED ON OTHER OD FMEAS. THE SSM AGREED WITH THE IOA ISSUE. IOA ALSO RECOMMENDS ADDING STATEMENTS TO THE EFFECTS REGARDING FIRE/EXPLOSION HAZARD AND HAZARD TO GROUND AND EVA CREWS. THE QUANTITY ON THIS FMEA APPEARS TO BE INCORRECT.

= :

- -- --

: = . -

3

REPORT DATE 2/26/88 C-192

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-281 03-2A-201			N	ASA DAT BASELIN NE	A: E [W []] (]	
SUBSYSTEM: MDAC ID: ITEM:	ARCS 281 MANIFOLD	4, GR(DUND	PURG	e/dr	AIN COU	PLING	3
LEAD ANALYST:	C.D. PRUS	T						
ASSESSMENT:								
CRITICAI FLIGH	JITY R IT	EDUND	ANCY	SCRE	ENS		CII ITH	EM
HDW/FU	INC A	•	В		C			
NASA [3 /3 IOA [3 /3] [] []]	[[·]	[[]]	[[] *]
COMPARE [/] []	[]	[]	[] ·
RECOMMENDATIONS:	(If dif	feren	t fr	om NA:	SA)			
[3 /3] []	[]	[] (] ADD/I] DELETE)
* CIL RETENTION	RATIONALE:	(If a	appl	icablo	e) A INA	DEQUATE DEQUATE	[[]]
REMARKS: IOA FAILURE MODE	S ON ANALY	HEET	SHOU	LD I	NCLUDE	"FAII	LS TO	

IOA FAILURE MODES ON ANALYSIS SHEET SHOULD INCLUDE "FAILS TO COUPLE" AND "RESTRICTED FLOW". IOA RECOMMENDS THAT "RESTRICTED FLOW" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE. THE QUANTITY ON THIS FMEA APPEARS TO BE INCORRECT.

REPORT DATE 2/26/88

Ē

i 🚛

: •<u>=</u>=

ASSESSMENT DATE:	1/01/88	NASA DATA:
ASSESSMENT ID:	RCS-282	BASELINE []
NASA FMEA #:	03-2A-202140-2	NEW [X]
SUBSYSTEM:	ARCS	
MDAC ID:	282	
ITEM:	MANIFOLD 5, ISOL VLV	

LEAD ANALYST: C.D. PRUST

ASSESSMENT:

	CRITICALITY FLIGHT					REDUNDANCY SCREENS								CIL ITEM				
	Н	IDW	I/FUI	NC		A				в			С					
NASA IOA	[[3 3	/1R /3]]	ן נ	P]]		[[NA]	[[P]	[[]	*	
COMPARE	[/N]	Ľ	N]		[N]	ן	N]	[]		

RECOMMENDATIONS: (If different from NASA)

•	/	1	r	1	r	7	r -	7	r 1
			1		1				
	•		•	-		-		-	
									/እኮኮ/ኮሮ፣ ወጥውነ

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [] INADEQUATE []]

and the second sec

;

> . .

REMARKS:

IOA AGREES WITH NASA/RI RATIONALE FOR 3/1R PNP ASSIGNMENT.

REPORT DATE 2/26/88 C-194

ASSESSME ASSESSME NASA FME	NT DA NT IA A #:	ATE: D:	1/01/ RCS-2 03-24	/88 283 A-202	140-	1		N	IASA I BASEI	DATA: LINE NEW	A: 7 [X] 7 [X]			
SUBSYSTE MDAC ID: ITEM:	M:		ARCS 283 MANII	CS 3 NIFOLD 5, ISOL VLV										
LEAD ANA	LYST	:	C.D.	PRUS	т									
ASSESSME	NT:													
	CRIT	ICAL	ITY	F	EDUN	DANCY	C SCR	EENS	• •		CIL	м		
	HD	W/FU	NC	A	L	F	3	c	:			-	•	
NASA IOA	[2 [2	/2 /2]]	[[]	[[]]	[[]]		[X [X] *]		
COMPARE	٢	/]	[]	[]	[]		[]		
RECOMMEN	DATI	ons:	(11	E dif	fere	nt fi	com N	ASA)	·					
	Γ	/]	[]	[]	[]	(Al] ס/סכ] ELEI	ΡΈ)	
* CIL RE	TENT	ION	RATION	VALE:	(If	app]	Licab	le) / IN/	DEQUI	ATE ATE	[[]]		
REMARKS: NO DIFFE OF MISSI	RENC ON D	ES. UE T	IOA H O HIGH	RECOM HER B	MEND PROP	s thi Consu	AT TH JMPTI	E "C' ON WI	EFFI	ECTS RCS.	DIS	CUSS	LOSS	

REPORT DATE 2/26/88 C-195

ASSESSMENT DATE: ASSESSMENT ID:	1/01/88 RCS-284	NASA DATA: BASELINE []
NASA FMEA #: SUBSYSTEM: MDAC ID:	ARCS 284 WANTFOLD 5 CROUND	
ITEM:	MANIFOLD 5, GROUND	PURGE/DRAIN COUPLING

LEAD ANALYST: C.D. PRUST

ASSESSMENT:

	CRITICALITY FLIGHT						REDUNDANCY SCREENS							C: I'	CIL ITEM			
-	•	HD	W/FUI	NC		A			в			С				-		
NASA IOA	[[2 2	/1R /1R]]	[[F P]]	[[F NA]	[[P P]]	([X X]	*	
COMPARE	[/]	[N]	[N]	[]	[]		

RECOMMENDATIONS: (If different from NASA)

[2 /1R]	(F)	[F]	[P]	[A]
				(ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [] INADEQUATE [] 1.1

REMARKS:

IOA AGREES WITH NASA/RI RATIONALE FOR FAILURE OF A AND B SCREENS. IOA RECOMMENDS THAT "POPPET FAILS OPEN" BE ADDED AS A FAILURE MODE ON THIS FMEA. THIS IS A CREDIBLE MODE AND IS ADDRESSED ON OTHER QD FMEAS. THE SSM AGREED WITH THE IOA ISSUE. IOA ALSO RECOMMENDS ADDING STATEMENTS TO THE EFFECTS REGARDING FIRE/EXPLOSION HAZARD AND HAZARD TO GROUND AND EVA CREWS. THE QUANTITY ON THIS FMEA APPEARS TO BE INCORRECT.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-285 03-2A-201	1080-3		NASA DATA BASELINE NEW	.: ; [; [X]]							
SUBSYSTEM: MDAC ID: ITEM:	RAIN COUF	LING	17 /										
LEAD ANALYST:	C.D. PRUS	ST											
ASSESSMENT:													
CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM													
HDW/FU	INC A	A B		c	.	•							
NASA [3 /3 IOA [3 /3] [] [] [] [] [] []	[נ] *]							
COMPARE [/] [·] [] []	[]							
RECOMMENDATIONS:	(If dif	fferent fr	om NASA)										
[3 /3] [] [] [] (A	ן וס/סס.] ELETE)							
* CIL RETENTION	RATIONALE:	: (If appl	icable) IN	ADEQUATE ADEOUATE	[r]							
REMARKS: IOA FAILURE MODE COUPLE" AND "RES FLOW" BE ADDED A CREDIBLE MODE AN THE SSM AGREED W	S ON ANALY TRICTED FI AS A FAILUR ID IS ADDRE VITH THE IC	ISIS SHEET OW". IOA RE MODE ON SSED ON O DA ISSUE.	SHOULD RECOMME THIS FM THER QD	INCLUDE " NDS THAT EA. THIS FMEAS.	FAIL "RES IS	S TO TRICTED A							
THE QUANTITY ON	THIS FMEA	APPEARS T	O BE INC	ORRECT.	15 · 24	-							

REPORT DATE 2/26/88 C-197

- -

ŧ

=

ASSESSMI ASSESSMI NASA FMI	ent Ent Ea f	DZ II I:	ATE: D:	1/01/8 RCS-28 03-2A-	38 36 -2021	.12-1		NASA DATA: BASELINE [] NEW [X]						
SUBSYSTI MDAC ID: ITEM:	EM:			ARCS 286 MANIFO	RCS 36 ANIFOLD ISOL VLVS									
LEAD ANA	ALYS	ST	:	C.D. 1	PRUSI	•								
ASSESSMI	ENT													
	CRI	(T) F1	ICAL	ITY	RE	DUND	ANCY	SCREE	ens			CIL ITEI	M	
	F	IDV	N/FUI	NC	A		В		C	2			-	
NASA IOA	[[1 1	/1 /1]]	[[]]	[[]	[[]]		[X [X]]	*
COMPARE	Γ		/]	[]	[]	[]		[]	
RECOMMEN	NDAT	CI C	ons:	(If	diff	eren	t fro	om NAS	SA)					
	[1	/1]	[]	[]	[]	(AE	[A 0D/D] ELF	ETE)
* CIL R	ETEI	VT:	ION	RATION	ALE:	(If a	appl:	icable	e) / IN/	ADEQUATI ADEQUATI	E	[[]]	

REMARKS:

THIS FMEA/CIL COVERS ONLY THE BELLOWS LEAKAGE FAILURE MODE FOR THE PRIMARY MANIFOLD ISOLATION VALVES. IOA HAS NO ISSUE WITH THIS FAILURE MODE, HOWEVER DOES RECOMMEND THAT THE EFFECTS DISCUSS THE POSSIBLE EXPOSURE OF EVA AND GROUND CREWS TO PROP OR PROP VAPORS. NASA/RI DO NOT COVER STRUCTURAL FAILURE, RUPTURE, OR EXTERNAL LEAKAGE OF THE VALVE HOUSING ON THIS FMEA OR ELSEWHERE. THE SSM AGREED THAT THIS VALVE BODY SHOULD BE ADDED TO THE PROP LINE EXTERNAL LEAKAGE FMEA (03-2A-202108-1) WITH CORRESPONDING RETENTION RATIONALE.

-

=

==

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	ent Ent Ea	D2 I] #:	ATE: D:	1/0 RC 03	01/88 5-286A -2A-2023	L40-	-3			NASA BASI	DATA: ELINE NEW	; [[]]	
SUBSYSTI MDAC ID: ITEM:	EM:			AR(28) MAI	CS 6 NIFOLD]										
LEAD ANA	ALY:	ST	:	c.]	.D. PRUST										
ASSESSME	ENT	:													
	CR	IT	ICAL	ITY	RI	EDUI	NDANCY	SCI	REENS			CI	L	r	
	2	F. HD	W/FU	NC	А		В			с		11		7	
NASA IOA	[[1 1	/1 /1]]	[[]]	[[]	[[]]	1_ 	[[X X]]	*
COMPARE	[/]	ſ]	[]	[<u>ן</u>		[]	
RECOMMEN	NDA	TI	ons:		(If dif:	fer	ent fro	l mc	NASA)						
	[1	/1]	Γ]	[]	Γ]	(Al] /ac	A 'DE] ELF	ETE)
* CIL RI	ETE	NT	ION	RAT	IONALE:	(1	f appl:	ical	ble) IN	ADEQ ADEQ	UATE UATE	[[]]	
REMARKS THIS FM	: EA/	CI	r cc	VER	S ONLY	THE	BELLO	NS :	LEAKA	GE F	AILUR	E N	101	DE	FOR

THIS FMEA/CIL COVERS ONLY THE BELLOWS LEAKAGE FAILURE MODE FOR THE VERNIER MANIFOLD ISOLATION VALVE. IOA HAS NO ISSUE WITH THIS FAILURE MODE, HOWEVER DOES RECOMMEND THAT THE EFFECTS DISCUSS THE POSSIBLE EXPOSURE OF EVA AND GROUND CREWS TO PROP OR PROP VAPORS. NASA/RI DO NOT COVER STRUCTURAL FAILURE, RUPTURE, OR EXTERNAL LEAKAGE OF THE VALVE HOUSING ON THIS FMEA OR ELSEWHERE. THE SSM AGREED THAT THIS VALVE BODY SHOULD BE ADDED TO THE PROP LINE EXTERNAL LEAKAGE FMEA (03-2A-202108-1) WITH CORRESPONDING RETENTION RATIONALE.

REPORT DATE 2/26/88

: ----

.

_

_

ASSESSMENT DATE	: 1/01/88				NASA	DATA		
ASSESSMENT ID: NASA FMEA #:	RCS-287 NONE				BAS	SELINE NEW	[]
SUBSYSTEM: MDAC ID: ITEM:	ARCS 287 MANIFOL	ARCS 287 MANIFOLD ISOL VLVS						
LEAD ANALYST:	C.D. PR	C.D. PRUST						
ASSESSMENT:								
CRITICA FLIG	LITY HT	REDUNE	ANCY	SCRE	ENS		CIL ITEN	1
HDW/F	UNC	A	В	-	С			_
NASA [/ IOA [1 /1] [] []	[[]	[] []		[[x] *
COMPARE [N /N] []	[]	[]		[N]
RECOMMENDATIONS	: (If d	ifferen	t fro	om NA	SA)			
[2/2] []	[]	[]	(AI	[A DD/DE] Elete)
* CIL RETENTION	RATIONAL	E: (If	appli	cable	e) ADEQ	UATE	[]]
REMARKS :					THADEZ		L	1

NASA/RI DO NOT COVER THIS FAILURE MODE (RESTRICTED FLOW). IOA WITHDRAWS 1/1 CRIT, BUT MAINTAINS CONCERN THAT RESTRICTED FLOW OF PROP TO A THRUSTER COULD RESULT IN BURN-THROUGH. IOA RECOMMENDS THAT THE RESTRICTED FLOW FAILURE MODE BE ADDRESSED ON THE FMEA/CIL. THE SSM AGREED THAT THIS FAILURE MODE SHOULD BE ADDED TO 03-2A-202120-3 (3/1R PPP) FOR PRIMARY MANIFOLD VALVES, AND TO 03-2A-202140-1 (2/2) FOR VERNIER MANIFOLD VALVES. HOWEVER, IOA RECOMMENDS A 3/1R PPP, 1/1 ABORT FOR 03-2A-202120-3. SEE ASSESSMENT SHEETS RCS - 267, 271, 275, AND 279.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-288 03-2A-2213	SA DATA: ASELINE NEW	[] [X]								
SUBSYSTEM: MDAC ID: ITEM:	ARCS 288 JET ALIGNM	RCS 88 ET ALIGNMENT BELLOWS, PRIMARY, ALL									
LEAD ANALYST: C.D. PRUST											
ASSESSMENT:	. <u>-</u> ,			· .							
CRITICAL	ITY RE	DUNDANCY	SCREENS		CIL ITEM						
HDW/FU	NC A	В	С								
NASA [1 /1 IOA [1 /1] [] [] [] [] [] []	[X] * [X]						
COMPARE [/] [] [] []	[]						
RECOMMENDATIONS:	(If diff	erent fro	m NASA)								
	J. [] [] [] (AD	[] D/DELETE)						
* CIL RETENTION	RATIONALE:	(If appli	.cable) AD INAD	EQUATE EQUATE	[] []						
REMARKS: IOA RECOMMENDS I	HAT "FAILUF	E OF BELI	OWS TO DE	FLECT" A	ND "ISOL						

VALVE RELIEF DEVICE FAILURE TO RELIEVE" BE ADDED AS CAUSES ON THIS FMEA WITH CORRESPONDING RETENTION RATIONALE. IOA ALSO RECOMMENDS THAT THE EFFECTS INCLUDE POSSIBLE EXPOSURE OF EVA AND GROUND CREWS TO PROP OR PROP VAPORS.

REPORT DATE 2/26/88

- G

-

.....

ASSESSMI ASSESSMI NASA FMI	ENT ENT EA	D. I: #:	ATE: D:	1/0 RCS NON	1/88 -289 E]	NASA BASE	DATA LINE NEW	: []]	
SUBSYSTE MDAC ID: ITEM:	E M :			ARC 289 JET	S Align	MENT	r beli	ows	, PRII	MARY,	ALL	AX	ES	
LEAD ANA	LYS	ST	:	c.D	. PRUS	Т							· . · ·	
ASSESSME	ENT	:												
	CR	CT: FI	ICAL LIGH	ITY T	R	EDUN	IDANCY	SCI	REENS				L EM	
	I	IDI	W/FU	NC	A		E	5	. (3				
NASA IOA	[[1	/ /1]	[[]]	[[]]	[[]		[]] K]	*
COMPARE	[N	/N]	[]	[]	[]		[]	1]	-
RECOMMEN	DAJ	TIC	ons:	(If dif	fere	ent fr	om N	iasa)					
	[/]	[]	[]	[]	(AD	[D/I]]	ETE)
* CIL RE	TEN	IT]	EON I	RATI	ONALE:	(If	appl	icab	ole) A INA	DEQU.	ATE ATE	[[]	
NASA/RI	DO	NC	OT C	OVER	THIS	FAIL	URE M	ODE	(RESI	RICT	ED FL	OW)	•	IOA

NASA/RI DO NOT COVER THIS FAILURE MODE (RESTRICTED FLOW). IOA NOW CONSIDERS THE CREDIBILITY OF RESTRICTED FLOW IN A BELLOWS TO BE QUESTIONABLE. IOA DOES NOT REGARD THE ABSENCE OF THIS FAILURE MODE IN THE FMEA/CIL TO BE AN OPEN ISSUE, BUT DOES RECOMMEND THAT THIS FAILURE MODE BE ADDRESSED.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-290 03-2A-221	1310-1	NASA DATA: BASELINE [] NEW [X]						
SUBSYSTEM: MDAC ID: ITEM:	ARCS 290 THRUSTER	RCS 90 HRUSTER BIPROP SOLENOID VLVS, PRIMARY,							
LEAD ANALYST: C.D. PRUST									
ASSESSMENT:									
CRITICAL FLIGH	ITY P	REDUNDA	NCY SCRE	ENS	CIL				
HDW/FU	NC A	A	В	С					
NASA [3 /1R IOA [1 /1] [F] [F]]	[P] []	[P] []	[X] * [X]				
COMPARE [N /N] [N	ן א	[И]	[N]	[]				
RECOMMENDATIONS:	(If dif	fferent	: from NA	SA)					
[1 /1] []	[]	[]	[A] NDD/DELETE)				
* CIL RETENTION 1	* CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE []								
IOA FAILURE MODES	5 ON ANALY	ISIS SH	EET SHOU	LD NOT INCLU	DE "FAILS				

IOA FAILURE MODES ON ANALYSIS SHEET SHOULD NOT INCLUDE "FAILS ON". IOA RECOMMENDS THAT THE FAILED OPEN MODE BE UPGRADED TO A 1/1 BECAUSE IT RESULTS IN LEAKAGE OF PROP. PER NSTS 22206, ANY SINGLE FAILURE WHICH RESULTS IN PROP LEAKAGE SHOULD BE CLASSIFIED AS A 1/1. PROP LEAKAGE IS A HAZARD TO EVA CREW, THE VEHICLE, AND GROUND CREW. FROM A LOSS OF THRUSTER STANDPOINT, IOA CONSIDERS THIS FAILURE TO BE A 3/1R FPP, 1/1 ABORT. SEE ASSESSMENT SHEETS RCS - 293, 295, AND 297.

Ŧ 7 1 ==

ASSESSMI ASSESSMI NASA FMI	ENT DATE: ENT ID: EA #:	1/01/88 RCS-291 NONE				NA B	SA DATA ASELINE NEW	: []]]	
SUBSYSTI MDAC ID: ITEM:	EM :	ARCS 291 THRUSTE	ARCS 291 THRUSTER BIPROP SOLENOID VLVS, P							AXES
LEAD AND	ALYST:	C.D. PR	UST							
ASSESSM	ENT:									
	CRITICAL	ITY	REDUN	DANCY	SCR	EENS		CIL ITE	м	
	HDW/FU	NC	A	В	6	C -				
NASA IOA	[/ [1 /1] [] []]	[[]]	ן נ]]	[[x] *]	
COMPARE	[N /N] [3	[]	ľ]	[N]	
RECOMME	NDATIONS:	(If d	iffere	nt fr	om N	ASA)				
	[1 /1] []	C]	[]	[A DD/D] ELET	E)
* CIL R	ETENTION	RATIONAL	E: (If	appl	icab.	le) AI INAI	EQUATE EQUATE	[[]]	

REMARKS: NASA/RI DO NOT COVER THIS FAILURE MODE (STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE). THE SSM AGREED THAT THIS VALVE BODY SHOULD BE ADDED TO THE PROP LINE EXTERNAL LEAKAGE FMEA (03-2A-202108-1) WITH CORRESPONDING RETENTION RATIONALE.

-

_

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-292 NONE			NASA DATA BASELINE NEW					
SUBSYSTEM: MDAC ID: ITEM:	ARCS 292 THRUSTER	R BIPROI	P SOLENOI	D VLVS, PRIM	ARY, ALL AXES				
LEAD ANALYST:	C.D. PRU	JST							
ASSESSMENT:									
CRITICALITY REDUNDANCY SCREENS CIL									
HDW/FU	NC	A .	В	С					
NASA [/ IOA [1 /1] []]	[]		[] * [X]				
COMPARE [N /N] []	[]	[]	[N]				
RECOMMENDATIONS:	(If di	ifferent	t from NA	SA)	· · · · · · · · · · · · · · · · · · ·				
[3 /1R	ַן נ	F]	[P]	[P] (A	[A] .DD/DELETE)				
* CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE [] REMARKS:									
NASA/RI DO NOT COVER THIS FAILURE MODE (RESTRICTED FLOW). IOA									

NASA/RI DO NOT COVER THIS FAILURE MODE (RESTRICTED FLOW). IOA WITHDRAWS 1/1 CRIT, BUT MAINTAINS CONCERN THAT RESTRICTED FLOW OF PROP COULD RESULT IN BURN-THROUGH. IOA RECOMMENDS THAT THE RESTRICTED FLOW FAILURE MODE BE ADDRESSED ON THE FMEA/CIL. THE SSM AGREED THAT THIS FAILURE MODE SHOULD BE ADDED TO 03-2A-221310-4 (3/1R FPP). HOWEVER, IOA RECOMMENDS A 3/1R FPP, 1/1 ABORT FOR 03-2A-221310-4. SEE ASSESSMENT SHEETS RCS - 293, 295, AND 297.

C-205

2.3

• •

÷....

- -

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-293 03-2A-2	21310-4		NASA DATA BASELINE NEW	: [X]
SUBSYSTEM: MDAC ID: ITEM:	ARCS 293 THRUSTE	R BIPROI	P SOLENOII) VLVS, PRIM	ARY, +X AXIS
LEAD ANALYST:	C.D. PR	UST			
ASSESSMENT:					<u></u>
CRITICAL	ITY	REDUNDA	ANCY SCREE	INS	CIL
FLIGH HDW/FU	NC	A	В	С	LIEM
NASA [3 /1R IOA [3 /1R] [] [F] P]	[P] [P]	[P] [P]	[X]* []
COMPARE [/] [И]	[]	[]	[N]
RECOMMENDATIONS:	(If d	ifferent	c from NAS	SA)	
[3 /1R] [F]	[P]	[P] (A	[] DD/DELETE)
* CIL RETENTION	RATIONAL	E: (If a	applicable	adequate Inadequate	[]
REMARKS: IOA AGREES WITH DECOMMENDS THAT	NASA/RI	RATIONAL M AND F	LE FOR FAI	LURE OF A S	CREEN. IOA ED TO A 3/1R

RECOMMENDS THAT THIS ITEM AND FAILURE MODE BE UPGRADED TO A 3/1R FPP, 1/1 ABORT. THE LOSS OF ONE PRIMARY THRUSTER DURING AN RTLS OR TAL ABORT WOULD RESULT IN REDUCED OMS AND RCS PROP DUMPING CAPABILITY. INABILITY TO COMPLETE PLANNED OMS AND RCS DUMPS COULD RESULT IN VIOLATIONS OF ENTRY MASS PROPERTIES CONSTRAINTS AND PROP TANK LANDING WEIGHT CONSTRAINTS.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-294 03-2A-221310-1	NASA DATA: BASELINE [] NEW [X]							
SUBSYSTEM: MDAC ID: ITEM:	ARCS 294 THRUSTER BIPROP SO	LENOID VLVS, PRIM	ARY, +X AXIS						
LEAD ANALYST:	C.D. PRUST								
ASSESSMENT:									
CRITICALI FLIGHT HDW/FUN	ITY REDUNDANCY I NC A B	SCREENS	CIL ITEM						
NAGA [3 /1D	1 (21 (2		r 17 1 1						
IOA [1 /1									
COMPARE [N /N] [И] [И	ן א]	[]						
RECOMMENDATIONS:	(If different fr	om NASA)							
[1 /1] [] [] <u>[</u>] (A)	[] DD/DELETE)						
* CIL RETENTION R	ATIONALE: (If appl.	icable)							
DEWS DUC.		ADEQUATE INADEQUATE	[] []						
REMARKS: IOA RECOMMENDS THAT THE INTERNAL LEAKAGE FAILURE MODE BE UPGRADED TO A 1/1 BECAUSE IT RESULTS IN THE LEAKAGE OF PROP. PER NSTS 22206, A SINGLE FAILURE WHICH RESULTS IN PROP LEAKAGE SHOULD BE CLASSIFIED AS A 1/1. PROP LEAKAGE IS A HAZARD TO EVA CREW, THE VEHICLE, AND GROUND CREW. FROM A LOSS OF THRUSTER STANDPOINT, IOA CONSIDERS THIS FAILURE TO BE A 3/1R FPP, 1/1 ABORT. SEE ASSESSMENT SHEET RCS-293.									

REPORT DATE 2/26/88

Ē...

. :

-

-

••••

ASSESSME ASSESSME NASA FME	NT DATE: NT ID: NA #:	1/01/ RCS-2 03-2A	1/01/88 RCS-295 03-2A-221310-4							NA B	SA DAT ASELIN NE	A: E (W (x]	
SUBSYSTE MDAC ID: ITEM:	:M :	ARCS 295 THRUS	TER	RB	BIPRO	PS	OI	ENOI	DV	LV	S, PRI	MAF	RY,	Y	AXIS
LEAD ANA	LYST:	C.D.	PRI	บรา	נ										
ASSESSME	ENT:														
	CRITICAL FLIGH HDW/FU	LITY HT JNC		RI A	EDUNDA	ANC	Y B	SCRE	ENS	с		C I	TEI	м	
NASA IOA	[3 /1] [3 /1]	R] R]	[[F P]	[[P P]]	[[P P]	[x]	*
COMPARE	[/]	[N]	[]	[]	(N]	
RECOMMEN	DATIONS	: (If	: d:	if	feren	t f	rc	om NA	SA)			÷			
	[3 /1]	R]	[F].	[P]	[P] () ADI	D/D] ELJ	ETE)
* CIL RE	TENTION	RATION	IALI	E:	(If a	app	1 1	cabl	e) IN	AC AC)EQUATE)EQUATE]]	

=

_

IOA AGREES WITH NASA/RI RATIONALE FOR FAILURE OF A SCREEN. IOA RECOMMENDS THAT THIS ITEM AND FAILURE MODE BE UPGRADED TO A 3/1R FPP, 1/1 ABORT. THE LOSS OF ONE PRIMARY THRUSTER DURING AN RTLS OR TAL ABORT WOULD RESULT IN REDUCED OMS AND RCS PROP DUMPING CAPABILITY. INABILITY TO COMPLETE PLANNED OMS AND RCS DUMPS COULD RESULT IN VIOLATIONS OF ENTRY MASS PROPERTIES CONSTRAINTS AND PROP TANK LANDING WEIGHT CONSTRAINTS.

REPORT DATE 2/26/88

C-208

C - 5

• •

ASSESSMENT I ASSESSMENT I NASA FMEA #:	DATE: [D: ;	1/01/8 RCS-29 03-2A-	1/01/88 RCS-296 03-2A-221310-1					NASA DATA: BASELINE [] NEW [X]						
SUBSYSTEM: MDAC ID: ITEM:		ARCS 296 THRUST	ARCS 296 THRUSTER BIPROP SOLENOID VLVS, PRIM							AR	Y,	Y	AXIS	
LEAD ANALYST	C:	C.D. P	C.D. PRUST											
ASSESSMENT:														
CRITICALITY REDUNDANCY SCREE						ENS	5		ç	IL	s			
HI	W/FU	I' NC	A			В			с		Ŧ	1. FL	1	
NASA [3 IOA [3	3 /1R 1 /1]	[F []]	[[P]]	[[P]]	[[x x]]	*
COMPARE []	N /N]	מ]]	[N]	[N]	[]	
RECOMMENDATI	cons:	(If	dif	feren	t :	fro	om NA	SĀ)					
[]	1 /1]	[]	[]	[] (2] ADĐ	/DI) SLI	ETE)
* CIL RETENT		RATIONA	LE:	(If a	apj	p1 :	icabl	e)			-		•	
								I	IA IA	DEQUATE DEQUATE	L L]	
REMARKS: IOA RECOMMENDS THAT THE INTERNAL LEAKAGE FAILURE MODE BE UPGRADED TO A 1/I BECAUSE IT RESULTS IN THE LEAKAGE OF PROP. PER NSTS 22206, A SINGLE FAILURE WHICH RESULTS IN PROP LEAKAGE SHOULD BE CLASSIFIED AS A 1/1. PROP LEAKAGE IS A HAZARD TO EVA CREW,														

THE VEHICLE, AND GROUND CREW. FROM A LOSS OF THRUSTER STANDPOINT, IOA CONSIDERS THIS FAILURE TO BE A 3/1R FPP, 1/1 ABORT. SEE ASSESSMENT SHEET RCS-295.

REPORT DATE 2/26/88

-

272 202

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-297 03-2A-2213	10-4	NASA DATA BASELINE NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM:	ARCS 297 THRUSTER B	IPROP SOLEN	OID VLVS, PRIM	ARY, Z AXIS
LEAD ANALYST:	C.D. PRUST	,		
ASSESSMENT:				
CRITICAL	LITY RE	DUNDANCY SC	REENS	CIL TTEM
HDW/FU	INC A	В	C	
NASA [3 /11 IOA [3 /11	[] [F] [P] [P]] [P]	[P] [P]	[X]* []
COMPARE [/] [N] []	[]	[N]
RECOMMENDATIONS	(If diff	erent from	NASA)	
[3 /1]	8] [F] [P]	[P] · (A	[] .DD/DELETE)
* CIL RETENTION	RATIONALE:	(If applica	ble) ADEQUATE INADEQUATE	[]
REMARKS:	NASA/RT RAT	TONALE FOR	FAILURE OF A S	CREEN. IOA
RECOMMENDS THAT	THIS ITEM A	ND FAILURE	MODE BE UPGRAD	ED TO A 3/1R

2

- -

RECOMMENDS THAT THIS ITEM AND FAILURE MODE BE UPGRADED TO A 3/IR FPP, 1/1 ABORT. THE LOSS OF ONE PRIMARY THRUSTER DURING AN RTLS OR TAL ABORT WOULD RESULT IN REDUCED OMS AND RCS PROP DUMPING CAPABILITY. INABILITY TO COMPLETE PLANNED OMS AND RCS DUMPS COULD RESULT IN VIOLATIONS OF ENTRY MASS PROPERTIES CONSTRAINTS AND PROP TANK LANDING WEIGHT CONSTRAINTS.

REPORT DATE 2/26/88
ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-298 03-2A-221310-1	NASA DATA: Baseline New	[] [X]
SUBSYSTEM: MDAC ID: ITEM:	ARCS 298 THRUSTER BIPROP SOL	ENOID VLVS, PRIMA	ARY, Z AXIS
LEAD ANALYST:	C.D. PRUST		
ASSESSMENT:			
CRITICAL	JITY REDUNDANCY	SCREENS	CIL
HDW/FU	JNC A B	с	I I GM
NASA [3 /1F IOA [1 /1	<pre> [F] [P] [] [] </pre>] [P]] []	[X] * [X]
COMPARE [N /N] [N] [N] [N]	[]
RECOMMENDATIONS:	(If different fro	m NASA)	
[1/1] [] [] [] (AI	[] DD/DELETE)
* CIL RETENTION	RATIONALE: (If appli	cable) ADEQUATE INADEQUATE	[]
REMARKS: IOA RECOMMENDS T TO A 1/1 BECAUSE 22206, A SINGLE CLASSIFIED AS A	THAT THE INTERNAL LEAD IT RESULTS IN THE L FAILURE WHICH RESULT 1/1. PROP LEAKAGE I	KAGE FAILURE MODE EAKAGE OF PROP. S IN PROP LEAKAGE S A HAZARD TO EVA	E BE UPGRADED PER NSTS SHOULD BE CREW,

THE VEHICLE, AND GROUND CREW. FROM A LOSS OF THRUSTER STANDPOINT, IOA CONSIDERS THIS FAILURE TO BE A 3/1R FPP, 1/1 ABORT. SEE ASSESSMENT SHEET RCS-297.

REPORT DATE 2/26/88

- ·

70.00

=

ASSESSMEN ASSESSMEN NASA FMEA	T DA T II #:	ATE: D:	1/01/8 RCS-29 NONE	38 99				N	ASA I BASEI	DATA: LINE NEW	[]]	
SUBSYSTEM MDAC ID: ITEM:	[:		ARCS 299 JET AI	LIGNN	MENT	BELLA	ows,	VERN	IER,	ALL	AX	ES		
LEAD ANAL	YST	:	C.D. H	PRUST	r									
ASSESSMEN	T :													
c	RIT	[CAL]	(TY	RI	EDUND	ANCY	SCRE	ens			CI TT	L EM	r	
	HD	v/FUI	1C	A		В		С	k 1					
NASA IOA	[[1	/ /1]]	[[]	[[]]	[[]]		[[x]]	*
COMPARE	[N	/N]	[]	Γ]	[]		[N]	
RECOMMEND	ATIC	ONS:	(If	dif	feren	t fro	om NA	SA)						
	[İ]	[]	[]	[]	(AI] D/	'DE] LE	TE)
* CIL REI	ENT:	ION I	RATION	ALE:	(If	appl	icabl	e) A INA	.DEQU .DEQU	ATE ATE	[[]]	
REMARKS: THERE ARE LINES.	NO	ALIC	SNMENT	BELI	LOWS	ON TI	HE VE	RNIE	R THI	RUSTE	ER.	PR	OF)

-

- -

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-300 NONE		NASA D BASEL	ATA: INE [] NEW []
SUBSYSTEM: MDAC ID: ITEM:	ARCS 300 JET ALIGNMENT	BELLOWS,	VERNIER,	ALL AXES
LEAD ANALYST:	C.D. PRUST			
ASSESSMENT:				
CRITICAL	ITY REDUN	DANCY SCR	EENS	CIL
HDW/FU	NC A	В	с	TLEW
NASA [/ IOA [1 /1] []	[] []	[] []	[] * [X]
COMPARE [N /N] []	[]	[]]	[N]
RECOMMENDATIONS:	(If differe	nt from NA	ASA)	
[/] []	[]	[]]	[] (ADD/DELETE)
* CIL RETENTION 1	RATIONALE: (If	applicab	le) ADEQUA	TE []
REMARKS: THERE ARE NO ALIO LINES.	GNMENT BELLOWS	ON THE VI	ERNIER THR	USTER PROP

REPORT DATE 2/26/88

.

E.3

C-213

. -

5

-

-

-

ini i

ASSESSMENT DATE ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-301 03-2A-2:	31310-3		NASA DATA: BASELINE NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM: AXES	ARCS 301 THRUSTEI	R BIPROP	SOLENOID	VLVS, VERNI	IERS, ALL
LEAD ANALYST:	C.D. PRU	JST			
ASSESSMENT:					
CRITICA FLIG	LITY IT	REDUNDAN	CY SCREEN	S	CIL ITEM
HDW/F	INC	A	В	С	
NASA [3 /1] IOA [1 /1	2] [] [F][][P] [] [P]]	[X] * [X]
COMPARE [N /N] [N] [N] [N]	[]
RECOMMENDATIONS	(If d	ifferent	from NASA	.)	
.[1 /1] [] [] []	[] DD/DELETE)
* CIL RETENTION	RATIONALI	E: (If ap	plicable) I	ADEQUATE NADEQUATE	
REMARKS: IOA FAILURE MOD ON". IOA RECOM UPGRADED TO A 1, NSTS 22206, ANY SHOULD BE CLASS CREW, VEHICLE, FROM A LOSS OF FAILURE TO BE A LOSS OF MISSION INCLUDED ON THIS	ES ON ANAI IENDS THAT 'I BECAUSH SINGLE FA IFIED AS A AND GROUNN VERNIER TH 2/2, SING IOA ALS 5 FMEA BE	LYSIS SHE T THE FAI I T RESU AILURE WH A 1/1. P O CREW. HRUSTER S CE LOSS O SO RECOMM SEPARATE	ET SHOULD LED OPEN LTS IN LE ICH RESUL ROP LEAKA TANDPOINT F VERNIER ENDS THAT D ONTO IN	NOT INCLUI FAILURE MOI AKAGE OF PH TS IN PROP GE IS A HAZ , IOA CONSI S RESULTS I THE SUBASS DIVIDUAL FN	DE "FAILS DE BE ROP. PER LEAKAGE ZARD TO EVA IDERS THIS IN PROBABLE SEMBLY ITEMS MEAS.

ч,

ASSESSME ASSESSME NASA FME	NT I NT I A #:	DATE:	1/01/8 RCS-30 03-2A-	88 02 -231:	310-1			N	ASA DA BASEL: I	ATA: INE NEW	: [[X]	
SUBSYSTE MDAC ID: ITEM: AXES	Μ:		ARCS 302 THRUST	rer 1	BIPRO	P SO	LENOI	D VI	vs, vi	ERNI	ERS		ALL
LEAD ANA	LYSI	:	C.D. 1	RUS	г								
ASSESSME	NT:						•						
	CRIT	ICAL	ITY	R	EDUND	ANCY	SCRE	ENS			CIL	J Mr	
	HE	W/FU	NC	A		В		C	:		TIC	111	
NASA IOA	[2 [2	2 /2 2 /2]	[[]]	[[]]	[[]		[X [X	(] (]	*
COMPARE	[/]	[]	[]	[]		[]	
RECOMMEN	DATI	ons:	(If	dif	feren	t fr	om NAS	SA)					
	[1]	[]	[]	[]	(AI	[)D/[] DEL	ETE)
* CIL RE	TENI	NON 1	RATION	ALE:	(If	appl	icable	e) A INA	DEQUA:	re re	[]]	
REMARKS: NO DIFFE INCLUDED	RENC	CES. THIS	IOA RI FMEA I	ECOMI BE SI	MENDS EPARA'	THA FED	T THE ONTO I	SUE INDI	ASSEMI VIDUA	BLY LFN	ITE IEAS	ms	

REPORT DATE 2/26/88

2° %--

-

•

.

ASSESSME ASSESSME NASA FME	NT NT A ;	DZ II #:	ATE: D:	1/01/8 RCS-30 NONE	38)3				N	ASA DA' BASELII NI	TA: NE [EW []	
SUBSYSTE MDAC ID: ITEM: AXES	M:			ARCS 303 THRUST	TER E	SIPROF	> S01	LENOII) VL	VS, VEI	RNIEF	s,	ALL
LEAD ANA	LYS	ST:	:	C.D. 1	PRUSI	2							
ASSESSME	NT	:				•							
·	CR: I	ITI FI HDV	CAL LIGH /FU	ITY F NC	RE A	DUNDA	NCY B	SCREE	INS C		CI IT	L EM	
NASA IOA	[[1	/ /1]]	[[]]	[[]]	[[]	ן נ	x]	*
COMPARE	[N	/N]	[]	[]	[]	[N]	
RECOMMEN	DA:	ric	ons:	(If	diff	ferent	: fro	om NAS	SA)				
	[1	/1]	[]	[]	נ]] (ADD/] DEL	ETE)
* CIL RE REMARKS:	TEI	nti		RATION	ALE:	(If a	ppli	cable	e) A INA	DEQUATI DEQUATI	E (E (]	
NASA/RI	DO	NC	L C	JVER TI	119 L	ALLUP		טער (פ	UTRU	CIURAL	LUL	OKE	1

NASA/RI DO NOT COVER THIS FAILURE MODE (STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE). THE SSM AGREED THAT THIS VALVE BODY SHOULD BE ADDED TO THE PROP LINE EXTERNAL LEAKAGE FMEA (03-2A-202108-1) WITH CORRESPONDING RETENTION RATIONALE.

REPORT DATE 2/26/88

SUBSYSTEM: ARCS MDAC ID: 304 ITEM: THRUSTER BIPROP SOLENOID VLVS, VERNIERS, ALL AXES LEAD ANALYST: C.D. PRUST AXES SSESSMENT: CIL CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM HDW/FUNC A B COMPARE N/N [F] IOA 1 /1 [] [COMPARE N /N [N] RECOMMENDATIONS: (If different from NASA) [] [1 /1 [] [] * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] REMARKS: IOA RECOMMENDS THAT THE INTERNAL LEAKAGE FAILURE MODE BE UPGRADEI TO A 1/1 BECAUSE IT RESULTS IN LEAKAGE OF PROP. PER NSTS 22206, ANY SINGLE FAILURE WHICH RESULTS IN PROP LEAKAGE SHOULD BE CLASSIFIED AS A 1/1. PROP LEAKAGE IS A HAZARD TO EVA CREW, VEHTCLE, AND GROUND CREW. FROM A LOSS OF VERNIER THRUSTER STANDPOINT, IOA CONSIDERS THIS FAILURE TO BE A 2	ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-304 03-2A-231310-3	NASA DATA: BASELINE [] NEW [X]
LEAD ANALYST: C.D. PRUST ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL FLIGHT A B C NASA [3 /1R] [F] [P] [P] [X] * IOA [1 /1] [] [] [] [] [X] * IOA [1 /1] [] [] [] [] [] [X] COMPARE [N /N] [N] [N] [N] [N] [] [] RECOMMENDATIONS: (If different from NASA) [1 /1] [] [] [] [] [] [] RECOMMENDATIONS: (If different from NASA) [1 /1] [] [] [] [] [] [] ADEQUATE [] NADEQUATE [] REMARKS: IOA RECOMMENDS THAT THE INTERNAL LEAKAGE FAILURE MODE BE UPGRADED TO A 1/1 BECAUSE IT RESULTS IN LEAKAGE OF PROP. PER NSTS 22206, ANY SINGLE FAILURE WHICH RESULTS IN PROP LEAKAGE SHOULD BE CLASSIFIED AS A 1/1. PROP LEAKAGE IS A HAZARD TO EVA CREW, VEHICLE, AND GROUND CREW. FROM A LOSS OF VERNIER THRUSTER STANDPOINT, IOA CONSIDERS THIS FAILURE TO BE A 2/2, SINCE LOSS OF VERNIERS RESULTS IN PROBABLE LOSS OF MISSION. IOA ALSO RECOMMENDS THAT THE SUBASSEMBLY ITEMS INCLUDED ON THIS FMEA BE SEPARATED ONTO INDIVIDUAL FMEAS.	SUBSYSTEM: MDAC ID: ITEM: AXES	ARCS 304 THRUSTER BIPROP SOLENOII	O VLVS, VERNIERS, ALL
ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL FLIGHT A B C NASA [3 /1R] [F] [P] [P] [X] * IOA [1 /1] [] [] [] [] [X] COMPARE [N /N] [N] [N] [N] [N] [] [] RECOMMENDATIONS: (If different from NASA) [1 /1] [] [] [] [] [] [] RECOMMENDATIONS: (If different from NASA) [1 /1] [] [] [] [] [] [] RECOMMENDATIONSE: (If different from NASA) [1 /1] [] [] [] [] [] [] REMARKS: IOA RECOMMENDS THAT THE INTERNAL LEAKAGE FAILURE MODE BE UPGRADEN TO A 1/1 BECAUSE IT RESULTS IN LEAKAGE OF PROP. PER NSTS 22206, ANY SINGLE FAILURE WHICH RESULTS IN PROP LEAKAGE SHOULD BE CLASSIFIED AS A 1/1. PROP LEAKAGE IS A HAZARD TO EVA CREW, VEHICLE, AND GROUND CREW. FROM A LOSS OF VERNIER THRUSTER STANDPOINT, IOA CONSIDERS THIS FAILURE TO BE A 2/2, SINCE LOSS OF VERNIERS RESULTS IN PROBABLE LOSS OF MISSION. IOA ALSO RECOMMENDS THAT THE SUBASSEMBLY ITEMS INCLUDED ON THIS FMEA BE SEPARATED ONTO INDIVIDUAL FMEAS.	LEAD ANALYST:	C.D. PRUST	
CRITICALITY REDUNDANCY SCREENS CIL FLIGHT HDW/FUNC A B C NASA [3/1R] [F] [P] [P] [X]* IOA [1/1] [] [] [] [] [] [X] COMPARE [N/N] [N] [N] [N] [] [] RECOMMENDATIONS: (If different from NASA) [1/1] [] [] [] [] [] [] [] RECOMMENDATIONS: (If different from NASA) [1/1] [] [] [] [] [] [] RECOMMENDATION RATIONALE: (If applicable) * CIL RETENTION RATIONALE: (If applicable) * CIL RETENTION RATIONALE: (If applicable) REMARKS: IOA RECOMMENDS THAT THE INTERNAL LEAKAGE FAILURE MODE BE UPGRADEN TO A 1/1 BECAUSE IT RESULTS IN LEAKAGE OF PROP. PER NSTS 22206, ANY SINGLE FAILURE WHICH RESULTS IN PROP LEAKAGE SHOULD BE CLASSIFIED AS A 1/1. PROP LEAKAGE IS A HAZARD TO EVA CREW, VEHICLE, AND GROUND CREW. FROM A LOSS OF VERNIER THRUSTER STANDPOINT, IOA CONSIDERS THIS FAILURE TO BE A 2/2, SINCE LOSS OF VERNIERS RESULTS IN PROBABLE LOSS OF MISSION. IOA ALSO RECOMMENDS THAT THE SUBASSEMBLY ITEMS INCLUDED ON THIS FMEA BE SEPARATED ONTO INDIVIDUAL FMEAS.	ASSESSMENT:		
HDW/FUNC A B C NASA<[3/IR]	CRITICALI FLIGHT	ITY REDUNDANCY SCREE	ENS CIL ITEM
NASA [3 /1R] [F] [P] [P] [X] * IOA [1 /1] [] [] [] [] [X] COMPARE [N /N] [N] [N] [N] [N] [] RECOMMENDATIONS: (If different from NASA) [1 /1] [] [] [] [] [] [] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) * CIL RETENTION RATIONALE: (If applicable) * CIL RETENTION RATIONALE: (If applicable) REMARKS: IOA RECOMMENDS THAT THE INTERNAL LEAKAGE FAILURE MODE BE UPGRADED TO A 1/1 BECAUSE IT RESULTS IN LEAKAGE OF PROP. PER NSTS 22206, ANY SINGLE FAILURE WHICH RESULTS IN PROP LEAKAGE SHOULD BE CLASSIFIED AS A 1/1. PROP LEAKAGE IS A HAZARD TO EVA CREW, VEHICLE, AND GROUND CREW. FROM A LOSS OF VERNIER THRUSTER STANDPOINT, IOA CONSIDERS THIS FAILURE TO BE A 2/2, SINCE LOSS OF VERNIERS RESULTS IN PROBABLE LOSS OF MISSION. IOA ALSO RECOMMENDS THAT THE SUBASSEMBLY ITEMS INCLUDED ON THIS FMEA BE SEPARATED ONTO INDIVIDUAL FMEAS.	HDW/FUN		C
COMPARE [N / N] [N] [N] [N] [N] [] RECOMMENDATIONS: (If different from NASA) [1 / 1] [] [] [] [] [] [] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) * CIL RETENTION RATIONALE: (If applicable) REMARKS: IOA RECOMMENDS THAT THE INTERNAL LEAKAGE FAILURE MODE BE UPGRADED TO A 1/1 BECAUSE IT RESULTS IN LEAKAGE FAILURE MODE BE UPGRADED TO A 1/1 BECAUSE IT RESULTS IN LEAKAGE OF PROP. PER NSTS 22206, ANY SINGLE FAILURE WHICH RESULTS IN PROP LEAKAGE SHOULD BE CLASSIFIED AS A 1/1. PROP LEAKAGE IS A HAZARD TO EVA CREW, VEHICLE, AND GROUND CREW. FROM A LOSS OF VERNIER THRUSTER STANDPOINT, IOA CONSIDERS THIS FAILURE TO BE A 2/2, SINCE LOSS OF VERNIERS RESULTS IN PROBABLE LOSS OF MISSION. IOA ALSO RECOMMENDS THAT THE SUBASSEMBLY ITEMS INCLUDED ON THIS FMEA BE SEPARATED ONTO INDIVIDUAL FMEAS.	NASA [3 /1R IOA [1 /1] [F] [P]] [] []	[P] [X]* [] [X]
RECOMMENDATIONS: (If different from NASA) [1/1] [] [] [] [] [] [] [] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) * CIL RETENTION RATIONALE: (If applicable) REMARKS: IOA RECOMMENDS THAT THE INTERNAL LEAKAGE FAILURE MODE BE UPGRADEN TO A 1/1 BECAUSE IT RESULTS IN LEAKAGE FAILURE MODE BE UPGRADEN TO A 1/1 BECAUSE IT RESULTS IN LEAKAGE OF PROP. PER NSTS 22206, ANY SINGLE FAILURE WHICH RESULTS IN PROP LEAKAGE SHOULD BE CLASSIFIED AS A 1/1. PROP LEAKAGE IS A HAZARD TO EVA CREW, VEHICLE, AND GROUND CREW. FROM A LOSS OF VERNIER THRUSTER STANDPOINT, IOA CONSIDERS THIS FAILURE TO BE A 2/2, SINCE LOSS OF VERNIERS RESULTS IN PROBABLE LOSS OF MISSION. IOA ALSO RECOMMENDS THAT THE SUBASSEMBLY ITEMS INCLUDED ON THIS FMEA BE SEPARATED ONTO INDIVIDUAL FMEAS.	COMPARE [N /N] [И] [И]	[И] []
<pre>[1/1] [] [] [] [] [] [] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) * CIL RETENTION RATIONALE: (If applicable)</pre>	RECOMMENDATIONS:	(If different from NAS	SA)
* CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE [] REMARKS: IOA RECOMMENDS THAT THE INTERNAL LEAKAGE FAILURE MODE BE UPGRADEN TO A 1/1 BECAUSE IT RESULTS IN LEAKAGE OF PROP. PER NSTS 22206, ANY SINGLE FAILURE WHICH RESULTS IN PROP LEAKAGE SHOULD BE CLASSIFIED AS A 1/1. PROP LEAKAGE IS A HAZARD TO EVA CREW, VEHICLE, AND GROUND CREW. FROM A LOSS OF VERNIER THRUSTER STANDPOINT, IOA CONSIDERS THIS FAILURE TO BE A 2/2, SINCE LOSS OF VERNIERS RESULTS IN PROBABLE LOSS OF MISSION. IOA ALSO RECOMMENDS THAT THE SUBASSEMBLY ITEMS INCLUDED ON THIS FMEA BE SEPARATED ONTO INDIVIDUAL FMEAS.	[1 /1] [] []	[] [] (ADD/DELETE)
REMARKS: IOA RECOMMENDS THAT THE INTERNAL LEAKAGE FAILURE MODE BE UPGRADED TO A 1/1 BECAUSE IT RESULTS IN LEAKAGE OF PROP. PER NSTS 22206, ANY SINGLE FAILURE WHICH RESULTS IN PROP LEAKAGE SHOULD BE CLASSIFIED AS A 1/1. PROP LEAKAGE IS A HAZARD TO EVA CREW, VEHICLE, AND GROUND CREW. FROM A LOSS OF VERNIER THRUSTER STANDPOINT, IOA CONSIDERS THIS FAILURE TO BE A 2/2, SINCE LOSS OF VERNIERS RESULTS IN PROBABLE LOSS OF MISSION. IOA ALSO RECOMMENDS THAT THE SUBASSEMBLY ITEMS INCLUDED ON THIS FMEA BE SEPARATED ONTO INDIVIDUAL FMEAS.	* CIL RETENTION H	RATIONALE: (If applicable) ADEQUATE [] INADEQUATE []
	REMARKS: IOA RECOMMENDS TH TO A 1/1 BECAUSE ANY SINGLE FAILUH CLASSIFIED AS A 1 PROP LEAKAGE IS A FROM A LOSS OF VH FAILURE TO BE A 2 LOSS OF MISSION. INCLUDED ON THIS	HAT THE INTERNAL LEAKAGE IT RESULTS IN LEAKAGE OF RE WHICH RESULTS IN PROP 1/1. A HAZARD TO EVA CREW, VEF ERNIER THRUSTER STANDPOIN 2/2, SINCE LOSS OF VERNIE IOA ALSO RECOMMENDS THA FMEA BE SEPARATED ONTO J	FAILURE MODE BE UPGRADED F PROP. PER NSTS 22206, LEAKAGE SHOULD BE HICLE, AND GROUND CREW. WT, IOA CONSIDERS THIS ERS RESULTS IN PROBABLE AT THE SUBASSEMBLY ITEMS INDIVIDUAL FMEAS.

.

.....

. -

ASSESSME ASSESSME NASA FME	ENT I ENT I EA #:	DATE: [D: :	1/01/ RCS-3 03-2A	88 05 -231	310-1		NASA DATA: BASELINE [] NEW [X]							
SUBSYSTE MDAC ID: ITEM: AXES	EM :		ARCS 305 THRUS	TER	BIPRO	P SO	LENOI	D VL	VS, VE	RNIER	s,	ALL		
LEAD ANA	LYSI	C:	C.D.	PRUS	Т									
ASSESSME	ENT:													
	CRIT	TCAL	ITY	R	EDUND	ANCY	SCRE	ENS		CI	L			
	HI	W/FU	NC	. A		В		C		11	EPI			
NASA IOA	[2]	2 /2 L /1]	[[]]	[[]	[[]	[[X X] *]		
COMPARE	[]	1 /N]	[]	[]	C]	ſ]		
RECOMMEN	IDAT]	cons:	(If	dif	feren	t fr	om NA	SA)						
	[1]	[].	נ]	[]] (ADD/	DE] LETE)	
* CIL RE	TENI	TION I	RATION	ALE:	(If a	appl	icabl	e)		ē r		٦		
								INA	DEQUATI	E []		
REMARKS: IOA WITH FLOW TO VERNIER ASSIGNME	IDRAV A TH THRU ENT.	NS 1/ IRUST JSTER	1 CRIT ER COU STAND	, BU' LD R POIN'	T MAII ESULT T, IO	NTAI IN A AG	NS CO BURN- REES	NCERI THROI WITH	N THAT UGH. 1 THE NA	REST FROM ASA/R	RI A I	CTED LOSS 2/2	OF	

IOA RECOMMENDS THAT THE SUBASSEMBLY ITEMS INCLUDED ON THIS FMEA BE SEPARATED ONTO INDIVIDUAL FMEAS.

-

.

.

_

REPORT DATE 2/26/88

-

ASSESSMI ASSESSMI NASA FMI	ENT ENT EA #	DATE: ID: :	1/01/3 RCS-3 03-2A	88 06 -221	312-1	L		N	ASA DATA BASELINI NEV	A: E [W [X]]
SUBSYSTI MDAC ID: ITEM: PRIMARY	EM: : , AL:	L AXE	ARCS 306 THRUS S	TER	COMBU	JSTIC	ON CHI	AMBER	OR NOZZ	ZLE E	XTENSION,
LEAD AND	ALYS	г:	C.D.	PRUS	т					-	
ASSESSMI	ENT:										
	CRI	FICAL FLIGH	ITY T	R	EDUNI	DANCY	SCRI	EENS		CIL ITE	M
	H	DW/FU	NC	A		E	5	C			
NASA IOA	[1 /1 1 /1]]	[[]]	[[]]	[[]	[X [X] *]
COMPARE	[/]	[]	[]	[1	ſ]
RECOMMEN	NDAT	IONS:	(If	dif	ferer	nt fr	om Ni	ASA)			
	נ	1]	[]	[]	[] ()	[ADD/D] ELETE)
* CIL RI	eten'	TION	RATION	ALE:	(If	appl	icab)	le) A INA	.DEQUATE .DEQUATE	[[]
REMARKS	: EREN	CES.	IOA R	ECOM	MENDS	5 THA	T TH	E FAI	LURE MOI	- DES O	N THIS

FMEA INCLUDE "STRUCTURAL FAILURE".

REPORT DATE 2/26/88 . C-219

NASA DATA: ASSESSMENT DATE: 1/01/88 ASSESSMENT ID: RCS-306A BASELINE [] NEW [X] NASA FMEA #: 03-2A-221313-1 SUBSYSTEM: ARCS 306 MDAC ID: ITEM: THRUSTER COMBUSTION CHAMBER OR NOZZLE EXTENSION, PRIMARY, ALL AXES LEAD ANALYST: C.D. PRUST ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM HDW/FUNC Α В С] [X]* [X]] [] [NASA [1 /1]] [[[IOA $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$] 1 COMPARE [/] [] [Γ 1] [] RECOMMENDATIONS: (If different from NASA) Γ (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE [1 **REMARKS:** NO DIFFERENCES. IOA RECOMMENDS THAT FAILURE MODES ON THIS FMEA INCLUDE "STRUCTURAL FAILURE".

REPORT DATE 2/26/88

ASSESSMENT DATE: 1/01/88 NASA DATA: ASSESSMENT ID: BASELINE [] NEW [X] RCS-307 03-2A-231310-2 NASA FMEA #: SUBSYSTEM: ARCS MDAC ID: 307 ITEM: THRUSTER COMBUSTION CHAMBER OR NOZZLE EXTENSION, VERNIER, ALL AXES LEAD ANALYST: C.D. PRUST ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM HDW/FUNC Α В C [[NASA [1 /1 [[[X] *] []]]] IOA [1 /1 1 1 1 1 [X] COMPARE] [] [1 Γ 1 **RECOMMENDATIONS:** (If different from NASA) ſ Γ] Γ 1 (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [INADEQUATE [**REMARKS:** NO DIFFERENCES. IOA RECOMMENDS THAT FAILURE MODES ON THIS FMEA

NO DIFFERENCES. IOA RECOMMENDS THAT FAILURE MODES ON THIS FMEA INCLUDE "STRUCTURAL FAILURE". IOA ALSO RECOMMENDS THAT THE SUBASSEMBLY ITEMS INCLUDED ON THIS FMEA BE SEPARATED ONTO INDIVIDUAL FMEAS.

REPORT DATE 2/26/88

ASSESSMEI ASSESSMEI NASA FMEI	TV VT A #	DA IC	ATE:):	1/01/3 RCS-10 03-2F	38 00013 -1010	K 060-1			N	IASA DAT BASELIN NI	ra: Ne Ew	[[X]	
SUBSYSTE MDAC ID: ITEM:	М:			FRCS 10001 PRESS	JRE I	RELIE	F AS	SEMBL	Y					
LEAD ANA	LŸS	T:		C.D.	PRUSI	r								
ASSESSME	NT:													
(CRI	TI	CAL	ITY	RI	EDUND	ANCY	SCREI	ENS			CIL	M	
	H	IDW	I/FUI	NC	A		В		c				••	
NASA IOA	[[1 1	/1 /1]]	[[]]	[[]]	[[]		[X [X]	*
COMPARE	[/]	[]	[]	[]		[]	
RECOMMEN	DAT	'IC	NS:	(If	difi	feren	t fro	om NAS	SA)		-			
	[/]	נ יי]	[]	[]	(AI	[0D/D] ELI	ETE)
* CIL RE'	ren	ΓT	ION I	RATION	ALE:	(If	appl	icable	e) A INA	DEQUATI	E	() [[]	
REMARKS:										-		-	-	

NO DIFFERENCES. IOA RECOMMENDS THE ADDITION OF A STATEMENT TO THE EFFECTS REGARDING POSSIBLE VIOLATIONS OF ORBITER ENTRY MASS PROPERTIES CONSTRAINTS, AND POSSIBLE LEAKAGE OF PROP OR PROP VAPORS.

REPORT DATE 2/26/88

-

ASSESSMENT DATE: 1/01/88 NASA DATA: ASSESSMENT ID: BASELINE [RCS-10002X] NASA FMEA #: NONE NEW [1 SUBSYSTEM: FRCS MDAC ID: 10002 ITEM: HE ISOL VLV LEAD ANALYST: C.D. PRUST ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM HDW/FUNC A В С NASA [] [F] [] [F] [] [P] [2 /1R] [X] IOA COMPARE [N/N] [N] RECOMMENDATIONS: (If different from NASA) [2/1R] [P] [F] [F] [A] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE Γ INADEQUATE [1

REMARKS:

NASA/RI DO NOT COVER THIS FAILURE MODE (RESTRICTED FLOW). IOA RECOMMENDS THAT THE RESTRICTED FLOW MODE BE ADDRESSED ON THE FMEA/CIL AS A 2/1R PFF. INABILITY TO REPRESS FRCS PROP TANK AND SUBSEQUENT INABILITY TO USE OR DEPLETE FRCS PROP COULD RESULT IN VIOLATIONS OF ENTRY MASS PROPERTIES CONSTRAINTS. LOSS OF FLOW THROUGH ONE VALVE NOT DETECTABLE DURING DUAL LEG OPERATION. CONTAMINATION CAN EFFECT BOTH VALVES. THE SSM AGREED THAT RESTRICTED FLOW SHOULD BE ADDED TO 03-2F-101020-4 (3/1R PPP). HOWEVER, IOA MAINTAINS 2/1R PFF POSITION.

ASSESSME	NT DATE:	1/01/	88				ł	iasa da:	FA:			
ASSESSME NASA FME	NT ID: A #:	RCS-1 NONE	0003	3X				BASELII	NE EW	[[]]	
SUBSYSTE MDAC ID: ITEM:	M:	FRCS 10003 HE IS	OL V	VLV								
LEAD ANA	LYST:	C.D.	PRUS	ST								
ASSESSME	NT:											
4	CRITICAL FLIGH	ITY T	I	REDUN	DANCY	SCR	EENS			CIL ITE	м	
	HDW/FU	NC	2	A	В		C	2				
NASA IOA	[/ [1 /1]]	[[]	[[]]	[[]		[[x]]	*
COMPARE	[N /N]	[]	[]	· []		[N]	
RECOMMEN	DATIONS:	(If	di	ffere	nt fr	om N	IASA)					
	[1 /1]	[]	[3	ľ]	(AD	[A D/D] ELE	TE) '
* CIL RE	TENTION	RATION	ALE	: (If	appl	icab	ole) /	DEQUAT	E	[ļ	
REMARKS:							LNE	ADEQUATI		L	J	

NASA/RI DO NOT COVER THIS FAILURE MODE (STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE). THE SSM AGREED THAT THIS VALVE BODY SHOULD BE ADDED TO THE HELIUM LINE EXTERNAL LEAKAGE FMEA (03-2F-101013-1) WITH CORRESPONDING RETENTION RATIONALE.

se la secola de la marca de la composición de

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	NT NT A	DF II #:	ATE: D:	1/01 RCS- 03-2	L/88 -10004 2F-101	1X L030-	-1		NAS BZ	SA DATA SELINE NEW	: [[]	x]]	
SUBSYSTE MDAC ID: ITEM:	M:			FRCS 1000 HE H	3)4 PRESS	REGU	JLATOR	ASS	SEMBLY					
LEAD ANA	LY	ST:	1	c.D.	PRUS	ST		,						
ASSESSME	NT	:												
	CR	ITI FI	CAL	ITY T	I	REDUN	IDANCY	SCI	REENS		CI T	L CEN	ſ	
	1	HDW	/FU	NC	7	ł	В		C.		*.		1	
NASA IOA	[[3 3	/1R /1R]]	[] []	9] 9]	[F [F]]	[P] [P]		[[X X]	*
COMPARE	[/]	[]	[]	[]]		[]	
RECOMMEN	DA'	ric	NS:	[]	f dif	fere	ent fr	om 1	IASA)					
	[/]	[]	[]	[]	(A	.DD/	DE] ELE	TE)
* CIL RE	TEI	NTI	ON 1	RATIC	ONALE:	: (()f	appl	icak	ole) ADE INADE	QUATE QUATE	[[]]	
NO DIFFE	REI	NCE	S. E V	IOA	RECON	MENE OF F	S ADD	ING MASS	A STATE	MENT I		CHE STE	E E Rat	FFECTS

REPORT DATE 2/26/88

=___

-

ASSESS ASSESS NASA F	MENT MENT MEA	D. I #:	ATE: D:	1/ RC 03	01/88 S-100 -2F-10	05X	95 - 3					NZ I	ASA DAT BASELIN NE	'A: E W	[х]	
SUBSYS MDAC I ITEM:	TEM: D:			FR 10 QU	CS 005 AD CHI	ECK	VAL	VE	AS	SEMB	LY							
LEAD A	NALY	ST	:	c.	D. PR	JST												
ASSESS	MENT	:																
	CR	IT F	ICAL LIGH	ITY T		RE:	DUND	ANC	CY B	SCRE	ENS	S C			CI IT	L EM	[
N1 0	. .	~~~	/10			 D	1	r	Т,	,	~	т П	7		r	v	٦	-
IO	A [A [2 1	/1]	Ľ	P]	[F]	נ	F]		[X]]	~
COMPAR	E [N	/N]	Ľ	N]	[N]	[N]		[]	
RECOMM	ENDA	TI	SNS:		(If d	lff	eren	t f	irc	m NA	SA))						
	נ	1	/1]	٢]	[]	[] (AD	[D/	DE] LE	TE)
* CIL	RETE	NT	ION	RAT	ONALI	2:	(If	app	oli	cabl	e)	7 1		I	r		,	

ADEQUATE [] INADEQUATE []

NASA/RI ORIGINALLY DID NOT COVER THIS FAILURE MODE (BLOCKAGE OF SINGLE INLET FILTER). HOWEVER, SSM ADDED A NEW FMEA/CIL (03-2F-101095-3, 2/1R PPP) FOR THIS FAILURE MODE AS A RESULT OF AN IOA ISSUE. IOA RECOMMENDS THAT THIS ITEM AND FAILURE MODE BE UPGRADED TO A 1/1. INABILITY TO REPRESS A FRCS PROP TANK AND SUBSEQUENT INABILITY TO USE OR DEPLETE FRCS PROP COULD RESULT IN VIOLATIONS OR ENTRY MASS PROPERTIES CONSTRAINTS AND LOSS OF LIFE OR VEHICLE DURING ENTRY.

REPORT DATE 2/26/88

REMARKS:

ASSESSME ASSESSME NASA FME	NT DATE: NT ID: A #:	1/01/88 RCS-100 NONE	3 006X			NASA DATA BASELINE NEW	: []]
SUBSYSTEM MDAC ID: ITEM:	Μ:	FRCS 10006 QUAD CH	HECK VAL	VE AS	SEMBLY			
LEAD ANA	LYST:	C.D. PF	RUST					
ASSESSME	NT:							
	CRITICAL	ITY	REDUND	ANCY	SCREEN	S	CIL	м
	HDW/FU	NC	A	В		C		•
NASA IOA	[/ [1 /1] [[] []	[[] [] []	[[x] *]
COMPARE	[N/N]) ([]	[] []	[N]
RECOMMEN	DATIONS:	(If d	lifferen	nt fro	m NASA)		
	[1 /1) ([]	[j (] (A)] ELETE)
* CIL RE	TENTION	RATIONAI	LE: (If	appli	cable) I	ADEQUATE NADEQUATE	[]
REMARKS:						-	-	-

NASA/RI DO NOT COVER THIS FAILURE MODE (STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE). THE SSM AGREED THAT THIS VALVE BODY SHOULD BE ADDED TO THE HELIUM LINE EXTERNAL LEAKAGE FMEA (03-2F-101013-1) WITH CORRESPONDING RETENTION RATIONALE. IOA ALSO RECOMMENDS THAT THE EFFECTS OF POSSIBLE PROP LEAKAGE BE INCLUDED ON THE FMEA (CORROSION, FIRE, EXPLOSION, EXPOSURE OF EVA AND GROUND CREWS).

REPORT DATE 2/26/88

ASSESSN ASSESSN NASA FN	IENT I IENT I IEA #:	DATE:	1/01/8 RCS-10 03-2F-	38)0073 -1010	{)60-2				NASA DATA BASELINE NEW	:] K]
SUBSYST MDAC II ITEM:	TEM:		FRCS 10007 PRESSU	JRE P	RELIE	F AS	SEMBLY	ž	. <u>.</u>		
LEAD AN	IALYSI	:	C.D. 1	PRUSI	2						
ASSESSN	IENT:										
	CRIT F HE	ICALI LIGHI W/FUN	ITY I IC	RI A	DUND	ANCY B	SCREI	ENS	c	CII ITH	E M
NASA IOA	2 . [2	2 /1R 2 /1R]	[P [P]	[N [N	A] A]	[[P] P]	[}	() * ()
COMPARE	C [/]	[]	[]	[]	[]
RECOMME	NDATI	ons:	(If	diff	feren	t fr	om NAS	SA)			
	[1]	נ	.]	[]	[] (A] DD/I] DELETE)
* CIL F	RETENI	TON F	RATIONA	ALE:	(If	appl	icable	∍) IN	ADEQUATE ADEQUATE	[[]]
REMARKS	5:										

NO DIFFERENCES. IOA RECOMMENDS ADDING STATEMENTS TO THE EFFECTS ABOUT POSSIBLE VIOLATIONS OF ORBITER ENTRY MASS PROPERTIES CONSTRAINTS. DUE TO INABILITY TO DUMP FRCS PROP, AND THE EFFECTS OF POSSIBLE PROP LEAKAGE (CORROSION, FIRE, EXPLOSION, EXPOSURE OF EVA AND GROUND CREWS). -

1

REPORT DATE 2/26/88

ÀSSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-10008X NONE	NASA DATA: BASELINE [] NEW []
SUBSYSTEM: MDAC ID: ITEM:	FRCS 10008 PRESSURE RELIEF ASSEMBLY	
LEAD ANALYST:	C.D. PRUST	
ASSESSMENT:		
CRITICAL	ITY REDUNDANCY SCREENS	CIL
HDW/FU	NC A B	C
NASA [/ IOA [3 /1R] [] [] [] [F] [NA] [] []* P] [X]
COMPARE [N /N] [N] [N] [и] [И]
RECOMMENDATIONS:	(If different from NASA)	
[3 /1R] [F] [NA] [P] [A] (ADD/DELETE)
* CIL RETENTION	RATIONALE: (If applicable)	
	IN	ADEQUATE [] ADEQUATE []
REMARKS: NASA/RI DO NOT C SSM AGREED THAT MODES ON 03-2F-1	OVER THIS FAILURE MODE (RES RESTRICTED FLOW SHOULD BE A 01060-3 (3/1R FNP, BURST DI	TRICTED FLOW). THE DDED TO THE FAILURE SK FAILS TO RUPTURE).

REPORT DATE 2/26/88

()

ASSESSME ASSESSME NASA FME	ENT ENT EA #	DÆ II ‡:	ATE:):	1/01/8 RCS-10 03-2F-	88 00092 -1010	()60-1			N	ASA DA BASELI N	TA: NE IEW	[[x]]	
SUBSYSTE MDAC ID: ITEM:	EM :			FRCS 10009 PRESSU	JRE F	RELIE	F ASS	SEMBLY	Z						
LEAD ANA	LYS	ST:	:	C.D. 1	RUSI	C			-						
ASSESSME	ENT :	:													
	CRI	T] FI	CAL LIGH	CTY C	RI	EDUNDA	ANCY	SCREE	ens			CI II	IL 'EM	ſ	
	F	IDV	I/FUI	NC .	A		В		С	n Gersenen 184	_: : :				
NASA IOA	[[1 1	/1 /1]	[[]]	[[]	[[]]		[[X X]	*
COMPARE	[1]	[]	[]	[]		[]	
RECOMMEN	IDAJ	CIC.	ons:	(If	diff	ferent	t fro	om NAS	SA)						
	(1	/1]	[]	[]	[]	(AI] DD/	A 'DF] :LF	TE
* CIL RI	ETEN	1 T]	ION I	RATION	ALE:	(If a	appl:	icable	≥) A INA	DEQUAT DEQUAT	'E 'E	[[]]	
REMARKS: THIS FME	בא כ זער ק	201 1	/ERS	ONLY T	THE E	BELLO	NS LI	EAKAGE	E FA	ILURE	MOE	DE.	ק ()A H DTN(

THIS FMEA COVERS ONLY THE BELLOWS LEAKAGE FAILURE MODE. IOA HAS NO ISSUE WITH THIS FAILURE MODE, HOWEVER DOES RECOMMEND ADDING STATEMENTS TO THE EFFECTS ABOUT POSSIBLE VIOLATION OF ENTRY MASS PROPERTIES CONSTRAINTS AND THE HAZARDS OF PROP LEAKAGE TO EVA CREW, VEHICLE, AND GROUND CREW. NASA/RI DO NOT COVER STRUCTURAL FAILURE, RUPTURE, OR EXTERNAL LEAKAGE OF THE VALVE HOUSING ON THIS FMEA OR ELSEWHERE. THE SSM AGREED THAT THIS VALVE BODY SHOULD BE ADDED TO THE PROP LINE EXTERNAL LEAKAGE FMEA (03-2F-102108-1) WITH CORRESPONDING RETENTION RATIONALE.

_

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-10010 03-2F-102	X 120-3			NASA D BASEI	ATA: INE NEW	[x]	
SUBSYSTEM: MDAC ID: ITEM:	FRCS 10010 PROP TANK	ISOL	VLVS	1/2 &	3/4/5					
LEAD ANALYST:	C.D. PRUS	T								
ASSESSMENT:										
CRITICAL	ITY R	EDUND	ANCYS	CREENS	5		CI	L	r	
HDW/FUN	NC A	. .	В		c	· v		. 6.19	L	
NASA [3 /3 IOA [1 /1] [] []]	[] []	[.]]		[[x]]	*
COMPARE [N /N] []	[]	ſ]		[N]	
RECOMMENDATIONS:	(If dif	feren	t from	NASA)				·	·	·· /- =·
[2 /1R] [P	']	[NA]	[P]	(AI] /00/	A 'DE] :LE	TE)
* CIL RETENTION F	RATIONALE:	(If	applic	able) IN	ADEQUA NADEQUA	TE TE	[[]]	
IOA RECOMMENDS TH	HAT THIS I	TEM A	ND FAI	LURE M	IODE BE	UPC	GRA	DE	D	то

IOA RECOMMENDS THAT THIS ITEM AND FAILURE MODE BE UPGRADED TO A 2/1R PNP AND PLACED ON THE CIL. THIS FAILURE COULD RESULT IN OVERPRESSURIZATION AND RUPTURE OF DOWNSTREAM PROP LINES, AND IS LISTED AS A CAUSE ON THE PROP LINE EXTERNAL LEAKAGE FMEA (03-2F-102108-1) AND AS A FAILURE MODE ON 03-2A-202140-3. IOA NOW CLASSIFIES THIS FAILURE AS A 2/1R PNP SINCE A PREVIOUS FAILURE IS REQUIRED BEFORE THE VALVE WILL BE CLOSED.

REPORT DATE 2/26/88

-

.

SUBSYSTEM:	FRCS		
MDAC ID:		2/4/5	

LEAD ANALYST: C.D. PRUST

ASSESSMENT:

	CR	IT:	ICAL	ITY T			RI	EDU	NDAN	ICY	S	CREEN	S			CI TT	L EN	r	
]	HDI	W/FU	NC			A			B	5		С			-		•	
NASA IOA	[[2	/ /1R]]		[[P]		F]	[נ	Ρ]]		[[x]]	*
COMPARE	[N	/N]		[N]	I	N]	[N]		[N]	
RECOMME	NDA'	FI (ONS:		(If	đ	if	fer	ent	fr	om	NASA	.)						
	[/]		[]	I	• .]	[]	(A)] /00	DE] ELF	ETE)
* CIL R	ETE)	NT	ION	RAI	ION	۲I	Ξ:	(I	far	pl	ic	able)	A	DEO	UATE	г		1	

INADEQUATE []

-

i 1

REMARKS:

NO ISSUE. NASA/RI DO NOT COVER THIS FAILURE MODE (FAILS MID-TRAVEL), HOWEVER THE WORST-CASE EFFECTS OF THIS FAILURE ARE COVERED BY THE FAILED CLOSED AND RESTRICTED FLOW FAILURE MODES.

REPORT DATE 2/26/88

•

ASSESSME ASSESSME NASA FME	NT NT A	Ď. I: #:	ATE: D:	1/01 RCS- 03-2	/88 10012 F-102	X 110-	3		1	NASA I BASEI	DATA LINE NEW	: [[x]	
SUBSYSTE MDAC ID: ITEM:	M:			FRCS 1001 MANI	2 FOLD	1-4	ISOLA	TION	VALV	VES					
LEAD ANA	LY	ST	:	C.D.	PRUS	T									
ASSESSME	NT	:													
	CR	IT	ICAL	ITY	R	EDUN	DANCY	SCR	EENS			CI	L		
]	F. HD	W/FU	NC NC	A	L	E	3	Ċ			1.1.	EM		
NASA IOA	[[3 1	/3 /1]	[[]	[[]]	[[]]		[[X] *]	
COMPARE	[N	/N]	[]	ĺ]	ĺ]		[N]	
RECOMMEN	'DA'	r1(ONS:	(I	f dif	fere	nt fr	om N	iasā)						
	ן [1	/1]	[]	ſ]	C]	(A] DD/	A DE:] LETI	E)
* CIL RE	TE	NT	ION	RATIO	NALE:	(If	appl	icab	le)						
									1 IN2	ADEQUA ADEQUA	ATE ATE	[[]]	
REMARKS: IOA RECO 1/1 AND	MM) PL	EN AC	DS T ED O	HAT T N THE	HIS I CIL.	TEM TH	AND F	AILU AILUR	RE MO	DDE BE JLD RE	E UP ESUL	GRA T I	DE N	DT	ΑC

OVERPRESSURIZATION AND RUPTURE OF DOWNSTREAM PROP LINES, AND IS LISTED AS A CAUSE ON THE PROP LINE EXTERNAL LEAKAGE FMEA (03-2F-102108-1) AND AS A FAILURE MODE ON 03-2A-202140-3.

REPORT DATE 2/26/88

-

-

ASSESSME ASSESSME NASA FME	ENT ENT EA	D2 II #:	ATE: D:	1/ RC NC	01/8 S-10 NE	88)0:	133	K					NASA BASI	DATA: ELINE NEW	[[]	
SUBSYSTE MDAC ID: ITEM:	M:			FR 10 MA	CS 013 NIFC	LI	1	L-4]	[50]	LA:	rion	VAI	LVES				
LEAD ANA	LY	ST		c.	D. Ę	R	วรา	2									
ASSESSME	INT	:												-			
	CR	IT: Fl	ICALI LIGH	ITY F			RI a	EDUNI	DAN	CY R	SCRE	ENS	S C		CIL ITE	M	
NASA IOA	[[2	/ /1R]		[[P]	[[P]]	[.] P]		[[x]	*
COMPARE	[N	/N]		[N]	[N]	[N]		[N]	
RECOMMEN	IDA'	TIC	ONS:		(If	d	iff	ferer	nt :	fro	om NA	SA))	.			<u>.</u>
	[/]		[]	[]	[]	(AE	[)D/D] ELI	ETE)
* CIL RE	ete:	NT	ION I	RAI	IONA	LI	Ξ:	(If	apj	91 :	icabl	e) Il	ADEQI VADEQI	UATE UATE	[[]]	-

NO ISSUE. NASA/RI DO NOT COVER THIS FAILURE MODE (FAILS MID-TRAVEL), HOWEVER THE WORST-CASE EFFECTS OF THIS FAILURE ARE COVERED BY THE FAILED CLOSED AND RESTRICTED FLOW FAILURE MODES.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-10014 NONE	x		NASA DA BASELI 1	ATA: INE [] NEW []	
SUBSYSTEM: MDAC ID: ITEM:	FRCS 10014 MANIFOLD	5 ISOLATI	ON VALV	Έ		
LEAD ANALYST:	C.D. PRUS	т				
ASSESSMENT:						
CRITICAL	ITY R	EDUNDANCY	SCREEN	S	CIL ITEM	
HDW/FU	NC A	Ē	3	С		
NASA [/ IOA [1 /1] [] [] [] [] [] []]	[] * [X]	
COMPARE [N /N] [] [] []	[N]	
RECOMMENDATIONS:	(If dif	ferent fr	om NASA	.)		
[2 /1R] [P	1][[A] [P]	[A] (ADD/DELETE	:)
* CIL RETENTION	RATIONALE:	(If app]	icable)	ADEOUA		
DEMTARKO	1997 - 1997 1997 - 1997 1997 - 1997		I	NADEQUA	FE []	
NASA/RI DO NOT C RELIEVE). IOA R ITEM AND FAILURE OVERPRESSURIZATI LISTED AS A CAUS FAILURE MODE ON IOA NOW CLASSIFI	OVER THIS ECOMMENDS MODE. TH ON AND RUP E ON THE P 03-2A-2021 ES THIS FA	FAILURE M THAT A 2/ IS FAILUM TURE OF I ROP LINE 40-3. ILURE AS	IODE (RE 'IR PNP RE COULD OWNSTRE EXTERNA A 2/1R	LIEF DE CIL BE RESULT AM PROP L LEAKAO	VICE FAILS T CREATED FOR IN LINES, AND GE FMEA AND CE A PREVIOU	O THIS IS AS A
FAILURE IS REQUI	RED BEFORE	THE VALV	E WOULD	BE CLOS	SED.	

- -

-

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-10015X 03-2F-121310-3	NASA DATA: BASELINE NEW	[] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 10015 THRUSTER BIPROP SC	OLENOID VALVE, PRIM	IARY, +Z AXIS
LEAD ANALYST:	C.D. PRUST		
ASSESSMENT:			
CRITICAL FLIGHT HDW/FU	TY REDUNDANCY C A I	í SCREENS B C	CIL ITEM
NASA [3 /1R IOA [3 /2R] [F] [1]] [F] [1	P] [P] P] [P]	[X] * [X]
COMPARE [/N] [] [] []	[]
RECOMMENDATIONS:	(If different fr	com NASA)	
[3 /2R] [F] [I	?] [P] (AD	[A] D/DELETE)
* CIL RETENTION H	ATIONALE: (If app)	Licable) ADEQUATE INADEQUATE	[]
REMARKS: IOA CONSIDERS THE OTHER. IOA CONSI 3/2R FPP. THE +2	RUSTERS IN THE SAME DERS THE LOSS OF A THRUSTERS ARE NOT	AXIS TO BE REDUND ALL +Z THRUSTERS TO REQUIRED FOR ET S	ANT TO EACH BE ONLY A EP OR PROP

۲

Ē

=

=

-

DUMPING. 03-2F-121310-3 INCLUDES THRUSTERS IN ALL AXES, AND THE CRITICALITY ASSIGNED IS FOR THE WORST-CASE AXIS.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-10016 NONE	x		NASA DATA BASELINI NEV	A: 5 [] 7 []
SUBSYSTEM: MDAC ID: ITEM:	FRCS 10016 THRUSTER	BIPROP SC	DLENOID) VLV, PRIMA	ARY, ALL AXES
LEAD ANALYST:	C.D. PRUS	т			
ASSESSMENT:					<u> </u>
CRITICAL	ITY R	EDUNDANCY	SCREE	INS	CIL
HDW/FU	NC A	. I	3	С	
NASA [/ IOA [1 /1] [] [) [] []]	[] []	[] * [X]
COMPARE [N /N] [] []	[].	[N]
RECOMMENDATIONS:	(If dif	ferent fi	om NAS	A)	
[/] [] []	[]	[] ADD/DELETE)
* CIL RETENTION	RATIONALE:	(If app)	icable) ADEQUATE	[]
REMARKS: NO HDW ISSUE. I COULD ONLY BE CA ASSESSED BY IOA	HIS FAILUR USED BY AN IN THE GNC	E MODE (1 EPDC (RJ SUBSYSTE	PREMATU D) FAI	INADEQUATE RE OPERATIC LURE. THE	[] DN, FAILS ON) RJDS ÂRE

REPORT DATE 2/26/88 C-237

-

-

==

.

.

.

۳

-

-

- --

-

-

ASSESSME ASSESSME NASA FME	ATE: D:	1/01 RCS- NONE			Ņ	iasa Base	DATA LINE NEW	: []]]							
SUBSYSTE MDAC ID: ITEM: AXES	M:			FRCS 1001 THRU	7 STER	BIPR	OP SC	LENO	ID VA	LVE,	VERI	NIE	R,	ALI	J		
LEAD ANA	LYS	5 T :	:	C.D.	PRUS	ST											
ASSESSME	NT	:															
	CR	IT:	ICAL	ITY	F	REDUN	DANCY	SCR	EENS			CI	L				
	H	HDV	N/FU	NC	P	A	E	5	c	2		L I LM					
NASA IOA	[[1	/ /1]]	[[]]	[[]]	[[]]		[[x] *]			
COMPARE	[N	/N]	[]	[]	[]		[N]			
RECOMMEN	DA'	FI C	ons:	(1	f dif	fere	nt fr	om N	ASA)								
	[1]	[]	[]	[]	(AI] /0C	DE] LETH	E)		
* CIL RE	TEI	N T I	ION	RATIO	NALE:	(If	appl	icab	le) A INA	DEQU	ATE ATE	[[]]	-		
REMARKS: NO HDW I COULD ON ASSESSED	SSULY	JE BI Y	. T E CA IOA	HIS F USED IN TH	AILUF BY AN E GNO	RE MO I EPD C SUB	DE (1 C (RJ SYSTE	PREMA D) F	TURE	OPER E.	ATION THE N	N, RJD	FA S	ILS ARE	ON)		

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-10018X NONE		NASA DA BASELI N	TA: NE [] EW []
SUBSYSTEM: MDAC ID: ITEM:	FRCS 10018 THRUSTER INJE	CTOR HEAD	ASSEMBLY,	PRIMARY
LEAD ANALYST:	C.D. PRUST			
ASSESSMENT:				
CRITICAL FLIGH	ITY REDUN T	DANCY SCRI	EENS	CIL ITEM
HDW/FU	NC A	В	С	
NASA [/ IOA [1 /1] []	[] []	[] []	[] * [X]
COMPARE [N /N] []	[]	[]]	[N]
RECOMMENDATIONS:	(If differe	nt from NA	ASA)	
[1 /1] []	[].	[]	[A] (ADD/DELETE)
* CIL RETENTION	RATIONALE: (If	applicabl	le) ADEQUAT INADEQUAT	E [] E []
NASA/RI DO NOT CO FLOW), HOWEVER, I FMEA WAS DELETED IOA RECOMMENDS TI	OVER THIS ITEM NOTE ON 03-2F- AND ADDED AS HAT THIS ITEM	AND FAILU 121312-1 S A CAUSE ON AND FAILUR	JRE MODE (R SAYS THAT T N 03-2F-121 RE MODE BE	ESTRICTED HE INJECTOR 312-1. ADDRESSED
AT THE SAME LEVE COVERED ON INDIV ATTENTION. RESTRICTED FLOW	THE CIL WITH L OF DETAIL WI IDUAL FMEAS, A OF THE INJECTO	A 1/1 CRIT TH OTHER T ND SHOULD R COULD RE	TICALITY. THRUSTER CO ALSO RECEI ESULT IN TH	THE INJECTOR IS MPONENTS VE 1/1 RUSTER BURN-
THROUGH.				

REPORT DATE 2/26/88

1.1

-

s.

C-239

-

ō

ē

Þ

ē

.

ASSESSMENT DATE: 1 ASSESSMENT ID: F NASA FMEA #: N					1/88 -10019 E	x			1	NASA DATA: BASELINE [] NEW []						
SUBSYST MDAC ID ITEM:		FRC: 100 THR	5 19 USTER	INJI	EMBLY, PF	IMARY										
LEAD AN	ALYS	ST	:	C.D	. PRUS	Т										
ASSESSM	ENT :	:														
	CRI	[T] F]	ICAI LIGH	JITY IT	R	EDUI	NDANCY	SCI	REENS	_	CIL ITEM					
	ł	١D	A/FU	NC	A		В		C	2						
NASA IOA	[[1	/ /1]]	[[]]	[[]]	[[]]	[] [X]	*				
COMPARE	[N	/N]	ſ]	[]	[]	[N]					
RECOMME	NDAI		ONS:	(:	If dif	fere	ent fr	om 1	NASA)							
	[1	/1]	C	j	[]	ſ] (A	[A] .DD/DELI	ETE)				
* CIL R	ETEN	VŤ:	ION	RATI	ONALE:	(1)	f appl	ical	ole) A INA	DEQUATE DEQUATE	[]					
REMARKS NASA/RI FAILURE THE INJ 121312- IOA REC TNDEPEN	DO BU ECTO SMMI DENT	NO JRI DR DR ENI	OT C N-TH FME DS T	OVER IROUGI A WAS	THIS H), HO S DELE THIS I CIL W	ITEN WEVI TED TEM ITH	A AND ER, NO AND A AND F A 1/1	FAII TE C DDEI AILU CRI	LURE M DN 03- D AS A JRE MC	ODE (STR -2F-12131 A CAUSE O DE BE AD LITY. TH	UCTURA 2-1 SA N 03-21 DRESSEI E INJEG	L (S THAT F- D CTOR IS				
AT THE COVERED	SAMI ON ON.	II II	LEVE	L OF	DETAI L FMEA	L WI S, Z	TH OT	HER OULI	THRUS	TER COMP RECEIVE	ONENTS	· · · · ·				

ASSESSMENT ASSESSMENT NASA FMEA #	DATE: ID: :	1/01/88 RCS-1002 NONE	203	K					NA E	ASA DATA BASELINE NEW	:]]]	
SUBSYSTEM: MDAC ID: ITEM:		ARCS 10020 HE ISOL	VI	ZV										
LEAD ANALYS	T:	C.D. PRI	JSI	2										
ASSESSMENT:														
CRI	TICAL	CTY D	RF	EDUNDA	ANC	CY	SCREE	NS	5	• •	C]	L	,	
Н	DW/FUN	1C	A	÷ -		в			С		1	. 6.11	L	
NASA [IOA [/ 2 /1R] [] [Р]]	[[F]	[[F]	[[X] *	
COMPARE [N /N	ן נ	N]	[N]	[N]	[N]	
RECOMMENDAT	IONS:	(If d:	iff	ferent	: 1	Erc	om NAS	A)						
С _л	2 /1R] [P _]	[F]	[F] (A)] DD/	A ′DE] LETE)
* CIL RETEN	TION I	RATIONAL	E:	(If a	app	51 i	cable) IN	AI IAI	DEQUATE DEQUATE	[]	
REMARKS: NASA/RI DO	NOT CO	OVER THIS	5 F	FAILU	RE	MC	DDE (R	ES	TI	RICTED F	LOV	1).	IO	4

NASA/RI DO NOT COVER THIS FAILURE MODE (RESTRICTED FLOW). IOA RECOMMENDS THAT THE RESTRICTED FLOW MODE BE ADDRESSED ON THE FMEA/CIL AS A 2/1R PFF. INABILITY TO REPRESS ARCS PROP TANK AND INABILITY TO USE OR DEPLETE ARCS PROP COULD RESULT IN LOSS OF ENTRY CONTROL AND VIOLATIONS OF ENTRY MASS PROPERTIES CONSTRAINTS AND PROP TANK LANDING WEIGHT CONSTRAINTS. LOSS OF FLOW THROUGH ONE VALVE NOT DETECTABLE DURING DUAL LEG OPERATION, AND CONTAMINATION CAN AFFECT BOTH VALVES SIMULTANEOUSLY. THE SSM AGREED THAT RESTRICTED FLOW MODE SHOULD BE ADDED TO 03-2A-201020-1 (2/1R PPP), HOWEVER IOA MAINTAINS 2/1R PFF POSITION.

REPORT DATE 2/26/88

-

1 611

ASSESSME ASSESSME NASA FME	ENT ENT EA	D) I) #:	ATE: D:	: 1/ RC NO	01/8 S-10 NE	38)0213	x				NASA D BASEL	ATA: INE NEW	[[]]	
SUBSYSTE MDAC ID: ITEM:	M:			AR 10 HE	CS 021 ISC	DL VI	LV				·					-
LEAD ANA	LY	ST	:	c.	D. I	PRUST	г									
ASSESSME	INT	:														
	CR	IT: F		LITY		RI	eduni	DANCY	SCRE	ENS	5		C] TT	L CEN	л	
]	HD	W/FU	JNC		A		В			с		**		1	
NASA IOA	[[1	/ /1]		[[]	[[]	[[]		[[x]	*
COMPARE	(N	/N]		[]	[]	[]		[N]	
RECOMMEN	IDA'	TI	ONS	:	(If	difi	ferer	nt fr	om NA	SA))					
	[1	/1]		C]	[]	[]	(AD	[)D/	A ⁄DH] ELF	ETE)
* CIL RE	TE	NT	ION	RAT	IONA	LE:	(If	appl	icabl	e) Il	ADEQUA' VADEOUA'	re re	[r]	
REMARKS:													Ľ			

NASA/RI DO NOT COVER THIS FAILURE MODE (STRUCTURAL FAILURE, RUPTURE, EXTERNAL LEAKAGE). THE SSM AGREED THAT THIS VALVE BODY SHOULD BE ADDED TO THE HELIUM LINE EXTERNAL LEAKAGE FMEA (03-2A-201013-1) WITH CORRESPONDING RETENTION RATIONALE.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-10022X 03-2A-201030-1	NASA DATA: BASELINE [] NEW [X]									
SUBSYSTEM: MDAC ID: ITEM:	ARCS 10022 HE PRESS REGULATO	DR ASSEMBLY									
LEAD ANALYST:		e an e									
ASSESSMENT:											
CRITICALITY REDUNDANCY SCREENS CIL											
HDW/FU	NC A	B C	11EM								
NASA [3 /1R IOA [3 /1R] [P] [] [P] [F] [P] F] [P]	[X]* [X]								
COMPARE [/] [] [] []	[]								
RECOMMENDATIONS:	(If different f	from NASA)									
. [/] [] [] [] (A	[] DD/DELETE)								
* CIL RETENTION	RATIONALE: (If app	olicable) ADEQUATE INADEOUATE									
REMARKS: NO DIFFERENCES. IOA RECOMMENDS ADDING A STATEMENT TO THE EFFECTS ABOUT POSSIBLE VIOLATIONS OF ENTRY MASS PROPERTY CONSTRAINTS AND PROP TANK LANDING WEIGHT CONSTRAINTS.											

____

. -

ASSESSMENT DATE: 1/01/88 NASA DAT ASSESSMENT ID: RCS-10023X BASELIN NASA FMEA #: 03-2A-201095-3 NE SUBSYSTEM: ARCS MDAC ID: 10023 ITEM: QUAD CHECK VALVE ASSEMBLY LEAD ANALYST: C.D. PRUST ASSESSMENT:																
ASSESSME	ENT:															
	CRI	TICAL FLIGH	ITY T	F	EDUN	DANCY	(SCR	REENS			CI IJ	IL TEM	[
	H	DW/FU	NC	A	L .]	3	(Ċ.,							
NASA IOA	[[1 /1 1 /1]]	[[]]]]	[[]		[[X X] *]			
COMPARE	[/]	[]	ľ]	[]		[]			
RECOMMEN	IDAT:	IONS:	[]	f dif	fere	nt fi	com N	IASA)								
	[/]	. []	[]	נ]	(A)] DD/	′DE] LETE)			
* CIL RE	TEN	TION	RATIC)NALE:	(If	app.	Licab	ole) INZ	ADEQU. ADEQU	ATE ATE	[[]			
NASA/RI	ORI	GINAL	LY DI	D NOI	cov	ER TH	HIS F	'AILUI	RE MO	DE (BLC	оск	AGE OI			

NASA/RI ORIGINALLY DID NOT COVER THIS FAILURE MODE (BLOCKAGE OF SINGLE INLET FILTER), HOWEVER ADDED 03-2A-201095-3 PER IOA ISSUE. IOA RECOMMENDS ADDING A STATEMENT TO THE EFFECTS ABOUT POSSIBLE VIOLATIONS OF ENTRY MASS PROPERTIES CONSTRAINTS AND PROP TANK LANDING WEIGHT CONSTRAINTS.

REPORT DATE 2/26/88

. -

= 2

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-10024X NONE		NA E	SA DATA: BASELINE NEW	[]
SUBSYSTEM: MDAC ID: ITEM:	ARCS 10024 QUAD CHECK	VALVE ASS	SEMBLY		
LEAD ANALYST:	C.D. PRUST				
ASSESSMENT:					
CRITICAL FLIGH	ITY RED T	UNDANCY S	SCREENS		CIL ITEM
HDW/FU	NC A	В	С		
NASA [/ IOA [1 /1] []] []	[] []]]	[] * [X]
COMPARE [N /N] []	[]	[]	[N]
RECOMMENDATIONS:	(If diffe:	rent from	NASA)		
[1]/1] []	[]	[] · (AD)	[A] D/DELETE)
* CIL RETENTION	RATIONALE: (1	If applic	able) AD INAD	EQUATE EOUATE	[] []
REMARKS: NASA/RI DO NOT CO RUPTURE, EXTERNA SHOULD BE ADDED (OVER THIS FA L LEAKAGE). FO THE HELIUR	ILURE MOD THE SSM M LINE EX	DE (STRUC AGREED T TERNAL L	TURAL FA HAT THIS EAKAGE FI	LURE, VALVE BODY MEA (03-2A-

201013-1) WITH CORRESPONDING RETENTION RATIONALE. IOA ALSO RECOMMENDS THAT THE EFFECTS OF POSSIBLE PROP LEAKAGE BE INCLUDED ON THE FMEA (CORROSION, FIRE, EXPLOSION, EXPOSURE OF EVA AND GROUND CREWS).

REPORT DATE 2/26/88

흔 김

-

-

===

-

-

_

_

ē

-

ASSES ASSES NASA	SMEN SMEN FMEA	IT 1 IT 1 1 #	DA' ID :	TE:	1/ RC 03	01/8 S-10 -2A-	38)02 -2(25X 010	()60	-2					NZ E	ASA BAS	D) EL:]	ATA INE NEW	: []	X]	
SUBSY MDAC ITEM:	STEM ID:	I:			AR 10 PR	CS 025 ESSI	JRI	e F	REL	IEF	F	ASS	EMBI	.X								
LEAD	ANAI	LYS	r:		c.	D. I	PRU	JSI	C													
ASSES	SMEN	IT:																				- · · -
	c	'RI'	TI FL	CALI IGHI	CTY C			RE	EDU	NDA	NC	CY	SCRE	EENS	5					IL TEM	ſ	
		H	DW,	/FUN	IC			A				в			C							
NA I	SA OA	[2	/1R /1R]]		ן נ	P P]		[[NA NA]	[[P P]			[[X X]]	*
COMPA	RE	[4	/]		[]		[]	[].			[]	
RECOM	MENI	DAT	10	NS:		(If	di	iff	ter	ent	1	fro	m NZ	SA))							
		[/]		[]		[]	[]		(A)	[DD/	DE] SLE	TE)
* CII	REI	ren'	TI	on i	RAI	ION	ALI	Ξ:	(I	fa	pı	pli	cabl	le) Il	AI JAI	DEQ DEQ	UA' UA'	re re	[[]	
REMAR NO DI	KS: FFEF	REN	CE	s.	IC	A RI	ECC	OMM	IEN	DS	AI	DDI	NG S	TAT	ren	IEN	TS	то	TI	IE	EF	FEC

NO DIFFERENCES. IOA RECOMMENDS ADDING STATEMENTS TO THE EFFECTS ABOUT POSSIBLE VIOLATIONS OF ORBITER ENTRY MASS PROPERTIES CONSTRAINTS AND PROP TANK LANDING WEIGHT CONSTRAINTS, AND THE EFFECTS OF POSSIBLE PROP LEAKAGE (CORROSION, FIRE, EXPLOSION, EXPOSURE OF EVA AND GROUND CREWS).

REPORT DATE 2/26/88
ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-10026X NONE	NASA DATA: BASELINE [] NEW []
SUBSYSTEM: MDAC ID: ITEM:	ARCS 10026 PRESSURE RELIEF ASSEMBLY	
LEAD ANALYST:	C.D. PRUST	
ASSESSMENT:		
CRITICAL FLIGH HDW/FU	ITY REDUNDANCY SCREEN T NC A B	NS CIL ITEM C
NASA [/ IOA [3 /1R] [] [] [] [F] [NA] [] []* P] [X]
COMPARE [N /N] [N] [N] [[N] [N]
RECOMMENDATIONS: [3 /1R	(If different from NASA] [F] [NA] [A) P] [A] (ADD/DELETE)
* CIL RETENTION H REMARKS: NASA/RI DO NOT CO SSM AGREED THAT H	RATIONALE: (If applicable) I OVER THIS FAILURE MODE (RE RESTRICTED FLOW SHOULD BE	ADEQUATE [] NADEQUATE [] STRICTED FLOW). THE ADDED TO THE FAILURE
MODES ON 03-2A-20	01060-3 (3/1R FNP, BURST D	ISK FAILS TO RUPTURE).
- · · · ·	and and a second sec Second second	1997))) (1997))) 1997))) 1997) 1997
-	na an a	en e
	egene in the second	

REPORT DATE 2/26/88

ъ. . :

- :

€..5

-

.....

ASSESSME ASSESSME NASA FME	NT I NT I A #	DATE: ID: :	1/01/8 RCS-10 03-2A-	38 0027: -201	X 060-1			N2 I	ASA DATA BASELINE NEW	: [X]]
SUBSYSTE MDAC ID: ITEM:	:M:		ARCS 10027 PRESSU	JRE 1	RELIE	F ASS	SEMBLY	Z			
LEAD ANA	LYS	г:	C.D. 1	PRUS	Г						
ASSESSME	NT:										
	FICAL FLIGH	ITY T	R	EDUND	ANCY	SCREI	ENS		CIL ITE	м	
	H	DW/FU	NC	A		В		С			
NASA IOA	ן נ	1 /1 1 /1]	[[]]	[[]]	[[]	[X [X] *] •
COMPARE	[/]	נ]	[]	[]	[]
RECOMMEN	DAT:	IONS:	(If	dif	feren	t fro	om NAS	SA)			
	[1 /1]	נ]	[]	[-] (A	[A DD/D] ELETE)
* CIL RE	TEN	TION	RATION	ALE:	(If	appl	icable	€) Al INAI	DEQUATE DEOUATE	[r]
REMARKS:										L	-

THIS FMEA COVERS ONLY THE BELLOWS LEAKAGE FAILURE MODE. IOA HAS NO ISSUE WITH THIS FAILURE MODE, HOWEVER DOES RECOMMEND ADDING STATEMENTS TO THE EFFECTS ABOUT POSSIBLE VIOLATION OF ENTRY MASS PROPERTIES CONSTRAINTS AND THE HAZARDS OF PROP LEAKAGE TO EVA CREW, VEHICLE, AND GROUND CREW. NASA/RI DO NOT COVER STRUCTURAL FAILURE, RUPTURE, OR EXTERNAL LEAKAGE OF THE VALUE HOUSING ON THIS EMEN OF FLSEWHEDE. THE SSM $\langle \rangle$

LEAKAGE OF THE VALVE HOUSING ON THIS FMEA OR ELSEWHERE. THE SSM AGREED THAT THIS VALVE BODY SHOULD BE ADDED TO THE PROP LINE EXTERNAL LEAKAGE FMEA (03-2A-202108-1) WITH CORRESPONDING RETENTION RATIONALE.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-10028 NONE	вх	NASA DATA: BASELINE NEW	[]
SUBSYSTEM: MDAC ID: ITEM:	ARCS 10028 PROP TANH	K ISOL VLVS 3/4/5		
LEAD ANALYST:	C.D. PRUS	ST		
ASSESSMENT:				
CRITICAI FLIGH HDW/FI	LITY F	REDUNDANCY SCREENS	; C	CIL ITEM
11011/11			C	
NASA [/ IOA [2/1F] [] [P] [F] [] F]	[] * [X]
COMPARE [N /N] . [N	и] [и] [NJ	[N]
RECOMMENDATIONS:	(If dif	fferent from NASA)	 I	
[3 /1F	;] [F	P] [F] [P] (AC	[A] D/DELETE)
* CIL RETENTION	RATIONALE:	: (If applicable) IN	ADEQUATE IADEQUATE	[]
IOA NOW CLASSIFI	ES C SCREE	EN AS "PASS". NAS	AARI DO NO	T COVER T

IOA NOW CLASSIFIES C SCREEN AS "PASS". NASA/RI DO NOT COVER THIS FAILURE MODE (RESTRICTED FLOW). THE SSM AGREED THAT THIS FAILURE MODE SHOULD BE ADDRESSED ON THE FMEA/CIL. IOA RECOMMENDS A 3/1R PFP FOR RESTRICTED FLOW OF THE PROP TANK ISOL 3/4/5 VALVES. RESTRICTED FLOW OF THE PROP TANK ISOL 3/4/5 VALVES. RESTRICTED FLOW THROUGH ONE 3/4/5 VALVE WOULD NOT BE DETECTABLE DURING DUAL LEG OPERATION. IOA WITHDRAWS 2/1R CRIT, BUT MAINTAINS CONCERN THAT RESTRICTED FLOW OF PROP TO A THRUSTER COULD RESULT IN BURN-THROUGH.

e 7

ASSESSME ASSESSME NASA FME	ENT ENT EA	D2 11 #:	ATE: D:	1/0 RCS- 03-	1/88 -1002 2A-20	9X 211	0-2			NZ E	ASA BASI	DATA: ELINE NEW	[[x].	
SUBSYSTE MDAC ID: ITEM:	EM:			ARCS 1002 PROD	5 29 P TAN	IK I	SOL V	LV 1,	/2		-				·	
LEAD ANA	LY	ST	:	C.D	. PRI	JST										
ASSESSME	INT	:														
	CRITICALII FLIGHT HDW/FUNC						UNDAN	CY S	CREEN	IS				CL Pen	ศ	
]	HD	W/FUI	NC		A		В		С					-	
NASA IOA	[[3 1	/3 /1]]	[[]]	[[]]	[]		[[x]]	*
COMPARE	[N	/N]	[]	[]	[]		[N]	
RECOMMEN	IDA'	TI	ons:	(If d	lffe	rent	from	NASA	\)						
•	[2	/1R]	[P]	[NA]	(P]	(Al] ,סכ	A / DI] ELE	TE)
* CIL RE	ETE	NT	ION	RATI	ONALI	E: (If ap	plic	able) I	AI INAI	DEQ DEQ	UATE UATE	[[]]	
REMARKS	: DMM	EN	DS T	HAT	THIS	FAI	LURĒ	MODE	BE U	JPGI	RAD	ED TO	A	2,	/1 <u>R</u>	PN

IOA RECOMMENDS THAT THIS FAILURE MODE BE UPGRADED TO A 2/1R PNP FOR THE 1/2 VALVE AND PLACED ON THE CIL. THIS FAILURE COULD RESULT IN OVERPRESSURIZATION AND RUPTURE OF THE DOWNSTREAM PROP LINES, AND IS LISTED AS A CAUSE ON THE PROP LINE EXTERNAL LEAKAGE FMEA (03-2A-202108-1) AND AS A FAILURE MODE ON 03-2A-202140-3. IOA NOW CLASSIFIES THIS FAILURE AS A 2/1R PNP SINCE A PREVIOUS FAILURE IS REQUIRED BEFORE THE VALVE WILL BE CLOSED.

REPORT DATE 2/26/88

응용의,용도신, 통이 관계 가지는 것 가지 않는

=

_

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-10030X 03-2A-202110-2		NASA DATA: BASELINE NEW	[] [X]
SUBSYSTEM: MDAC ID: ITEM:	ARCS 10030 PROP TANK ISOL	VLVS 3/4/5		
LEAD ANALYST:	C.D. PRUST			
ASSESSMENT:				
CRITICAL	ITY REDUNDA	NCY SCREENS	5	CIL ITEM
HDW/FU	NC A	В	С	· · · · · · ·
NASA [3 /3 IOA [2 /1R] []] [P]	[] [[F] [] P]	[] * [X]
COMPARE [N /N] [N]	[N] [М]	[N]
RECOMMENDATIONS:	(If different	: from NASA)	
[_3 /1R] [P]	[NA] [P] (AI	[] DD/DELETE)
* CIL RETENTION	RATIONALE: (If a	applicable)	() ADEQUATE NADEQUATE	[]]
REMARKS: IOA RECOMMENDS TH FOR THE 3/4/5 VA	HAT THIS FAILURE LVE. THIS FAILU	MODE BE UI	PGRADED TO ESULT IN	A 3/1R PNP

OVERPRESSURIZATION AND RUPTURE OF THE DOWNSTREAM PROP LINES, AND IS LISTED AS A CAUSE ON THE PROP LINE EXTERNAL LEAKAGE FMEA (03-2A-202108-1) AND AS A FAILURE MODE ON 03-2A-202140-3. IOA NOW CLASSIFIES THIS FAILURE AS A 3/1R PNP SINCE A PREVIOUS FAILURE IS REQUIRED BEFORE THE VALVE WILL BE CLOSED.

REPORT DATE 2/26/88

ASSESSMEN ASSESSMEN NASA FMEA	1T D2 1T II 1 #:	ATE: D:	8 03	1X						NASZ BAS	A DATA: SELINE NEW	: [[]	
SUBSYSTEN MDAC ID: ITEM:	4:		ARCS 10031 PROP 1	'AN	к	ISOL	VI	v	1/2					
LEAD ANAI	LYST	:	C.D. F	RU	ST									
ASSESSMENT:														
C	CRITI	ICALI	TTY]	RE	DUNDA	NC	Y	SCREE	INS			CIL	ſ
	HDV	V/FUN	IC	Ì	A			В			С			•
NASA IOA	[[3	/ /1R]	[[]	P]	[[P]]	[[] P]		[[] *]
COMPARE	[И	/N]	[]	N]	[N]	[[И		[]
RECOMMENI	DATIC	ONS:	(If	di	ff	erent	: f	rc	m NAS	SA)				
	[]	[]	[]	(AI	[DD/DE] LETE)			
* CIL RET	[ENT]	ION F	RATIONA	LE	:	(If a	ıpp	9 1 i	.ca)le	e) IN	ADEÇ ADEÇ	QUATE QUATE	[[]
REMARKS:	NZ		א סם דא	TO	C	OVER	тн	TS	FATT	UR	E MO	DE (FA	TLS	MID-

NO ISSUE. NASA/RI DO NOT COVER THIS FAILURE MODE (FAILS MID-TRAVEL), HOWEVER THE WORST-CASE EFFECTS OF THIS FAILURE ARE COVERED BY THE FAILED CLOSED AND RESTRICTED FLOW FAILURE MODES.

REPORT DATE 2/26/88 C-252

ASS ASS NAS	ESSME ESSME A FME	NT NT A ‡	D2 II #:	ATE: D:	1/ RC NC	01/88 S-10032X NE									NA E	ASA BASE	DATA LINE NEV	A : 2 7	[[]	
SUB MDA ITE	SYSTE C ID: M:	M:			AF 10 PF	CS 1032 ROP T	'Al	٩ĸ	ISC	DL .	VL	7S	3/4/	/5							
LEĂ	D ANA	LYS	ST	:	c.	D. P	PRI	JSI	C											/ 16	
ASS	ESSME	NT	:																		
	CRITICALI FLIGHT HDW/FUN							RI A	EDUI	NDA	NC	х: в	SCREI	ENS	s c				CIL ITE	м	
	NASA IOA	[[3	/ /1R]		[[P]]		[]	P]]	[[P]]			[]	*
COM	IPARE	[N	/N]		נ	N]		[]	N]	[N]			[]	
REC	OMMEN	DA'	FI (ONS:		(If	d:	if	fere	ent	f	ro	m NAS	5A))						
		נ		/]		[]		[]	[j	(1	AD	[D/ D] ELI	ETE)
* C	IL RE	TE	N'T'	ION	RAJ	TON	ΥĽ	Е:	(I:	fa	pp	li	cable	e) II	AI NAI	DEQU	JATE JATE		[]]	. .
T III	mur/1/0 •																				

NO ISSUE. NASA/RI DO NOT COVER THIS FAILURE MODE (FAILS MID-TRAVEL), HOWEVER THE WORST-CASE EFFECTS OF THIS FAILURE ARE COVERED BY THE FAILED CLOSED AND RESTRICTED FLOW FAILURE MODES.

REPORT DATE 2/26/88

d Breeze

 C-253

•

ASSESSME ASSESSME NASA FME	88 003 -20	3) 21	(L11-3	5				NZ H	ASA DA BASELI N	TA: NE EW	[[]	X]]				
SUBSYSTE MDAC ID: ITEM:	M:		ARCS 10033 RCS CI	ROS	SI	FEED	VL	vs	1/2	& :	3/4	1/5					
LEAD ANA	LYST	:	C.D.	PRU	รา	2											
ASSESSME	NT:																
	ITY I IC		RE A	DUNE	AN	CY B	SCRE	ENS	s c		(L Em	,			
NASA IOA	[3 [3	/3 /1R]	[[P]	[[F]	[[P]		[x]]	*
COMPARE	ſ	/N]]	N]	[N]	[N]		[]	N]	
RECOMMEN	DATI	ONS:	(If	di	ff	eren	it :	fro	om NAS	SA)	1						
	[3	/1R]	[P]	נ	NA	A]	[P]	(ADI	[5/1	DE] LE	TE)
* CIL RE	TENT	ION F	RATION	ALE	:	(If	apı	pli	cable	≥) IN	AI JAI)EQUAT)EQUAT	E E	-]	
REMARKS:														-		-	

IOA RECOMMENDS THAT THIS ITEM AND FAILURE MODE (RELIEF DEVICE FAILS CLOSED) BE UPGRADED TO A 3/1R PNP. THE LOSS OF ALL REDUNDANCY (OMS & RCS CROSSFEED VALVE DEVICES) COULD RESULT IN OVERPRESSURIZATION AND RUPTURE OF CROSSFEED LINES. THIS FAILURE IS LISTED AS A CAUSE ON THE PROP LINE EXTERNAL LEAKAGE FMEA (03-2A-202108-1) AND AS A FAILURE MODE ON 03-2A-202140-3.

REPORT DATE 2/26/88

C-254

.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-10034 NONE	x		NASI BAS	A DATA: SELINE [] NEW []
SUBSYSTEM: MDAC ID: ITEM:	ARCS 10034 RCS CROSS	FEED V	LVS 1/2	& 3/4/5	5
LEAD ANALYST:	C.D. PRUS	T			
ASSESSMENT:					
CRITICAI	JTY F	REDUNDA	NCY SCR	EENS	CIL ITEM
HDW/FU	INC A	. .	В	С	
NASA [/ IOA [2 /2] [] []]		[] []	[] * [X]
COMPARE [N /N] []	[]	[]	[N]
RECOMMENDÀTIONS:	(If dif	ferent	from N	ASA)	
[/] []	[]]	. []	[] (ADD/DELETE)
* CIL RETENTION	RATIONALE:	(If a	pplicab	le) ADE(INADE(QUATE [] QUATE []
REMARKS: NO ISSUE. NASA/	RI DO NOT	COVER	THIS FA	ILURE MO	DE (FAILS MID-

TRAVEL), HOWEVER THE WORST-CASE EFFECTS OF THIS FAILURE ARE COVERED BY THE FAILED CLOSED AND RESTRICTED FLOW FAILURE MODES.

REPORT DATE 2/26/88

_

•

=== . ____.

ASSESSMEN ASSESSMEN NASA FMEN	TV TV A	D2 II #:	ATE: D:	1/01/8 RCS-10 03-2A-	8 0352 -2021	20-2			ł	IASA DAT BASELIN NE	'A: IE IW	[[x]]	
SUBSYSTEN MDAC ID: ITEM:	4:			ARCS 10035 MANIFO	DLD 1	L-4 I:	SOL	VALVES	ł						
LEAD ANA	LYS	ST	:	C.D. 1	RUSI	2									
ASSESSME	NT:	:													
(CR	IT:	ICALI	LTY P	RI	DUND	ANCY	SCREE	NS			CI IT	L EN	ſ	
	I	HD	N/FUN		A		E	3	Ċ	2				•	
NASA IOA	[[3 1	/3 /1]]	[[]	[[]]	[[]]		[[x]	*
COMPARE	נ	N	/N]	[]	[]	[]		[N]	
RECOMMEN	DA'	FI (ons:	(If	difi	feren	t fi	om NAS	A)						
	[2	/1R]	[P]	[]	IA]	[]	P] ((AD	[D/	A 'DE) CLE	TE)
* (IL RE	TEI	NT	ION I	RATION	ALE:	(If	app]	licable	2) 2 IN2	ADEQUATE ADEQUATE	2	[[]]	
REMARKS:										-		•		-	

IOA RECOMMENDS THAT THIS ITEM AND FAILURE MODE BE UPGRADED TO A 2/1R PNP AND PLACED ON THE CIL. THIS FAILURE COULD RESULT IN OVERPRESSURIZATION AND RUPTURE OF DOWNSTREAM PROP LINES, AND IS LISTED AS A CAUSE ON THE PROP LINE EXTERNAL LEAKAGE FMEA (03-2A-202108-1) AND AS A FAILURE MODE ON 03-2A-202140-3. IOA NOW CLASSIFIES THIS FAILURE AS A 2/1R PNP SINCE A PREVIOUS FAILURE IS REQUIRED BEFORE THE VALVE WILL BE CLOSED.

REPORT DATE 2/26/88

ASSESSMI ASSESSMI NASA FMI	ENT ENT EA	D2 II #:	ATE: D:	1/0: RCS- 03-:	1/88 -10036 2A-202	X 140-	3		1	NASA BASE	DATA LINE NEW	: [[]	k]
SUBSYSTI MDAC ID: ITEM:	EM : :			ARCS 1003 VERI	5 36 NIER M	ANIF	OLD 1	ISOL	VALVI	2			
LEAD ANA	ALY:	ST:	:	C.D	. PRUS	T							
ASSESSME	ENT	:											
	CRITICA FLIC HDW/1				R	EDUN	DANCY	SCR	EENS			CII ITI	L E M
	1	HDV	V/FU	INC	А		I	3	C	2			
NASA IOA	[[1 1	/1 /1]]	[[]]	[[]]	[[]]		[]	K] * K]
COMPARE	ן		/]	ſ]	[]	ſ]		[·]
RECOMMEN	IDA!	rIC	ons :	(:	If dif	fere	nt fi	com N	ASA)			- 19	
	[•	/]	ſ]	[]	[]	(A	[DD/I] DELETE)
* CIL RE	ETEI	NT I	ION	RATIO	ONALE:	(If	appl	licab	le) A	ADEQU	ATE	[r]
REMARKS: NO DIFFI POSSIBLE	: EREI E EX	NCI	ES. DSUF	IOA RE OF	RECOM EVA A	MEND ND G	S THA	AT TH CRE	E EFI	ECTS PRO	DIS P OR	CUSS PRO	J 5 THE DP VAPORS

REPORT DATE 2/26/88 C-257

- -

ASSESSMEN ASSESSMEN NASA FMEA	IT DA IT II X #:	ATE: D:	1/01/8 RCS-10 NONE	38)037:	x					NASA DA BASELI N	TA: NE EW	[[]]	
SUBSYSTEN MDAC ID: ITEM:	1:		ARCS 10037 MANIFO	DLD	1-4 IS	SOL	. v	ALVES	;					
LEAD ANAI	Lyst	:	C.D. 1	PRUS	r									
ASSESSMENT:														
c	RIT	ICAL	TY	R	EDUNDA	ANC	Y	SCREE	NS			CIL	х	
	HDI	W/FUN	1C	A			B	ut to initial		C		1 1 DF	1	
NASA IOA	[[3	/ /1R]	[[P]	[[P]	[[] P]		[[] *]	
COMPARE	[N	/N]	[N]	[N]	[N]		[]	
RECOMMENI	DATIO	ONS:	(If	dif	feren	t f	ro	m NAS	A)					
[/]]	[]	[]	(AD	[D/DF] Elete;)
* CIL REI	ENT	ION P	RATION	ALE:	(If a	app	li	cable	:) 	ADEQUAT	E	Į	j	
REMARKS:	N	7 C 7 /1			COVED	mu	ITC	БУТТ	UD TN	ADEQUAT	ይ (ፑል	L	J MTD-	

_

_

NO ISSUE. NASA/RI DO NOT COVER THIS FAILURE MODE (FAILS MID-TRAVEL), HOWEVER THE WORST-CASE EFFECTS OF THIS FAILURE ARE COVERED BY THE FAILED CLOSED AND RESTRICTED FLOW FAILURE MODES.

REPORT DATE 2/26/88

. .

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-10038) NONE	ĸ	NASA DATA: BASELINE [] NEW []							
SUBSYSTEM: MDAC ID: ITEM: AXES	ARCS 10038 THRUSTER H	SIPROP SC	LENOI	D VALVE,	PRIMARY, ALL					
LEAD ANALYST:	C.D. PRUST	C			•					
ASSESSMENT:										
CRITICAI FLIGH HDW/FU	LITY RI IT JNC A	EDUNDANCY E	SCRE	ens C	CIL ITEM					
NASA [/ IOA [1 /1] [] [] [] []].	[] []	[] * [X]					
COMPARE [N /N] [] []	[]	[N]					
RECOMMENDATIONS	(If dif	ferent fr	om NA	SA)						
[/] [] []	[]	[] (ADD/DELETE)					
* CIL RETENTION REMARKS:	RATIONALE:	(If appl	icabl	e) ADEQU INADEQU	ATE [] ATE []					

NO HDW ISSUE. THIS FAILURE MODE (PREMATURE OPERATION, FAILS ON) COULD ONLY BE CAUSED BY AN EPDC (RJD) FAILURE. THE RJDS ARE ASSESSED BY IOA IN THE GNC SUBSYSTEM.

REPORT DATE 2/26/88

-

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-10039X NONE		NASA DATA BASELINE NEW	: [] []									
SUBSYSTEM: MDAC ID: ITEM:	ARCS 10039 THRUSTER BIP	ROP SOLENOI	ID VLV, VERNI	ER, ALL AXES									
LEAD ANALYST:													
ASSESSMENT:													
CRITICAL FLIGH HDW/FU	ITY REDU F NC A	NDANCY SCRE B	C	CIL ITEM									
NASA [/ IOA [1 /1] []] []	[] []		[] * [X]									
COMPARE [N /N] []	[]	[]	[N]									
RECOMMENDATIONS:	(If differ	ent from NA	SA)										
[/] []	[]	[] (A	[] DD/DELETE)									
* CIL RETENTION	RATIONALE: (I	f applicabl	.e) ADEQUATE INADEQUATE										

.

NO HDW ISSUE. THIS FAILURE MODE (PREMATURE OPERATION, FAILS ON) COULD ONLY BE CAUSED BY AN EPDC (RJD) FAILURE. THE RJDS ARE ASSESSED BY IOA IN THE GNC SUBSYSTEM.

REPORT DATE 2/26/88

-

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-10040X NONE		NASA DATA: BASELINE [] NEW []										
SUBSYSTEM: MDAC ID: ITEM:	ARCS 10040 THRUSTER INJ	ECTOR HEAD	ASSY, PRIMAR	Y									
LEAD ANALYST:	C.D. PRUST												
ASSESSMENT:													
CRITICAL	ITY REDU	NDANCY SCRE	ENS	CIL									
HDW/FU	NC A	В	С	1154									
NASA [/ IOA [1 /1] []		[] []	[] * [X]									
COMPARE [N /N] . []	[]	[]	[N]									
RECOMMENDATIONS:	(If differ	ent from NA	SA)										
[1 /1] []	[]	[] (A	[A] DD/DELETE)									
* CIL RETENTION	RATIONALE: (I	f applicabl	e) ADEQUATE INADEQUATE	[]									
REMARKS: NASA/RI DO NOT C	OVER THIS ITE	M AND FAILU	RE (RESTRICT	ED FLOW).									

IOA RECOMMENDS THAT THIS ITEM AND FAILURE MODE BE ADDRESSED ON THE FMEA/CIL WITH A 1/1 CRITICALITY. THE INJECTOR IS AT THE SAME LEVEL OF DETAIL AS OTHER THRUSTER COMPONENTS WHICH ARE COVERED ON INDIVIDUAL FMEA, AND SHOULD ALSO RECEIVE 1/1 ATTENTION. RESTRICTED FLOW OF THE INJECTOR COULD RESULT IN THRUSTER BURN-THROUGH.

=: =

ASSESSME ASSESSME NASA FME	NT NT A i	D2 II #:	ATE: D:	1/01/8 RCS-10 NONE	88 00413	ĸ		NASA DATA: BASELINE [] NEW []								
SUBSYSTE MDAC ID: ITEM:	M:			ARCS 10041 THRUS	TER 1	INJEC	TOR H	HEAD 2	ASS	SY, PRIMA	RY					
LEAD ANA	LYS	LYST: C.D. PRUST														
ASSESSME	NT	:					•						•••			
CRITICALITY REDUNDANCY SCREENS											C T	CIL				
	F	IDV	V/FU	NC	A		В		C				·* &			
NASA IOA	[[1	/ /1]	[[]]	[[]	[[]]	[x]	*		
COMPARE	ĺ	N	/N]	[]	[]	[]	[N]			
RECOMMEN	DAJ	ric	ONS:	(If	diff	feren	t fro	om NAS	SA))						
	[1	/1]	[]	[]	[] (] ADD	A / Di] ELE	TE)		
* CIL RE	TEI	1T]	ION I	RATION	ALE:	(If	appli	icable	e) 11	ADEQUATE VADEQUATE	[]]			
REMARKS:											-		-			

-

.

-

ŧ

•

NASA/RI DO NOT COVER THIS ITEM AND FAILURE (RESTRICTED FLOW). IOA RECOMMENDS THAT THIS ITEM AND FAILURE MODE BE ADDRESSED ON THE FMEA/CIL WITH A 1/1 CRITICALITY. THE INJECTOR IS AT THE SAME LEVEL OF DETAIL AS OTHER THRUSTER COMPONENTS WHICH ARE COVERED ON INDIVIDUAL FMEA, AND SHOULD ALSO RECEIVE 1/1 ATTENTION.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-10042X NONE	NASA DATA: BASELINE [] NEW []							
SUBSYSTEM: MDAC ID: ITEM: AXES	FRCS 10042 THRUSTER BIPR	OP SOLENOI	D VALVE, PR	IMARY, ALL					
LEAD ANALYST:	C.D. PRUST								
ASSESSMENT:									
CRITICALI FLIGHI	TY REDUN	DANCY SCREI	ENS	CIL ITEM					
HDW/FUN	IC A	В	C						
NASA [/ IOA [1 /1) []) []	[] []	[] []	[] * [X]					
COMPARE [N /N] []	[]	[]	[N]					
RECOMMENDATIONS:	(If differe	nt from NAS	5A)						
[1 /1] []	[]	[]	[A] ADD/DELETE)					
* CIL RETENTION F	ATIONALE: (If	applicable	≥) ADEQUATE INADEQUATE	[]					

NASA/RI DO NOT COVER THIS FAILURE MODE (DELAYED OPERATION, ONE VALVE OPENS SLOWLY OR LATE). IOA RECOMMENDS THAT THIS ITEM AND FAILURE MODE BE ADDRESSED ON THE FMEA/CIL WITH A 1/1 CRIT. SUCH A FAILURE COULD RESULT IN ZOTS CAUSING THRUSTER RUPTURE AND LEAKAGE OF PROP.

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	NT NT A	D2 II #:	ATE: D:	1/ RC NO	01/8 S-10 NE	88 0432	ĸ			N	IASA DA BASELJ N	ATA: INE [NEW []
SUBSYSTE MDAC ID: ITEM: AXES	M:			AR 10 TH	CS 043 RUSI	ER I	BIPRC	LVE, I	PRIMARY,	ALL			
LEAD ANA	LYS	ST	:	c.	D. I	PRUS	r						
ASSESSME	NT	:											
	CR	IT: Fl	ICAL LIGH	ITY T		R) A	EDUNE	ANCY	SCREE	ENS	•	CIL ITEM	ſ
	1	יטה	N/ FU	NC		A		Б			•		
NASA IOA	[[1	/ /1]]		ני נ]]	[[]]	[[]]	[[X] *]
COMPARE	[N	/N]		[]	[]	[]	[N]
RECOMMEN	IDA'	FI (SNS:		(If	dif	ferer	nt fr	om NAS	SA)			
	[1	/1]		[]	[]	[ן ו	[A (ADD/DE] :LETE)
* CIL RE	TE	NT:	ION	RAT	ION	ALE:	(If	appl	icable	≥)	DEOUA	re r	1

INADEQUATE []

_

- --

REMARKS: NASA/RI DO NOT COVER THIS FAILURE MODE (DELAYED OPERATION, ONE VALVE OPENS SLOWLY OR LATE). IOA RECOMMENDS THAT THIS ITEM AND FAILURE MODE BE ADDRESSED ON THE FMEA/CIL WITH A 1/1 CRIT. SUCH A FAILURE COULD RESULT IN ZOTS CAUSING THRUSTER RUPTURE AND LEAKAGE OF PROP.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/01/88 RCS-10116 03-2F-121	5X L310-1	NASA DAT. BASELIN NE	DATA: LINE [] NEW [X]										
SUBSYSTEM: MDAC ID: ITEM:	FRCS 10116 THRUSTER	FRCS L0116 THRUSTER BIPROP SOLENOID VLV, PRIMAR												
LEAD ANALYST:														
ASSESSMENT:														
CRITICAL	CIL													
HDW/FU	NC A	۲.	В	C										
NASA [3 /3 IOA [1 /1] [] [] [] []]	[] []	[] * [X]									
COMPARE [N /N] [J (]	[]	[N]									
RECOMMENDATIONS:	(If dif	fferent f	rom NA	SA)										
[1 /1] [] []	[]	[A] ADD/DELETE)									
* CIL RETENTION	RATIONALE:	(If app	licable	e) ADEQUATE INADEOUATE										
REMARKS: IOA RECOMMENDS THAT THIS ITEM AND FAILURE MODE (PREMATURE OPERATION DURING GROUND C/O TRICKLE CURRENT TEST) BE UPGRADED TO A 1/1 AND PLACED ON THE CIL. FIRING OF A THRUSTER ON THE GROUND COULD RESULT IN LOSS OF LIFE DUE TO EXPOSURE TO PROP, PROP VAPORS, OR THRUSTER PLUME.														

THIS EPDC (RJD) FAILURE MAY BE COVERED IN THE GNC SUBSYSTEM.

REPORT DATE 2/26/88 C-265

- -

.....

,

ASSESSMI ASSESSMI NASA FMI	EN' EN' EA	r D r I #:	ATE D:	: 1/0 RCS 03-	01/88 5-1013 -2A-22	8X 1310-	•3		1	IASA BASE	DATA LINE NEW	'A: TE[] WW[X]					
SUBSYST MDAC ID ITEM: AXES	ЕМ: :	:		ARC 101 THI	CS L38 RUSTER	BIPF	OP SC	LENC	DID VA	ALVE,	PRI	IAR	Y,	A	\LL		
LEAD AND	AL	YST	:	c.1	D. PRU	ST											
ASSESSM	EN	г:															
CRITICALITY REDUNDANCY SCREENS C											CI	L	r				
	FLIGHT HDW/FUNC				A	E	3	(С				1				
NASA IOA		[3 [1	/3 /1]]	[[]	[[]]	[[]]		[[x]]	*		
COMPARE		[N	/N]	[]	[]	[]		[N]			
RECOMME	ND	ATI	ons	:	(If di	ffere	ent fi	com N	IASA)								
	L	[1	/1]	[]	[]	[Ĵ	(Al] /0C	A 'DE] ELE	TE)		
* CIL R	ET)	ENT	ION	RAT	IONALE	:: (If	app]	licat	ole) TNZ	ADEQU	ATE ATE	[r)]			
REMARKS	:								±114	IDEQ0		L		1			
IOA REC	OM	MEN	DS	THAT	THIS	ITEM	AND I	AILU	TRE MO	DDE (PREM	ATU	RE	C			
OPERATI	ON	DU	RIN	G GR	DUND C	:/0 TF	ICKL	E CUF	RENT	TEST) BE	UF	GF	IAS	DED TO		
A 1/1 A	ND	PL	ACE	DON	THE C	IL.	FIRIN	IG OF			ER OI	I N	'HE		ROUND		
COULD R	ES	ULT	ΞN	LOS	SOFL	TLE T	JUE TO) EXF	USURI	5 TO	PROP	,					

 \equiv

-

general salatto de Corezos

PROP VAPORS, OR THRUSTER PLUME. THIS EPDC (RJD) FAILURE MAY BE COVERED IN THE GNC SUBSYSTEM.

1

REPORT DATE 2/26/88 C-266

.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-308 05-6KF-2176	5 -1	NASA DATA BASELINE NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 308 CONTROLLER,	, REMOTE POWI	ER	
LEAD ANALYST:	D. HARTMAN	···	: <u>·</u> · · · ·	
ASSESSMENT:				
CRITICAL FLIGH	ITY RED F	DUNDANCY SCRI	EENS	CIL ITEM
HDW/FU	NC A	В	С	
NASA [3 /1R IOA [2 /1R] [P]] [P]	[P] [P]	[P] [P]	[] * [X]
COMPARE [N /] []] []	[]	[N]
RECOMMENDATIONS:	(If diffe	erent from NA	ASA)	
[/] []] []	[] (A	[] DD/DELETE)
* CIL RETENTION) REMARKS: IOA AGREES WITH)	RATIONALE: (NASA FMEA.	(If applicab)	Le) ADEQUATE INADEQUATE	[]

REPORT DATE 2/26/88 C-267

±. ≣rri

-____

> -

= -

_

=

ASSESSMEN ASSESSMEN NASA FMEA	1T C 1T I 4 # :	ATE: D:	1/29/ FRCS- 05-61	/88 -309 KF-21	.76 -	-2	NASA DATA: BASELINE [] NEW [X]							
SUBSYSTEN MDAC ID: ITEM:	1:		FRCS 309 CONTH	ROLLE	R, I	REMOTE	POWER				11 2 ¹¹			
LEAD ANAI	LYSI	::	D. H2	RTMA	N									
ASSESSMENT:														
c	CRIT F	ICAL	ITY F	F	EDU	NDANCY	SCREE	NS		CIL ITE	M			
	HC	W/FUI	NC	A	•	В		С						
NASA IOA	[3 [3	/1R /1R]]	[F [F	,] ,]	[P [P]]	[P [P]	[[] *]			
COMPARE	[/]	[]	[]	[]	[]			
RECOMMENI	ATI	ONS:	(11	E dif	fere	ent fro	om NAS.	A)						
	[1]	[]	[]	[] (A	[DD/D] ELETE)			
* CIL RET	ENI	NOL 1	RATION	VALE:	(11	f appli	icable) AI INAI	DEQUATE DEQUATE	[[]]			
NO DIFFE	RENC	ES.												

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-310 05-6KF-2176	A-1	NASA DATA: BASELINE [NEW [X							
SUBSYSTEM: MDAC ID: ITEM:	FRCS 310 CONTROLLER,	REMOTE POWER								
LEAD ANALYST:	D. HARTMAN									
ASSESSMENT:										
CRITICAL FLIGH	ITY RED T	UNDANCY SCREEN	S	CIL ITEM						
HDW/FU	NC A	В	С							
NASA [3 /1R IOA [3 /1R] [P]] [P]	[P] [[P] [P] P]	[]* [].						
COMPARE [/] []	[][]	[]						
RECOMMENDATIONS:	(If diffe	erent from NASA)							
] []	[][][] . (A)	[] DD/DELETE)						
* CIL RETENTION	RATIONALE: (If applicable) I	ADEQUATE NADEQUATE	[]						
REMARKS: NO DIFFERENCES.				· -						

REPORT DATE 2/26/88 C-269

-

_

÷

•

Nana a -----

:-: ----- •

ASSESSME ASSESSME NASA FME	NT NT A #		ATE: D:	1/ FF 05	/29/8 RCS-3 5-6KI	38 31: 7-:	1 217	76A-	-2			NASA DATA: BASELINE [] NEW [X]									
SUBSYSTE MDAC ID: ITEM:	м:			FF 31 CC	RCS 11 ONTRO)L]	LEI	R, F	REM	OJ	E	PO	WER								
LEAD ANA	LYS	ST:	:	D.	HAI	۲T	IAN	1													
ASSESSME	NT:																				
	CRI	ד: דו	ICAL	ГТУ Г	?		RI	EDUN	NDA	NC	CY	SCI	REENS	5					L L L	4	
	H	ID	N/FUI	NC			A				в			С						-	
NASA IOA	[[3 2	/3 /1R]		[[P]]		[[P]	[[P]]]	X]]	*
COMPARE	[N	/N]		[N]		[N]	Γ	N].			[N]	
RECOMMEN	DAI	'IC	ONS:		(If	d:	if	fere	ent	f	rc	om 1	NASA)							
	נ		/]		נ]		[]	[]		(AI] ,00	/DI] ELE	TE)
* CIL RE	FEN	TT:	ION 1	RAI	ION		E:	(If	E aj	PF	oli	.cal	ole) Il	AI IAI	DEQ DEQ	UAT	E	[[]]	
IOA AGRE	ES	W:	ITH I	NAS	SA FN	IE2	Α.									_					

۲

== : .

REPORT DATE 2/26/88 C-270

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-312 05-6KF-21	1/29/88 NASA DATA: FRCS-312 BASELINE 05-6KF-2176 -1									
SUBSYSTEM: MDAC ID: ITEM:	FRCS 312 CONTROLLE	R, REMOTE PO	WER								
LEAD ANALYST:	D. HARTMA	N									
ASSESSMENT:											
CRITICAL FLIGH	ITY R T	EDUNDANCY SC	REENS	CIL ITEM							
HDW/FU	NC A	В	C								
NASA [3 /1R IOA [2 /1R] [P] [P] [P]] [P]	[P] [P]	[] * [X]							
COMPARE [N /	J (] []	[]	[N]							
RECOMMENDATIONS:	(If dif	ferent from	NASA)								
[/] [] []	[] (A	[] ADD/DELETE)							
* CIL RETENTION	RATIONALE:	(If applica	ble) ADEOUATE	r ٦							
REMARKS:	· ·		INADEQUATE	[j							

IOA AGREES WITH NASA FMEA.

.

· =---

•

-

..... . .

REPORT DATE 2/26/88 C-271

ASSESSMEI ASSESSMEI NASA FMEI	NT NT A #		ATE: D:	1/ FF 05	29/8 CS-3 -6KI	V/88NASA DATA-313BASELINESKF-2176 -2NEW								A: E W	[[х]]				
SUBSYSTEN MDAC ID: ITEM:	M:			FF 31 CC	CS .3 NTRO	DL	LEI	R, R	EM	ote	P	OWEF	ર								
LEAD ANA	LYS	T:	:	D.	HAI	HARTMAN															
ASSESSME	NT:																				
(CRI	T] FI	CAL	LTY r			RI	EDUN	DA	NCY	S	CREF	ENS	5				CI TT	L EM		
	H	IDV	V/FUI	NC			A			В	B C										
NASA IOA	[[3 3	/1R /1R]]		[[P P]]		[P [P	,] ,]		[[P P]			[[]]	*
COMPARE	[/]		[]		[]		[]			[]	
RECOMMENI	DAT	'IC	ONS:		(If	d.	if	fere	nt	fr	om	NAS	SA))							
•	[/]		[]		[]		[]	(2	AD	[D/	DE:] LE	TE)
* CIL RET	FEN	(T)	EON 1	RAI	NOI	ΥĽ	E:	(If	aj	ppl	ic	able	e) IN	IA IAI	DEQU DEQU	ATE ATE		[[]	
NETIMINO .																					

جرز

_

NO DIFFERENCES.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-314 05-6KF-2176A-1	NASA DATA BASELINE NEW	: [x]							
SUBSYSTEM: MDAC ID: ITEM:	FRCS 314 CONTROLLER, REM	OTE POWER								
LEAD ANALYST:	D. HARTMAN	HARTMAN								
ASSESSMENT:										
CRITICAL FLIGH	ITY REDUNDA T	NCY SCREEN	IS	CIL ITEM						
HDW/FU	NC A	B	С							
NASA [3 /1R IOA [3 /1R] [P]] [P]	(P] ([P] (P] P]	[]*						
COMPARE [/] []	[] [1	[]						
RECOMMENDATIONS:	(If different	from NASA	A)							
[/] []	[] [] (A	[] DD/DELETE)						
* CIL RETENTION	RATIONALE: (If a)	pplicable) 1	ADEQUATE NADEQUATE	[]						
REMARKS: NO DIFFERENCES.		_								

REPORT DATE 2/26/88 C-273

i i ____

ASSESSME ASSESSME NASA FME	NT DA NT IA A #:	ATE: D:	1/29/8 FRCS-3 05-6KI	[[X]]							
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 315 CONTRO	OLLEF			<u> </u>					
LEAD ANA	LYST	:	D. HAP	RTMAN								
ASSESSME	NT:											
	CRIT	ICALI LIGHT	CTY C	RE	DUNDA	NCY	SCREE	ENS			CIL ITEM	ſ
	HD	W/FUI	IC	A		В		С				
NASA IOA	[3 [3	/3 /3]	[[]	[[]	[[]]		[[] *
COMPARE	ſ	1]	[]	[]	[]		Γ]
RECOMMEN	DATI	ons:	(If	diff	ferent	: fro	om NAS	SA)			-	
	[/]	[]	[.]	C]	(AI	[DD/DE] :LETE)
* CIL RE REMARKS: NO DIFFE	TENT: RENC	ION H Eș.	RATION	ALE:	(If a	appli	icable	e) A INA	DEQUA DEQUA	TE	[[]

-

REPORT DATE 2/26/88

ASSESSMI ASSESSMI NASA FMI	ENT ENT EA	D2 II #:	ATE: D:	1/: FR 05	L/29/88 FRCS-316)5-6KF-2251 -1						NASA DATA: BASELINE [] NEW [X]											
SUBSYSTI MDAC ID: ITEM:	EM: :			FR 31 DI	CS 6 ODE																	
LEAD AND	ALY	ST	:	D.	HAI	S.L.I	MAI	N														
ASSESSMI	ENT	:																				
	CR	IT: Fl	ICAL	ITY F			R	EDU	עמאנ	ANG	CY	S	CREE	EN S	5				C: I'	IL FEI	M	
]	HD	W/FUI	NC			Α				в				С							
NASA IOA	[[3 3	/1R /1R]]		[[P F]		[[NZ P	4]]		[[P F]]			[[X]]	*
COMPARE	[/]		[N]		[N]		[N]			[N]	
RECOMMEN	NDA!	FI (ONS:		(If	đ	if	fei	rent	t :	fro	om	NAS	SA))			12	-		5	
	[/]		[j		[]		[]		(AI] ,00	/DI] ELF	ETE)
* CIL RI	ETE	NT:	ION	RAT	IONZ		E:	(]	[f a	apj	91 i	LCa	able	2) Il	AI VAI	DEÇ DEÇ	UAT QUAT	E	[]]	
LUA AGRI	LES	-₩.	T.LH	NAS	a fi	11	Α.															

REPORT DATE 2/26/88

7

-

ASSESS ASSESS NASA I	SMENI SMENI FMEA	r da r 11 #:	ATE:):	1/2 FRC 05-	29/8 CS-3 -6KF	8 17 -2	25	1 -2					NAS BA	SA DATA SELINE NEW	.: [[]] X]	
SUBSYS MDAC I ITEM:	STEM: ID:	:		FRO 317 DIC	CS 7 DDE												
LEAD A	ANALY	(ST:		D.	HAR	TM	AN										
ASSES	SMENT	C:															
	CI	RITI FI HDV	CALI LIGHT V/FUN	TY C			RE: A	DUNE	AN	сү В	SCRI	EENS	C			l Em	
NAS	SA OA	[3 [3	/3 /1R]]		[[F]	[[P]	[נ] F]		[x]	*
COMPAI	RE	[/N]		[N].	[N]	[N]		[]	и]	
RECOM	MEND	ATIC	ons:		(If	di	ff	eren	it	fro	om N2	ASA)					
		[/]	-	[]	[]	[]	(1] DEL	ETE)
* CIL	RET	ENTI	EON I	RAT	IONA	LE	:	(If	ap	pl:	icabl	le) IN	ADE IADE	EQUATE EQUATE	[[]	
IOA A	GREE	s w:	стн 1	NAS	A FM	EA	L .										

_

_

.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-318 05-6KF-225	: [] [X]									
SUBSYSTEM: MDAC ID: ITEM:	FRCS 318 DIODE	S S S S S S S S S S S S S S S S S S S									
LEAD ANALYST:	D. HARTMAN	HARTMAN									
ASSESSMENT:											
CRITICAL FLIGH	ITY RI T	EDUNDANC	Y SCREEN	IS .	CIL ITEM						
HDW/FU	NC A		B	С							
NASA [3 /1R IOA [3 /1R] [P] [F] [] [NA] [P] [P] F]	[] * [X]						
COMPARE [/) [N] [И] [И	N]	[N]						
RECOMMENDATIONS:	(If dif	ferent f	rom NASA	()							
·] [] [] []	[] DD/DELETE)						
* CIL RETENTION REMARKS:	RATIONALE:	(If app	licable) I	ADEQUATE NADEQUATE	[]						
IOA AGREES WITH	NASA FMEA.										

REPORT DATE 2/26/88

. .

1

C-277

. .

____ -

≡

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-319 05-6KF-2251 ·	(
SUBSYSTEM: MDAC ID: ITEM:	FRCS 319 DIODE		y
LEAD ANALYST:	D. HARTMAN		
ASSESSMENT:			
CRITICAL	ITY REDU	NDANCY SCREENS	CIL
HDW/FU	NC A	ВС	11.CM
NASA [3 /3 IOA [3 /1R] []] [F]	[] [] [P] [F]	[] * [X]
COMPARE [/N] [N]		[N]
RECOMMENDATIONS:	(If differe	ent from NASA)	
. [/] []	[] [] (A)	[] DD/DELETE)
* CIL RETENTION	RATIONALE: (I	f applicable) ADEQUATE INADEQUATE	
REMARKS: IOA AGREES WITH	NASA FMEA.		

.

•	ASSESSMI ASSESSMI NASA FMI	ENT ENT EA	D/ I) #:	ATE: D:	1/29 FRCS 05-6	1/29/88 NASA DAT FRCS-320 BASELIN 05-6KF-2252 -1										: []	x]]	
]	SUBSYSTI MDAC ID: ITEM:	EM: :			FRCS 320 DIOD	E													
	LEAD ANA	ALY	ST	:	D. H	ART	MA	N											
	ASSESSMI	ENT	:																
		CR	IT F HD	ICALI LIGHI W/FUI	LTY F NC		RI A	EDUI	NDA	NCY E	sc: S	REENS	3 Č			CI I	IL FEI	1	
	NASA IOA	[[3 2	/1R /1R]]	[[P P]		[F [F))	[[P P]]		[[x]]	*
I	COMPARE	נ	N	/]	[]		[]	[]		[N]	
•	RECOMMEN	NDA'	ri(ons:	(I	fd	if	fere	ent	fr	om 1	NASA)						
	•••••	[/]	[]		[]	[]	(A] DD,	/DI] ELF	ETE)
•	* CIL RI REMARKS: IOA AGRI	ete: Ees	NT:	ION I ITH I	RATIO	NAL FME	E: A.	(I:	fa	ppl	ica)	ble) Il	AI NAI	DEQI	JATE JATE	[]	

•

REPORT DATE 2/26/88 C-279

.

NASA DATA: ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-321 BASELINE [] NEW [X] 05-6KF-2252 -2 NASA FMEA #: SUBSYSTEM: FRCS MDAC ID: 321 DIODE ITEM: LEAD ANALYST: D. HARTMAN ASSESSMENT: REDUNDANCY SCREENS CIL CRITICALITY FLIGHT ITEM ВС HDW/FUNC Α [P] [F] [P] [F] [P] [P] [X]* NASA [3 /1R] IOA $\begin{bmatrix} 2 \\ 1R \end{bmatrix}$ [X] COMPARE [N /] [N] [N] [] r 1 RECOMMENDATIONS: (If different from NASA) [,] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE Γ INADEQUATE [1 **REMARKS:**

NASA FMEA CONTAINS MULTIPLE FAILURES. DIODE FAILING SHORT ALONE HAS NO EFFECT.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-322 05-6KF-2252 -1	SA DATA: ASELINE [] NEW [X]							
SUBSYSTEM: MDAC ID: ITEM:	FRCS 322 DIODE								
LEAD ANALYST: D. HARTMAN									
ASSESSMENT:									
CRITICAL FLIGH HDW/FU	ITY REDUNDAN T NC A	ICY SCREENS B C	CIL ITEM						
NASA [3 /1R IOA [2 /1R] [P] [] [P] [P] [P P] [P] []*] [X]						
COMPARE [N /] [] [] [[и]						
RECOMMENDATIONS:	(If different	from NASA)							
, so a seconda de la second Seconda de la seconda de la Seconda de la seconda de la] [] [ן ז <u>ר</u>] [] (ADD/DELETE)						
* CIL RETENTION	RATIONALE: (If ap	plicable) AD INAD	EQUATE [] EQUATE []						
IOA AGREES WITH	NASA FMEA.								

REPORT DATE 2/26/88 C-281

 \square

- -

.....

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-323 NASA DATA: BASELINE [] NEW [X] 05-6KF-2252 -2 NASA FMEA #: SUBSYSTEM: FRCS MDAC ID: 323 DIODE ITEM: LEAD ANALYST: D. HARTMAN ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL ITEM FLIGHT С B Α__ HDW/FUNC [F] [P] [P] [P] [P] [X] * NASA [3 /1R] ŢŢ [X] IOA [2 /1R] COMPARE [N /] [N] [N] []]RECOMMENDATIONS: (If different from NASA) [3/3] [] [] [] [D] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [INADEQUATE [] REMARKS: NASA FMEA CONTAINS MULTIPLE FAILURES. DIODE FAILING SHORT ALONE HAS NO EFFECT.

==

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

C-282

a state a second
ASSESSMENT DATE: 1/29/88 NASA DATA: BASELINE [ASSESSMENT ID: FRCS-324 NASA FMEA #: NEW [X] 05-6KF-2267 -1 SUBSYSTEM: FRCS MDAC ID: 324 ITEM: DIODE LEAD ANALYST: D. HARTMAN ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM HDW/FUNC Α B С NASA [3 /3]]] [[[[] IOA [3/3] 1 COMPARE [/] [1 Γ 1 **RECOMMENDATIONS:** (If different from NASA) [3/2R] [P] [P] [P] [(ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [INADEQUATE [1 **REMARKS:** THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE

THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

2-2

11

ASSESSMI ASSESSMI NASA FMI	ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-325 NASA FMEA #: 05-6KF-2267 -2									NASA DATA: BASELINE [] NEW [X]						
SUBSYST MDAC ID ITEM:	EM: :		FRCS 325 DIODE	2												
LEAD AND	ALYSI	!:	D. HA	RTM	N											
ASSESSM	ENT:															
	CRIT	ICAL	ITY	F	REDUN	DANCY	SCR	EENS			CIL	м				
	HC	W/FU	NC	7	ł	В		c	2		110					
NASA IOA	[3 [3	/3]]	[[]]	[[]]	[[]]		[[] *]				
COMPARE	[/]	[]	[]	נ]		[]				
RECOMME	NDATI	ons:	(I1	e din	ffere	nt fr	om N	ASA)								
	ſ	/].	[]	ſ]	[]	(AI	[DD/D] ELETE)				
* CIL R	eteni	NOI	RATION	VALE :	: (If	appl	icab	ole) A INA	ADEQUA ADEQUA	TE TE	[]]				
REMARKS NO DIFF	: ERENC	CES.														

C-284

÷

5

ASSESSME ASSESSME NASA FME	ENT I ENT I EA #:	DATE: [D: ;	NASA DATA: BASELINE [] NEW [X]										
SUBSYSTE MDAC ID: ITEM:	EM :		FRCS 326 DIOD	E									
LEAD ANA	LYSI	C:	D. H	ARTMA	N								
ASSESSME	ENT:												
	CRIT	TICAL	ITY	F	REDUN	DANCY	SCI	REENS			CII TTF	L M	
	н	W/FU	NC	A	L	В		С			* * *]	
NASA IOA	[3	3 /3 3 /3]]	[[]]	[[]]	[[]]		[[]]	*
COMPARE	[1]	[]	[]	[]		[]	
RECOMMEN	IDATI	IONS:	(1	f dif	fere	nt fr	om 1	IASA)					
	[3	3 /2R]	[])	[P]	[P]	(A)	[DD/I] DELI	STE)
* CIL RE	TENI	LION	RATIO	NALE:	(If	appl	ical	ole) A	DEQU	ATE	[j	•
REMARKS: THIS FAI POSITION TO FALSE	LURH I. H ELY H	E MAY REDUN FAILI	CAUS DANCY NG TH	E LOS PROV E VAI	S OF IDED VE C	ACCU	RATI SS (INA E INDI DF ALL DSSIBL	DEQUA CATIO REDU Y EFI	ATE ON OI UNDAI FECTI	[F TH NCY ING] IE V MAY MIS	VALVE (LEAD SSION

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

. -

•

REPORT DATE 2/26/88

OPERATIONS.

ε.

. بيا

ASSESSME ASSESSME NASA FME	NT D NT I A #:	ATE: D:	1/29/3 FRCS-3 05-6K	88 327 F-22	67 -2	2			NASA DATA BASELINI NEV	A: E [W [X]
SUBSYSTE MDAC ID: ITEM:	М:		FRCS 327 DIODE								
LEAD ANA	lyst	:	D. HAI	RTMA	N						
ASSESSME	NT:										
	CRIT	ICAL	ITY	R	EDUNI	DANCY	SCR	EENS		CII	J
	HD	W/FU	NC	A		В			с	T 11	214
NASA IOA	[3 [3	/3 /3]	[[]]	[[]]	[[]]	[[] *]
COMPARE	[/]	[]	[]	[]	Γ]
RECOMMEN	DATI	ONS:	(If	dif	ferer	nt fr	om N.	ASA)			
	[/	1	[]	[.]	[]	[ADD/D] DELETE)
* CIL RE	TENT	ION	RATION	ALE:	(If	appl	icab	le) TN	ADEQUATE	[r]
REMARKS: NO DIFFE	RENC	ES.						τN	UDEQUALE	L	

REPORT DATE 2/26/88

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-328 NASA FMEA #: 05-6KF-2202A-1										NASA BASI	DATA ELINE NEW	: [[X]
SUBSYSTE MDAC ID: ITEM:	:M:		FRCS 328 DRIVI	ER,	HY	BRID				-			.
LEAD ANA	LYST	:	D. H	ARTM	AN	T							
ASSESSME	NT:												
	CRIT F	ICAL	ITY F		RE	DUND	ANCY	SCR	EENS			CII ITE	M
	HD	W/FU	NC		A		E	•	•	С			
NASA IOÀ	[3 [3	/1R /1R]]	[[P P]]	1] []]	[P] P]		[[] *]
COMPARE	[/]	[]	[]	. []		[]
RECOMMEN	DATI	ons:	(11	f di	ff	eren	t fr	om N	ASA)				
	נ	1]	[]	[]	. []	(A	[DD/D] DELETE)
* CIL RE	TENT	ION	RATION	JALE	:	(If	appl	icab	le) INZ	ADEQU ADEQU	JATE JATE	[[]]
NO DIFFE	RENC	ES.											

-

Ę

= :

-

.

ASSESSMEL	TI	DÆ	ATE:	1/	29/8	8									NZ	SA	DA	TA :				
ASSESSME	TN	II):	FR	CS-3	29	•								F	BAS	ELI	NE	[]	
NASA FME	A #	:	•	05	-6KF	-2	220)2A	-2								N	IEW	Ĺ	X	3	
CUBCVCTF	vr -			ਸਤ	CS										. 1							
MDAC TD.				32	9																	
ITEM:				DR	IVER	,	HY	BR	ID													
LEAD ANA	LYS	ST :	:	D.	HAR	Tł	1AN	1														
ASSESSME	NT :	:																	•			
	CRJ	(T)	CAL	ITY			RĒ	EDU	NDA	NN(CY	sc	REE	NS	5				CJ	L		
	·	FI	LIGH	T															IJ	EN	I	
	F	IDV	V/FU	NC			Α				В				С							
NASA	г	3	13	1		г		۱		٢		1		٢		1			ſ		٦	*
IOA	Ē	2	/1R	j		ĭ	Ρ	ว์		Č	P	j		້	Ρ	j			Č	Х	j	
COMPAPE	г	N	/N	٦		г	N	٦		г	N	٦		٢	N	1			ſ	N	٦	
CONTAIL	L		/	J		L		-		•		-		Ľ		•						
RECOMMEN	DAJ	CI C	ons:		(If	d:	if1	fer	ent		fro	om	NAS	A)								
	Г		,	٦		٢		٦		Г		1		٢		1			٢		1	
	L		/	1		L		1						•				(Al	ĎĎ/	′DI	ELE	ETE)
* CTL RE	ותית	יידינ	TON	RAT	אסדי	L	E:	(1	fa	ומו	oli	ica	ble)								
	* ***							`-		1				f .	AI	DEQ	UAJ	ΓE	Г		1	
														IN	IAI	DEQ	UAJ	ΓE	Ī		Ĵ	
REMARKS:																			-		-	
IOA AGRE	ES	W.	ITH	NAS	SA FM	ΈŻ	Α.															

-

)

REPORT DATE 2/26/88 C-289

. -

-

-

-

ASSESSMENT DAT ASSESSMENT ID NASA FMEA #:	TE: 1/29/ : FRCS- 05-6K	DATA: LINE [] NEW [X]			
SUBSYSTEM: MDAC ID: ITEM:	FRCS 331 DRIVE	R, HYBRI	D		
LEAD ANALYST:	D. HA	RTMAN			
ASSESSMENT:					· · · <u>-</u> · · ·
CRITIC	CALITY IGHT	REDUN	DANCY SC	REENS	CIL ITEM
HDW	/FUNC	A	В	С	
NASA [3, IOA [3,	/1R] /1R]	[P] [P]	[P] [P]	[P] [P]	· [] * []
COMPARE [,	/]	[]	[]	[]	[]
RECOMMENDATION	NS: (If	differe	nt from	NASA)	
. [/	/]	[]	[]	[]	[] (ADD/DELETE)
* CIL RETENTIO	ON RATION	ALE: (If	applica	Nble) ADEQU INADEQU	ATE [] ATE []
NO DIFFERENCES	5.				

=

REPORT DATE 2/26/88

. ~

ASSESSMENT DATE: 1/29/88 NASA DATA: ASSESSMENT ID: FRCS-332 BASELINE [] NEW [X] NASA FMEA #: 05-6KF-2202 -1 SUBSYSTEM: FRCS MDAC ID: 332 ITEM: DRIVER, HYBRID LEAD ANALYST: D. HARTMAN ASSESSMENT: REDUNDANCY SCREENS CRITICALITY CIL FLIGHT ITEM HDW/FUNC Α ВС NASA [3/1R] [P] [P] [P] IOA [2/1R] [P] [P] [P] [[X] COMPARE [N /] [] [] [N] **RECOMMENDATIONS:** (If different from NASA) 1 (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [INADEQUATE [] 1 **REMARKS:**

IOA AGREES WITH NASA FMEA.

•___

1.1

ASSESSMENT DAT ASSESSMENT ID: NASA FMEA #:	E: 1/29/8 FRCS-3 05-6KF	8 33 '-2202 -2		NASA DATA BASELINI NEV	A: 5 [] 7 [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 333 DRIVEF	R, HYBRID)		
LEAD ANALYST:	D. HAF	TMAN			-
ASSESSMENT:	•				
CRITIC FLI	ALITY GHT	REDUNI	ANCY SCRE	CENS	CIL ITEM
HDW/	FUNC	A	в		
NASA [3 / IOA [3 /	1R] 1R]	[P] [P]	[₱] [₱]	[P] [P]	[] * []
COMPARE [/]	[]	[]	[]	[]
RECOMMENDATION	S: (If	differer	nt from NA	ASA)	
[/]	[]]	[]	[]	[] ADD/DELETE)
* CIL RETENTIO	N RATIONA	ALE: (If	applicabl	.e) ADEQUATE INADEQUATE	[]

=

Ī

=

NO DIFFERENCES.

,

ASSESSMENT DATE: 1/29/88 NASA DATA: BASELINE [] NEW [X] ASSESSMENT ID: FRCS-334 NASA FMEA #: 05-6KF-2201A-1 SUBSYSTEM: FRCS MDAC ID: 334 ITEM: DRIVER, HYBRID LEAD ANALYST: D. HARTMAN ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM HDW/FUNC Α В С NASA [3 /3 [] [] [[1 [] I] IOA [3/3] 1 1 COMPARE [/] [] [] [] ſ 1 **RECOMMENDATIONS:** (If different from NASA) [3/2R] [P] [P] [P] Γ ٦ (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE Γ INADEQUATE [1 REMARKS:

THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

		t ÷		05	-6KI	F-:	220	D1A-	NASA DAT BASELIN A-2 NE						NE [] EW [X]					
SUBSYSTE MDAC ID: ITEM:	:M:			FR 33 DR	CS 5 IVEI	R,	H	YBRI	D											
LEAD ANA	LYS	ST:		D.	HAI	RTI	MAI	N												
ASSESSME	NT :	:																		
	CRI	TI FL	CAL	ITY T			R	EDUN	DAN	ICY	S	CREE	NS	5				C] I'	IL FEI	M
	F	IDW	I/FUI	NC			A			B				С						
NASA IOA	[[3 3	/1R /1R]]		[[P P]]	[P F]		[[P P]]			[[x]
COMPARE	[/]		[]	[N]		[]			[N]
RECOMMEN	IDAJ	rio	NS:		(If	đ	if	fere	nt	fr	om	NAS	A))						
	[/]	•	[]	l]		[]		(AI] ,00	/ D:] EL
* CIL RE	TEN	1TI	ON 1	RAT	ION	ALI	E:	(If	aŗ	ppl	ica	able	:)	7.1	זספר	יידי איזי	T	r		٦
REMARKS :													11	NAI	DEQU	JAT:	E	[]
IOA AGRE	ES	WI	TH	NAS	A FI	ME	Α.			•.										

.....

=

REPORT DATE 2/26/88 C-294

-

•

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-336 05-6KF-22	NASA DATA: BASELINE [] NEW [X]									
SUBSYSTEM: MDAC ID: ITEM:	FRCS 336 DRIVER, H	YBRID									
LEAD ANALYST:	D. HARTMA	N			···· 						
ASSESSMENT:											
CRITICALITY REDUNDANCY SCREENS CIL FLIGHT TTEM											
HDW/FUI	NC A	:	В	С	1154						
NASA [3 /3 IOA [3 /3] [] [] [] []	[] []	[] * []						
COMPARE [/] [] []	[]	[]						
RECOMMENDATIONS:	(If dif	ferent f	rom NAS	SÁ)							
[3 /2R] [P] [₽]	[P] (A	[] ADD/DELETE)						
* CIL RETENTION H	RATIONALE:	(If app	licable	adequate Inadequate	[]						
EMARKS: HIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE OSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD O FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION											

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

,

OPERATIONS.

1

6 3

÷ : .

- -

C-295

τ.

S. . .:

_

_

_

5

-

-

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-337 05-6KF-2	7 2201 -2		NASA DATA BASELINE NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 337 DRIVER,	HYBRID			an 1997 - 1 997 -
LEAD ANALYST:	D. HARTI	IAN			
ASSESSMENT:					
CRITICAL FLIGH	ITY F	REDUNDA	NCY SCRI	CENS	CIL ITEM
HDW/FUI	NC	A	В	C	
NASA [3 /1R IOA [3 /1R] [] [P] F]	[P] [F]	[P] [P]	[] * [X]
COMPARE [/] [М]	[N]	[]	[N]
RECOMMENDATIONS:	(If d	ifferent	from NA	ASA)	
[/] []	[]	[] (A	[] .DD/DELETE)
* CIL RETENTION 1	RATIONALI	E: (If a	pplicab	Le) ADEQUATE INADEQUATE	
REMARKS: IOA AGREES WITH	NASA FME	Α.			

.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-338 05-6KF-2202A-1		NASA DATA BASELINE NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 338 DRIVER, HYBRID			
LEAD ANALYST:	D. HARTMAN			
ASSESSMENT:				
CRITICAL FLIGH	ITY REDUND	ANCY SCREED	NS	CIL ITEM
HDW/FU	NC A	В	С	
NASA [3 /1R IOA [3 /1R] [P]] [P]	[P] [P]	[P] [P]	[] * []
COMPARE [/] []	[]	[]	[]
RECOMMENDATIONS:	(If differen	t from NAS	A)	
[/] [··]]	[]]	[] (A	[] DD/DELETE)
* CIL RETENTION	RATIONALE: (If a	applicable) ADEQUATE INADEQUATE	() []
NO DIFFERENCES.			• •	

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME SUBSYSTE MDAC ID: ITEM: LEAD ANA	NT A # M: LYS	DATE: ID: : T:	1/2 FRC 05- FRC 339 DRI D.	9/88 S-339 6KF-22 S VER, H HARTMA	02A- YBRI N	-2 ID		1	IASA BASE	DATA LINE NEW	:_` []] []	
ASSESSME	N.L.:												
	CRI	TICAI FLIGH	LITY IT	R	EDUN	IDANCY	SCR	EENS			CII ITE	SM .	
	H	DW/FU	INC	Α		E	5	C	2				
NASA IOA	[[3 /3 3 /3]	[[]]	[[]	[]]		[[]]	*
COMPARE	[1]	[]	[]	[]		נ]	
RECOMMEN	DAT	IONS:	(If dif	fere	ent fr	om N	ASA)					
	Γ	/	·]	[]	[]	[]	(A)	[DD/I] >ELE	TE)
* CIL RE REMARKS: NO DIFFE	TEN	TION CES.		ONALE:	(11	f appl	icab.	le) / IN/	() ADEQU ADEQU	ATE ATE	[[]]	

REPORT DATE 2/26/88

.

.

Second Contraction

_

i i

NASA DATA: ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-340 BASELINE [1 NEW [X] NASA FMEA #: 05-6KF-2001 -1 SUBSYSTEM: FRCS 340 MDAC ID: ITEM: FUSE, 1A LEAD ANALYST: D. HARTMAN ASSESSMENT: REDUNDANCY SCREENS CIL CRITICALITY FLIGHT ITEM HDW/FUNC ВС А NASA [3/1R] [P] [P] [P] IOA [3/1R] [F] [P] [F] î x i COMPARE [/] [N] [] [N] [N] RECOMMENDATIONS: (If different from NASA) Γ (ADD/DELETE) . * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [ADEQUATE [] INADEQUATE [] **REMARKS:** IOA AGREES WITH NASA FMEA.

REPORT DATE 2/26/88

ASSESSMEN ASSESSMEN NASA FMEZ	NT DA NT IA A #:	00	01 -1					N7 I	ASA BASE	DATA: LINE NEW	[[x]]					
SUBSYSTEM MDAC ID: ITEM:	4:		FR 34 FU	CS 1 SE,	1A	L											
LEAD ANAI	LYST	:	D.	HAR	TM	IAN	ſ										
ASSESSMEN	NT:																
C			RE	DUND	ANC	CY B	SCRE	ENS	S C			CIL ITE	м				
	пр	W/ F UI				Л			J			C					
NASA IOA	[3 [3	/1R /1R]]		[[P P]	[[P P]] [P P]		[[]]	*
COMPARE	[/]		[]	[]	[]		[]	
RECOMMENI	DATI	ons:		(If	di	ff	eren	t i	fro	om NA	SA))					
	[/]		[]	[]	[]	(AI	[)D7D] ELI	ETE)
* CIL RE	FENT	ION I	RAT	IONA	LE	2:	(If	apı	91	lcabl	e) Il	ia Iaf	DEQU. DEQU.	ATE ATE	[[]]	
REMARKS: NO DIFFE	RENC	ES.						•									

......

_

:

REPORT DATE 2/26/88 C-300

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-342 05-6KF-2076 -	-1	NASA DAT. BASELIN NE	A: E [] W [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 342 RESISTOR, 5.1	.K 1/4W		
LEAD ANALYST:	D. HARTMAN			
ASSESSMENT:				
CRITICAL	ITY REDUN	IDANCY SCR	EENS	CIL
HDW/FU	INC A	B .	с	TIEM
NASA [3 /3 IOA [3 /3] []] []	[] []	[] .	[] * []
COMPARE [/] []	[]	[]	[]
RECOMMENDATIONS:	(If differe	ent from N	ASA)	
[/] []	[]	[].	[] ADD/DELETE)
* CIL RETENTION	RATONALE: (11	f applicab	le) ADEQUATE INADEQUATE	[] []
REMARKS: NO DIFFERENCES.				

REPORT DATE 2/26/88

Ξ

- -

ASSESSME ASSESSME NASA FME	NT D NT I A #:	DATE:	1/29 FRCS 05-6	/88 -343 KF-20	076 -	1		1	NASA BASE	DATA LINE NEW	: []] (]	
SUBSYSTE MDAC ID: ITEM:	:M:		FRCS 343 RESI	STOR,	, 5.1	K 1/4	W					,	
LEAD ANA	LYSI	:	D. H	ARTM	AN								
ASSESSME	NT:												
	CRIT	ICAI	LITY IT	I	REDUN	DANCY	SCR	EENS			CII ITI	_ E M	
	HE	W/FU	INC	1	X .	F	3	(2				
NASA IOA	[3 [3	/3]]	[[]]	[[]]	[]]]		[[] *]	,
COMPARE	[1]	C]	[]	[J		[]	
RECOMMEN	IDATI	ONS:	(1	f dif	ffere	nt fi	com N	ASA)					
	[1]	נ]	C]	, []	(A)] DD/I] DELET	'E)
* CIL RE	те́і	NOI	RATIO	NALE	; (If	app]	licab	le)	ADEQU	ATE	[]	
REMARKS: A SHORT IOA RECO	ACRO	oss A Ids F	RLR REMOVA	TYPE L OF	RESI THE	STOR "SHOP	IS N RT" F	OT A AILUI	CRED RE MO	IBLE DE FI	L FAJ ROM	」 (LURE THIS	¦ -

÷

ISSUE RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88 (SHORT FAILURE MODE TO BE REMOVED).

FMEA.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-344 05-6KF-20	76 -1		NASA DATA BASELINI NEW	A: E [W [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 344 RESISTOR,	5.1K 1/4	ส			
LEAD ANALYST:	D. HARTMAI	N				
ASSESSMENT:						
CRITICAL	ITY RI	EDUNDANCY	SCREEN	S	CIL	
HDW/FU	NC A	В		с	T T D14	
NASA [3 /3 IOA [3 /3] [] [] [] [] []]	[] *]
COMPARE [/] [] [J [3	[]
RECOMMENDATIONS:	(If dif	ferent fro	om NASA)		
] [] [] [] (2	[ADD/DEI] LETE)
* CIL RETENTION REMARKS: NO DIFFERENCES.	RATIONALE:	(If appl:	icable) Il	ADEQUATE NADEQUATE	[]]

REPORT DATE 2/26/88 C-303

= ...

11

-

-

۰.

_

ASSESSMENT DATE:	1/29/88			NASA DATA	:										
ASSESSMENT ID: NASA FMEA #:	FRCS-345 05-6KF-207	76 -1		BASELINE	[] [X]										
SUBSYSTEM: MDAC ID: ITEM:	FRCS 345 RESISTOR,	5.1K 1,	/4W												
LEAD ANALYST:	D. HARTMAN	1													
ASSESSMENT:	ASSESSMENT:														
CRITICAL	ITY RE	EDUNDAN	CY SCREI	ENS	CIL										
HDW/FU	NC A		В	С											
NASA [3 /3 IOA [3 /3] [] [] [] []	[] []	[] * []										
COMPARE [/] [] [3	[]	[]										
RECOMMENDATIONS:	(If diff	ferent :	from NAS	SA)											
[/] [] []	[] (A	[] .DD/DELETE)										
* CIL RETENTION	RATIONALE:	(If ap	plicable	≥) ADEQUATE INADEQUATE	[]										
REMARKS: A SHORT ACROSS A IOA RECOMMENDS R FMEA.	RLR TYPE H EMOVAL OF J	RESISTO THE "SHO	R IS NO? ORT" FA:	F A CREDIBLE LLURE MODE F	FAILURE. ROM THIS										
ISSUE RESOLVED A (SHORT FAILURE M	T MEETING V ODE TO BE P	WITH SU	BSYSTEM).	MANAGER ON	1/20/88										

REPORT DATE 2/26/88 C-304

ASSESSMENT ASSESSMENT NASA FMEA	DATE: DATE: #:	1/29/8 FRCS-3 05-6KI	38 346 7-20	76 -1			N	IÁŠA I Basei	DATA: LINE NEW	: [[X]
SUBSYSTEM: MDAC ID: ITEM:		FRCS 346 RESIST	ror,	5.18	(1/4	W					
LEAD ANALY	ST:	D. HAI	RTMA	N							
ASSESSMENT	:										
CR	ITICAL	ITY	R	EDUNE	DANCY	SCRE	ENS			CIL	
	FLIGH HDW/FU	T NC	A		В		c	3		TTE.	M
NASA [IOA [3 /3 3 /3	/FUNC /3][/3][]]	[[]]	[[]]		[[] *]
COMPARE [/]	[]	٢]	[]		[]
RECOMMENDA	TIONS:	(If	dif	feren	nt fr	om NA	SA)				
ſ	1]	נ]	[]	[]	(Al	[DD/D] ELETE)
* CIL RETE REMARKS:	INTION	RATION	ALE:	(If	appl	icabl	.e) / IN/	ADEQUI ADEQUI	ATE ATE	[]]

Ξ.

÷-...

=.::

REPORT DATE 2/26/88 C-305 C- 6

_

ASSESSM ASSESSM NASA FM	ENT ENT EA	D2 I) #:	ATI D:	E:	1/29, FRCS- 05-61	/88 -347 KF-2(076 -	-1		1	NASA BASE	DATA LINE NEW	: [[}] (]	
SUBSYST MDAC ID ITEM:	EM: :				FRCS 347 RESI:	STOR	, 5.1	LK 1/4	w						
LEAD AN	ALY	ST	:		D.H	ARTM/	AN								
ASSESSM	ENT	:													
	CR	IT: F		ALI GHT	TY	I	REDUN	IDANCY B	SCR	EENS	-		CII ITH	S M	
	1	שח	m/1	FUN	C		1	D		,	-				
NASA IOA	[[3 3]:]:	3 3]	[[]	[[]]	[[]		[[]	*
COMPARE	נ		/]	[]	[]	[]		[]	
RECOMME	NDA	FI (ON:	5:	(I:	f dif	ffere	ent fr	om N	ASA)					
	נ		/]	[]	[]	[J	(A)] DD/I] DELF	ETE)
* CIL R	ete:	NT	IOI	NR	ATIO	NALE	: (I1	f appl	icab	le) I	ADEQU	ATE ATE	[]	
REMARKS A SHORT IOA REC FMEA.	: ACI	RO: EN	SS DS	A RE	RLR (MOVA)	IYPE L OF	RESI THE	ISTOR "SHOR	IS N T" F	OT A AILUI	CRED RE MO	IBLE DE FI	FAJ ROM	LUF THI	E. S
ISSUE R	ESO	LV	ED	AT	MEE	FING	WITH	I SUBS	YSTE	M MAI	NAGER	ON	1/20)/88	3

(SHORT FAILURE MODE TO BE REMOVED).

REPORT DATE 2/26/88

ASSESSMENT DATE: 1/29/88 NASA DATA: BASELINE [] NEW [X] ASSESSMENT ID: FRCS-348 NASA FMEA #: 05-6KF-2077 -1 SUBSYSTEM: FRCS MDAC ID: 348 ITEM: RESISTOR, 5.1K 1/4W LEAD ANALYST: D. HARTMAN ASSESSMENT: REDUNDANCY SCREENS CIL CRITICALITY ITEM FLIGHT В С HDW/FUNC Α NASA [3 /3]] []] * [I] [3 /3 IOA 1 ſ] [ſ COMPARE ſ ſ 1 1] 1 **RECOMMENDATIONS:** (If different from NASA)] [3/2R] [P] [P] [P] [(ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE Ε INADEQUATE Γ ٦

REMARKS:

THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT THE MEETING WITH THE SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	NT D NT I A #:	ATE: D:	1/29/ FRCS- 05-6F	′88 •349 (F-2()77 -	1		И	IASA BASE	DATA LINE NEW	: [[X] []	
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 349 RESIS	TOR,	5.1	.K 1/4	W						
LEAD ANA	LYST	:	D. HA	RTM	AN								
ASSESSME	NT:												
	CRIT	ICAL	ITY T	I	REDUN	DANCY	SCR	REENS			CII	M	
	HD	W/FU	NC	1	7	В	6	C	2				
NASA IOA	[3 [3	/3 /3]]	[[]]	[[]]	[[]]		[[]	*
COMPARE	Γ	/	1	ľ]	[]	[]		[]	
RECOMMEN	DATI	ONS:	(If	dif	fere	nt fr	om N	IASA)					
	[/]	[]	C]	C]	(AI] >ELE'	TE)
* CIL RE	TENT	ION	RATION	ALE :	(If	appl	icab	ole) A INA	DEQU	ATE ATE	[[]]	
A SHORT	ACRO	SS A	RLR I	YPE	RESI	STOR	IS N	IOT A	CRED	IBLE	FAI	LUR	E.

-

-

=

_

....

· • •

A SHORT ACROSS A RLR TYPE RESISTOR IS NOT A CREDIBLE FAILURE. IOA RECOMMENDS REMOVAL OF THE "SHORT" FAILURE MODE FROM THIS FMEA.

ISSUE RESOLVED AT THE MEETING WITH THE SUBSYSTEM MANAGER ON 1/20/88 (SHORT FAILURE MODE TO BE REMOVED).

REPORT DATE 2/26/88

NASA DATA: ASSESSMENT DATE: 1/29/88 BASELINE [ASSESSMENT ID: FRCS-350 NEW [X] 05-6KF-2077 -1 NASA FMEA #: SUBSYSTEM: FRCS MDAC ID: 350 ITEM: RESISTOR, 5.1K 1/4W LEAD ANALYST: D. HARTMAN ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM В С HDW/FUNC A] NASA [3 /3] [[j] [[J Ł IOA $\begin{bmatrix} 3 / 3 \end{bmatrix}$ 1 1 COMPARE [/] 1 [] **RECOMMENDATIONS:** (If different from NASA) [3/2R] [P] [P] [P] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEOUATE Γ 1 INADEQUATE [1 **REMARKS:** THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE

THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT THE MEETING WITH THE SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	ent Ent Ea	「 D. 「 I: #:	ATE: D:	1/2 FRC 05-	9/88 S-351 6KF-2()77 -	·1		1	NASA DAY BASELII NI	ra: Ne [Ew [x]	
SUBSYSTE MDAC ID: ITEM:	CM :	:		FRC 351 RES	S ISTOR,	, 5.1	.K 1/4	IW					
LEAD ANA	LY	ST	:	D .]	HARTM2	AN							
ASSESSME	ENT	::											
	CF	TIS ت		LITY	I	REDUN	IDANCY	C SCR	EENS		CI	L	
		HD	W/FU	JNC	1	A	F	3	(3.		1314	
NASA IOA	[3	/3 /3]	[[]]	[[]]	[[].	[[]	*
COMPARE	(•	/]	ſ]	[]	Γ]	[]	
RECOMMEN	ID A	TI	ONS :	: (C	If dia	ffere	ent fi	om N	iasa)				
	(•	/]	ſ]	[]	[]] (ADD/] DEL	ETE)
* CIL RE	ETI	ENT	ION	RATI	ONALE	: (If	app]	licab	ole) Z	ADEQUATI	E []	
REMARKS: A SHORT IOA RECO FMEA.	AC DMIN	CRO IEN	SS 2 DS 1	REMOV	TYPE AL OF	RESI THE	STOR "SHOP	IS N RT" F	INT A IOT A	CREDIBI RE MODE	LE FA FROM	ILUI TH:	RE. Is

ه

-

•

i i

.

ISSUE RESOLVED AT THE MEETING WITH THE SUBSYSTEM MANAGER ON 1/20/88 (SHORT FAILURE MODE TO BE REMOVED).

REPORT DATE 2/26/88

C-310

Charles and the main state

ASSESSMENT DATE: 1/29/88 NASA DATA: BASELINE [ASSESSMENT ID: FRCS-352 NEW [X] NASA FMEA #: 05-6KF-2077 -1 SUBSYSTEM: FRCS MDAC ID: 352 ITEM: RESISTOR, 5.1K 1/4W LEAD ANALYST: D. HARTMAN ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM HDW/FUNC B С A [3 /3 [3 /3] NASA 1 [[]]]] * [[[r E IOA 1 ſ 1 COMPARE [[[]]] ſ 1 **RECOMMENDATIONS:** (If different from NASA) [3/2R] [P] [P] [P] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE INADEQUATE Γ 1 **REMARKS:** THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD

ISSUE NOT RESOLVED AT THE MEETING WITH THE SUBSYSTEM MANAGER ON 1/20/88.

TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION

REPORT DATE 2/26/88

OPERATIONS.

111

T

Ī

ӛ

_

 \equiv _

_

ASSESSMI ASSESSMI NASA FMI	ent Ent Ea	D2 II #:	ATE: D:	1/29/8 FRCS-3 05-6KI	38 353 5-207			N2]	ASA DATA BASELINE NEW	[[X] · + · · · · · · · · · · · · · · · · ·	
SUBSYSTI MDAC ID: ITEM:	EM : :			FRCS 353 RESIS	for,	5.1K	1/41	ł		 .		
LEAD AND	ALY	ST	:	D. HAI	RTMAI	N						
ASSESSMENT:												
	CR	IT:	ICAL	ITY	R	EDUNDA	ANCY	SCR	EENS		CIL TTEM	٢
		HD	W/FU	NC	A		В		С			•
NASA IOA	[[3 3	/3 /3]	[[]	[[]]	ן נ]]	[[] *]
COMPARE	[/]	[]	נ]	[]	[]
RECOMME	NDA	TI	ONS:	(If	dif	feren	t fro	om N	ASA)			
	[/]	נ]	נ]	[] (A	[DD/DI] Clete)
* CIL R	ETE	NT	ION	RATION	ALE:	(If a	appl:	icab	le) Al INA	DEQUATE DEQUATE	[[]]
REMARKS A SHORT IOA REC FMEA.	: AC OMM	CRO: IEN	SS A DS R	RLR T EMOVAL	VPE I OF I	RESIS' THE "	TOR SHOR	IS N F" F	OT A AILUR	CREDIBLE E MODE F	FAII ROM 7	LURE. THIS

ISSUE RESOLVED AT THE MEETING WITH THE SUBSYSTEM MANAGER ON 1/20/88 (SHORT FAILURE MODE TO BE REMOVED).

REPORT DATE 2/26/88 C-312

ASSESSMENT DATE: 1/29/88 NASA DATA: FRCS-354 BASELINE [ASSESSMENT ID: 1 NEW [X] NASA FMEA #: 05-6KF-2077 -1 SUBSYSTEM: FRCS MDAC ID: 354 ITEM: RESISTOR, 5.1K 1/4W LEAD ANALYST: D. HARTMAN ASSESSMENT: REDUNDANCY SCREENS CRITICALITY CIL ITEM FLIGHT В C HDW/FUNC A NASA [3 /3] [[] [[1 L 1 IOA [3 /3] Ĩ 1 COMPARE [/] Ī] RECOMMENDATIONS: (If different from NASA) [3/2R] [P] [P] [P] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE [] **REMARKS:** THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT THE MEETING WITH THE SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

Ξ.

-

≣

_

C

-

=

_ .=

-

-

ASSESSME ASSESSME NASA FME	ENT ENT EA	D2 11 #:	ATE D:	: 1/: FR 05	29/8 CS-3 -6KF	8 55 -20	77 -	1			NASA DA' BASELII NI	FA: NE [EW [x]]	
SUBSYSTE MDAC ID: ITEM:	M:			FR 35 RE	CS 5 SIST	or,	5.1	K 1/4	W						
LEAD ANA	LYS	ST	:	D.	HAR	TMA	N								
ASSESSME															
	CR	TT] דו		LITY HT		R	EDUN	DANCY	S	CREEN	5	C: I'	L L		
	I	HD	N/F	UNC		A		В			с				
NASA IOA	[[3 3	/3 /3]		[[]]	[[]	[[]	[[]]	*
COMPARE	[/]		[]	[]	[]	[]	
RECOMMEN	IDA'	FI	ons	:	(If	dif	fere	nt fr	om	NASA)				
	[/]		[]	[]	[]	[(ADD,	DE:] LE	TE)
* CIL RE	TEI	NT:	ION	RAT	IONA	LE:	(If	appl	ica	able) Il	ADEQUATI NADEQUATI	E [E []]	
REMARKS: A SHORT IOA RECO FMEA.	ACI MM	RO: ENI	ss i Ds i	a RLI REMO	R TY Val	PE OF	resi The	STOR "SHOR	IS T"	A NO FAIL	I CREDIBI	LE FA FROI	AILI M TI	UR HI	E. S

ISSUE RESOLVED AT THE MEETING WITH THE SUBSYSTEM MANAGER ON 1/20/88 (SHORT FAILURE MODE TO BE REMOVED).

ASSESSME ASSESSME NASA FME	: 1/29 FRCS 05-6	1/29/88 FRCS-356 05-6KF-2078 -1				NASA DATA: BASELINE [] NEW [X]							
SUBSYSTE MDAC ID: ITEM:	FRCS 356 RESI	FRCS 356 RESISTOR, 1.2K 2W								14			
LEAD ANALYST:			D. H	D. HARTMAN									
ASSESSME	INT :												
CRITICAL			LITY	ITY REDUNDANCY SCRE				EENS			CIL		
	H	DW/F	UNC	A		E	3	c	2		TIC	111	
NASA IOA	[3 /3 3 /3]]	[[]	[[]]	[[]]		[[] *]	
COMPARE	[1]	ſ]	٢]	ſ]		[]	
RECOMMENDATIONS: (If different from NASA)													
5.	ן ביינ ביינ	3 /2	R]	[P]	[]	']	[])	(AI	[)D/D] ELETE	:)
* CIL RE	TEN'	TION	RATIC	DNALE:	(If	appl	icab	le) A INA	DEQU	ATE ATE	[]	
REMARKS: THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION													

ISSUE NOT RESOLVED AT THE MEETING WITH THE SUBSYSTEM MANAGER ON 1/20/88.

e su de l'autorité de la recentra de la sector de la recentra de la sector de la s

. .

-

REPORT DATE 2/26/88

OPERATIONS.

-

2 - 2 2 - 2

Ξ. .

٠÷,

. •

Ē

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-357 NASA FMEA #: 05-6KF-2078 -1							NASA DATA: BASELINE [] NEW [X]					
SUBSYSTEM MDAC ID: ITEM:	FRCS 357 RESISTOR, 1.2K 2W											
LEAD ANAL	D. HARTMAN											
ASSESSMEN	T:											
CRITICAL			ITY REDUNDANCY SCREENS						CIL			
FLIGH HDW/FUN		IC A		В			с		TIFI	1		
NASA IOA	[3 [3	/3 /3]	[[]	[[]	[[]	[[]]	*
COMPARE	[/]	[]	[]	נ]	[]	
RECOMMEND	ATIC	ons:	(If	diff	erent	fro	m NAS	A)				
	[/]	[]	נ]	[] (A] ID/DI] ELE	ETE)
* CIL RET	ENTI	ON F	RATIONA	LE:	(If a	ppli	cable	e) AI INAI)EQUATE)EQUATE	[[]]	
REMARKS: NO DIFFER	ENCE	s	an a				· · · · ·					
· · · · · · · · · · · · · · · · · · ·		· · ··					_			·	÷ .	

ISSUE RESOLVED AT THE MEETING WITH THE SUBSYSTEM MANAGER ON 1/20/88 (SHORT FAILURE MODE TO BE REMOVED).

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	FRCS-358	NASA DATA: BASELINE NEW	[]]				
SUBSYSTEM: MDAC ID: ITEM:	FRCS 358 HE OX & FU ISO	L VLV A OR B SWITCH					
LEAD ANALYST:							
ASSESSMENT:							
CRITICAL FLIGH	ITY REDUND. T	ANCY SCREENS	CIL ITEM				
HDW/FU	NC A	B C					
NASA [/ IOA [3 /1R] []] [P]	[] [] [P] [P]	[] * [.]				
COMPARE [N /N	ן א ן	[N] [N]	[]				
RECOMMENDATIONS: (If different from NASA)							
[] /] []	[][](AI	[] DD/DELETE)				
* CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE []							
REMARKS: HELIUM OXIDIZER AND FUEL ISOLATION VALVE A & B SWITCH RE-ANALYZED BY IOA. SEE ASSESSMENT IDS FRCS 11080X-11084X.							

REPORT DATE 2/26/88

.

-

. .

-

_

=

.

_

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	FRCS-359	NAS BA	A DATA: SELINE [] NEW []				
SUBSYSTEM: MDAC ID: ITEM:	FRCS 359 HE OX & FU ISOL VLV A OR B SWITCH						
LEAD ANALYST:							
ASSESSMENT:							
CRITICAL	ITY REDUNDAN	ICY SCREENS	CIL				
HDW/FU	NC A	B C	1164				
NASA [/ IOA [3 /1R] [] [] [P] [] [] P] [P]	[] *				
COMPARE [N /N	ן א ן ([N] [N]	[]				
RECOMMENDATIONS: (If different from NASA)							
[/] [] [3 []	[] (ADD/DELETE)				
* CIL RETENTION RATIONALE: (If applicable)							
· · · · · ·			QUATE []				
REMARKS: HELIUM OXIDIZER AND FUEL ISOLATION VALVE A & B SWITCH RE-ANALYZED BY IOA. SEE ASSESSMENT IDs FRCS 11080X-11084X.							

REPORT DATE 2/26/88 C-318

. .

- - - - - -
ASSESSME ASSESSME NASA FME	NT DATE: NT ID: A #:	FRCS-3	60		NASA DATI BASELINI NEV	A: E [] N []
SUBSYSTE MDAC ID: ITEM:	M:	FRCS 360 HE OX 4	& FU IS	SOL VLV A	OR B SWITCH	
LEAD ANA	LYST:					
ASSESSME	NT:					
	CRITICAI FLIGH	LITY IT	REDUN	IDANCY SCI	REENS	CIL ITEM
	HDW/FU	JNC	A	В	С	
NASA IOA	[/ [3 /11] 2]	[] [P]	[] [P]	[] [P]	
COMPARE	[N /N	3	[И]	[N]	[N]	[]
RECOMMEN	DATIONS	(If (differe	ent from 1	NASA)	
	[/]	[]	[]	[]]	[] ADD/DELETE)
* CIL RE	TENTION	RATIONA	LE: (I1	f applical	ole) Adequate Inadequate	[]
REMARKS: HELIUM O BY IOA.	XIDIZER SEE ASS	AND FUE	L ISOLA IDs FI	TION VALVES 11080	VE A & B SWIT(X-11084X.	CH RE-ANALYZED

REPORT DATE 2/26/88

E 2

-

-

Ξ

en a Horizon Kola

_

ASSESSME ASSESSME NASA FME	NT D NT I A #:	ATE: D:	FRCS-	361				1	NASA DA BASELI 1	ATA: INE (NEW (-]]
SUBSYSTE MDAC ID: ITEM: 1, 2	М:		FRCS 361 HE OX	& F	U ISC	DL VI	V A	OR B	SWITCH	I OPE	en c	CONTACTS
LEAD ANALYST:												
ASSESSME	NT:											
CRITICALITY REL						EDUNDANCY SCREENS					CIL	
	HD	W/FU	NC	A		B	•	C	2	4		L
NASA IOA	[[3	/ /3]	[[]]	[[]]	[[]	[•] *]
COMPARE	[N	/N]	נ]	Γ]	Γ]	[•]
RECOMMEN	DATI	ons:	(If	dif	ferer	nt fr	om N	ASA)				
	נ	/]	[]	ľ]	[]] (ADD))/DE] LETE)
* CIL RE	TENT	ION	RATION	ALE:	(If	appl	icab	le) / IN/	ADEQUAT ADEQUAT	re (re (•]
HELIUM O	XIDI	ZER	AND FU	EL I	SOLAT	NOI	VALV	E A 8	B SWJ	тсн	RE-	ANALYZED
BY IOA. SEE ASSESSMENT IDS FRCS 11080X-11084X.												

Ē

- - :

REPORT DATE 2/26/88

ASSESSMI ASSESSMI NASA FMI	ENT D ENT I EA #:	ATE: D:	FRCS-	362				N	IASA DA BASELI N	TA: NE [EW []
SUBSYSTI MDAC ID: ITEM: 1, 2	EM : :		FRCS 362 HE OX	& F	U ISC	DL VL	VA	OR B	SWITCH	OPEN	CONTACTS
LEAD AN	ALYST	:									
ASSESSMI	ENT:										
	CRIT F HD	'ICAL 'LIGH W/FU	ITY T NC	R	EDUND	DANCY B	SCR	eens C	:	CIL ITE	M
NASA IOA	[[3	/ /3]]	[[]]	[]]	[[]]	[[] *]
COMPARE	[]	/N]	[]	[]	[]	[]
RECOMMEN	NDATI	ONS :	(If	dif	feren	it fr	om Ni	ASA)			
	[/]	נ]	[]	[]	[(ADD/D] DELETE)
* CIL R	eteni	NOI	RATION	ALE:	(If	appl	icab	le) A INA	DEQUAT	Ë (Ë (]
HELIUM (DXIDI	ZER	AND FU	EL I	SOLAT	TON	VALV	ΕΑδ	B SWI	TCH RE	-ANALYZED

BY IOA. SEE ASSESSMENT IDS FRCS 11080X-11084X.

REPORT DATE 2/26/88

24.49 24.49

÷:

•••• • = "

-

ASSESSMI ASSESSMI NASA FMI	ENT ENT EA	D/ I) #:	ATE D:	: FRCS	-363				1	NASA DAI BASELIN NE	'A: E [W [] [.]	
SUBSYSTH MDAC ID: ITEM: 3, 4	EM :			FRCS 363 HE C	X & I	TU IS	OL VI	LV A	OR B	SWITCH	GPC C	ONTACTS	
LEAD ANA	ALY:	ST	:										
ASSESSME	ENT	:											
CRITICALITY REDUNDANC							DANCY	C SCR	EENS	CIL	CIL		
	1	HD	W/FU	JNC	7	L	I	3	(С	TIC	м	
NASA IOA	[[3	/ /3]]	[[]]	[[]]	[[]]	[[] *] [*] :	
COMPARE	[N	/N]	[]	[]	[]	[]	
RECOMMEN	IDA'	ric	SNS	: (I	f dif	fere	ent fi	com N	ASA)				
	[/]	נ]	٢]	[] ([ADD/D] Elete)	
* CIL RE	ETE:	NT:	ION	RATIO	NALE:	(If	app]	licab	le) INZ	ADEQUATE ADEQUATE	[]]	
HELIUM C BY IOA.	XI S	DI: EE	ZER ASS	AND F	UEL I NT II	SOLA S FR	TION CS 11	VALV LO80X	E A 8 -1108	E B SWIT 84X.	CH RE	-ANALYZE	:D

REPORT DATE 2/26/88

ASSESSM ASSESSM NASA FM	ENT DA ENT II EA #:	ATE: D: FF	RCS-364					NASA DA BASELI N	TA: NE [EW []
SUBSYST MDAC ID ITEM: 3, 4	EM : :	FF 36 He	RCS 54 5 OX & F	U IS	OL VI	LV A	OR B	SWITCH	GPC (CONTAC
LEAD AN	ALYST	:								
ASSESSM	ENT :									
	CRITI FI HDV	ICALITY LIGHT V/FUNC	r R	EDUN	DANCY	K SCR	REENS	с	CII ITI	L Em
NASA IOA	[[3	/] /3]	[[]]	[]]	[[]]	[[] *]
COMPARE	[]	/N]	ľ]	[]	נ]	C	ן
RECOMME	NDATIC	ONS:	(If dif	fere	nt fi	com N	iasa)			
	[/]	٢]	[]	[1] (ADD/I] DELETE
* CIL R	ETENTI	ION RAT	'IONALE:	(If	app]	licab	ole) IN	ADEQUAT ADEOUAT	E [E []

HELIUM OXIDIZER AND FUEL ISOLATION VALVE A & B SWITCH RE-ANALYZED BY IOA. SEE ASSESSMENT IDS FRCS 11080X-11084X.

REPORT DATE 2/26/88

Ξ.

- .

C-323

·

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	FRCS-365	NAS BA	A DATA: SELINE [] NEW []				
SUBSYSTEM: MDAC ID: ITEM: 5, 6	FRCS 365 HE OX & FU ISOL	VLV A OR B SW	ITCH CLOSE CONTACTS				
LEAD ANALYST:							
ASSESSMENT:			an a				
CRITICAL FLIGH	ITY REDUNDA F	NCY SCREENS	CIL ITEM				
HDW/FU.	NC A	вс					
NASA [/ IOA [3 /1R] []] [P]	[] [] [F] [P]	[] * [X]				
COMPARE [N /N] [N]	[N] [N]	[и]				
RECOMMENDATIONS:	(If different	from NASA)					
[/] []	[]][]	[] (ADD/DELETE)				
* CIL RETENTION	RATIONALE: (If a	pplicable) ADE INADE	QUATE [] QUATE []				
REMARKS: HELIUM OXIDIZER AND FUEL ISOLATION VALVE A & B SWITCH RE-ANALYZED BY IOA. SEE ASSESSMENT IDS FRCS 11080X-11084X.							

REPORT DATE 2/26/88 C-324

==

_

ASSESSMENT DATE ASSESSMENT ID: NASA FMEA #:	FRCS-366	NASA DATA BASELINI NEV	A: 5 [] 7 []
SUBSYSTEM: MDAC ID: ITEM: 5, 6	FRCS 366 HE OX & FU ISOL V	VLV A OR B SWITCH (CLOSE CONTACTS
LEAD ANALYST:			
ASSESSMENT:			
CRITICA FLIG	LITY REDUNDAN(CY SCREENS	CIL ITEM
HDW/F	INC A	ВС	
NASA [/ IOA [3 /1]] [] [R] [P] [] [] P] [P]	[]*
COMPARE [N /N] [И] [נא] [א	[]
RECOMMENDATIONS	(If different a	from NASA)	
[/] [] [] [] (2	[] ADD/DELETE)
* CIL RETENTION	RATIONALE: (If app	plicable) ADEQUATE	
REMARKS: HELIUM OXIDIZER	AND FUEL ISOLATION	INADEQUATE	L J CH RE-ANALYZED

HELIUM OXIDIZER AND FUEL ISOLATION VALVE A & B SWITCH RE-ANALYZE BY IOA. SEE ASSESSMENT IDS FRCS 11080X-11084X.

REPORT DATE 2/26/88 C-325

......

_

ASSESSMENT DATE ASSESSMENT ID: NASA FMEA #:	FRCS-367		NASA DATA BASELINE NEW	: [] []
SUBSYSTEM: MDAC ID: ITEM: 7, 8	FRCS 367 HE OX &	FU ISOL VL	/ A OR B SWITCH O	PEN CONTACTS
LEAD ANALYST:				
ASSESSMENT:				and the second second
CRITICA FLIG HDW/F	LITY HT JNC	REDUNDANCY A B	SCREENS C	CIL ITEM
			•	
NASA [/ IOA [3 /1] [R] [P] [F] []] [P]	[] * [X]
COMPARE [N /N] [и] [и] [N]	[N]
RECOMMENDATIONS	: (If di	fferent fro	om NASA)	
[/] [] [] [] (A)	[] DD/DELETE)
* CIL RETENTION	RATIONALE	: (If appli	icable) ADEQUATE INADEQUATE	[] []
REMARKS: HELIUM OXIDIZER BY IOA. SEE AS	AND FUEL SESSMENT I	ISOLATION V Ds FRCS 110	ALVE A & B SWITCH 80X-11084X.	H RE-ANALYZED

i **1**

= :

REPORT DATE 2/26/88

 ASSESSMI ASSESSMI NASA FMI	ENT ENT EA #	DATE: ID: :	FRCS-	368	ł					NA B	SA DATA ASELINE NEW	: [[]
SUBSYSTI MDAC ID: ITEM: 7, 8	E M : :		FRCS 368 HE OX	æ	FU	ISOL	VL	VAO	RB	3 S	WITCH O	PEN (CONTACTS
LEAD ANA	ALYS	ST:											
ASSESSMI	en t :	:											
	CRI H	TICAL FLIGH	ITY T NC		rei A	DUNDA	NCY B	SCRE	ENS	с		CIL ITEN	4
NASA IOA	[[/ 3 /1R]	[[P]	[[P]	[[P]	[[] *]
COMPARE	[N /N]	l	N]	[N]	[N	1	[]
RECOMMEN	IDAI	NONS:	(If	di	ff	erent	fr	om NA	SA)				
	נ	1]	[]	[]	[] (Al	[וס/סכ] ELETE)
* CIL RI	eten	TION	RATION	ALE	:	(If a	ppl	icabl	e) IN	AD IAD	EQUATE EQUATE	[[]
 HELIUM (BY IOA.	XIC SE	DIZER E ASS	and fui Essmen	EL T I	IS(Ds	DLATI FRCS	ON 11	VALVE 080X-	A 110	&)84	B SWITCI X.	I RE-	-ANALYZED

REPORT DATE 2/26/88 C-327

<u>.</u> • · ·

F 14

_

n 3

-

:---

ASSESSMI ASSESSMI NASA FMI	ent Ent Ea (DA II #:	ATE:):	FRCS-	369				1	IASA I BASEI	DATA: LINE [NEW []]	
SUBSYST MDAC ID ITEM: 9, 10	em : :			FRCS 369 HE OX	:& F	U IS	OL VI	LVA	OR B	SWITC	сн брс с	ONTACT	S
LEAD AN	ALYS	ST:	:										
ASSESSM	ENT	:									<u>.</u> .		
	CRI	[T] FI	CAL LIGH	ITY T	F	EDUN	DANCY	SCR	EENS		CII ITE	M	
	F	HDV	V/FU	NC	A	1	I	3	C	3	·		
NASA IOA	[[3	/ /3]]	[[]]	[[]]	[[]]	[[] *]	
COMPARE	[N	/N]	[]	[]	[]	ſ]	
RECOMME	NDAT	FIC	ONS:	(If	dif	fere	nt fi	com N	IASA)				
	[/]	נ]	[]	[]	[(ADD/D] ELETE)	
* CIL R	etei	IT N	EON I	RATION	IALE :	(If	app:	Licab	ole) / IN/	ADEQUA ADEQUA	ATE [ATE []]	
REMARKS HELIUM BY IOA.	: OXII SI	DI2 EE	ZER ASS	AND FU ESSMEN	IEL J	(SOLA) S FR	TION CS 1	VALV 1080X	ТЕ А 8 (-1108	8 B SV 84X.	VITCH RE	-ANALY	ZED

-

.

_

=

REPORT DATE 2/26/88 C-328

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	FRCS-370		NASA DATA: BASELINE NEW	: [] []
SUBSYSTEM: MDAC ID: ITEM: 9, 10	FRCS 370 HE OX & FU	ISOL VLV A OF	B SWITCH GI	PC CONTACTS
LEAD ANALYST:				
ASSESSMENT:				
CRITICAL FLIGH HDW/FU	ITY RE T NC A	DUNDANCY SCREE B	C	CIL ITEM
NASA [/ IOA [3/1R] [] [F] []] [F]	[] [P]	[] * [X]
COMPARE [N /N	л] [N] [И]	[N]	[N]
RECOMMENDATIONS:	(If diff	erent from NAS	SA)	
[/	J [] []	[] (Al	[] DD/DELETE)
* CIL RETENTION	RATIONALE:	(If applicable	ADEQUATE	

HELIUM OXIDIZER AND FUEL ISOLATION VALVE A & B SWITCH RE-ANALYZED BY IOA. SEE ASSESSMENT IDS FRCS 11080X-11084X.

REPORT DATE 2/26/88

- -

1

; ::

: =

.

ASSESSMENT DATE ASSESSMENT ID: NASA FMEA #:	FRCS-371			NASA DATA BASELINE NEW	: [] []
SUBSYSTEM: MDAC ID: ITEM: 11, 12	FRCS 371 HE OX &	FU ISOL V	VLV A OR	B SWITCH C	LOSE CONTACTS
LEAD ANALYST:					
ASSESSMENT:					
CRITICA FLIG HDW/FI	LITY IT INC		CY SCREEN	S .	CIL ITEM
110471		A	Б	C	
NASA [/ IOA [3 /1]] [2] [] [P] [] [F] [] P]	[] * [X]
COMPARE [N /N] [м] [и] [ן א	[N]
RECOMMENDATIONS	(If di	fferent f	rom NASA)	
[/] [] [] [] (AI	[] DD/DELETE)
* CIL RETENTION	RATIONALE	: (If app	olicable) I	ADEQUATE NADEQUATE	[] []
HELIUM OXIDIZER	AND FUEL	ISOLATION	VALVE A	& B SWITCH	RE-ANALYZED
BY IOA. SEE AS	SESSMENT I	Ds FRCS 1	1080X-11	084X.	

-

.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	FRCS-372	72 NASA DATA: 72 BASELINE [] NEW []							
SUBSYSTEM: MDAC ID: ITEM: 11, 12	FRCS 372 HE OX & F	U ISOL VL	V A OR B	SWITCH CI	LOSE CONTACTS				
LEAD ANALYST:									
ASSESSMENT:		19 19 1 1 1 1							
CRITICAL FLIGH HDW/FU	JTY R T NC A	EDUNDANCY	SCREENS	с	CIL ITEM				
NASA [/ IOA [3 /1R] [] [F] [] [F] [] P]	[] * [X]				
COMPARE [N /N	ן [א	א] נא	ј []	N]	[א]				
RECOMMENDATIONS:	(If dif	ferent fr	om NASA)						
ť /] [] [] [) (AI	[] DD/DELETE)				
* CIL RETENTION	RATIONALE:	(If appl	icable) IN	ADEQUATE ADEQUATE					
HELIUM OXIDIZER	AND FUEL I	SOLATION	VALVE A	& B SWITCH	H RE-ANALYZED				

BY IOA. SEE ASSESSMENT IDS FRCS 11080X-11084X.

_

C-331

.

-

-

-

ASSESSME ASSESSME NASA FME	NT D NT I A #:	ATE: D:	1/29/8 FRCS-3 03-2F-	38 373 -1033	350 -	1			NZ	ASA DAT BASELIN NE	A: E [W [X]
SUBSYSTE MDAC ID: ITEM:	:M:		FRCS 373 HE TK	PRES	55-2	PRESS	5 SENS	501	2 2	274.17- 74.12		
LEAD ANA	Lyst	:	D. HAI	RTMAN	4							·
ASSESSME	NT:											
	CRIT F	ICAL	ITY F	RI	EDUND	ANCY	SCREI	ENS	5		CII ITE	M
	HC	W/FUI	NC	A		В			С	11.1.00		
NASA IOA	[3 [3	/2R /3]	[P []]	[P []] [P]	ן נ] *]
COMPARE	[/N]	[N	ן	[N]	[N]	[]
RECOMMEN	IDATI	ONS:	(If	dif	feren	t fro	om NAS	5A))			
	[/]	[]	[]	נ] ([ADD/D] Deletë)
* CIL RE	ETENI	NON 1	RATION	ALE:	(If	appl:	icable	е) тт	AI JAI	DEQUATE	[r] 1
REMARKS: IOA AGRE	EES W	ITH	NASA FI	MEA.					1634		· L	J

.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-374 03-2F-103350	-1	NASA DATA BASELINE NEW	: [] / [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 374 HE TK PRESS-	2 PRESS SEN	SOR	
LEAD ANALYST:	D. HARTMAN			
ASSESSMENT:				
CRITICAL FLIGH	ITY REDU T	NDANCY SCRE	ENS	CIL ITEM
HDW/FU	NC A	В	С	
NASA [3 /2R IOA [3 /3] [P]] []	[P] []	[P] []	[] * []
COMPARE [/N] [М]	[И]	[N]	[]
RECOMMENDATIONS:	(If differ	ent from NA	SA)	
] []	[]]	[]	[] ADD/DELETE)
* CIL RETENTION	RATIONALE: (I	f applicabl	e) Adequate	[]
REMARKS:	NACA ENTRA		INADEQUATE	[]

IOA AGREES WITH NASA FMEA.

=

-

¥. Л

11 / 12

al na 10

Ξ... 44524

REPORT DATE 2/26/88 C-333

ASSESSME ASSESSME NASA FME	NT D. NT I A #:	ATE: D:	1/29/ FRCS- 03-2F	88 375 -10	50 -1	L	NASA DATA: BASELINE [] NEW [X]							
SUBSYSTE MDAC ID: ITEM:	М:		FRCS 375 HE FU	TR	E	PRESS-	-1	PF	RESS	SEI	NSC	DR	1 1 ⁽ *1)	
LEAD ANA	lyst	:	D. HA	RTM	IAN	I								
ASSESSME	NT:													
	CRIT F	ICALI LIGHI	LTY P		RF	DUND	N	CY	SCRE	EN	S		CIL ITEN	1
	HD	W/FUI	NC		A			В			С			
NASA IOA	[3 [3	/2R /3]	[[P]]	[[P]	[[P]	[[] *]
COMPARE	נ	/N]	[N]	[N]	[N]	[]
RECOMMEN	DATI	ons:	(If	di	ff	erent	: 1	fro	om NA	SA)			
	[/]	[]	[]	נ] (Ai] וס/סס] Elete)
* CIL RE	TENT	ION I	RATION	ALE	::	(If a	app	pli	cabl	e) Il	AI NAI	DEQUATE DEQUATE	[[]
TAN VAVE			142047 L											

٥

=

.

_

REPORT DATE 2/26/88

C-334

.

ASSESSME ASSESSME NASA FME	NT D. NT I A #:	ATE: D:	1/29 FRCS 03-2	9/88 5-376 2F-10	3350	-1	NASA DATA: BASELINE [] NEW [X]						
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 376 HE H	S TU TK	PRES	55-1 P	RESS	SENSO	OR				
LEAD ANA	LYST	:	D. H	IARTM	AN								
ASSESSME	NT:												
	CRIT F	ICAL LIGH	ITY T		REDUN	IDANCY	SCR	EENS	. <u></u>		CIL ITE	' M	
	HD	W/FU	NC		A	В		C					
NASA IOA	[3 [3	/2R /3]]	[P]]	[P []	[P []]	-	[[] *]	
COMPARE	[/N]	ິ []	ן א	[N]	[א]		[]	
RECOMMEN	DATI	ons:	()	(f di	ffere	ent fr	om N	iasa)					
	נ	/]	[]	[]	Γ]	(AI	ן ס/סכ] ELETE)	
* CIL RE	TENT	ION	RATIC	ONALE	: (I1	appl	icab	ole) AI INAI)EQUA	ATE ATE	[]	
REMARKS:	ES W	ттн :	NASA	FMEA	_						-	-	

REPORT DATE 2/26/88

_

=.= . ••• :

ASSESSME ASSESSME NASA FME	NT DA NT II A #:	ATE: D:	1/29/8 FRCS-3 03-2F-	38 377 -103	-1]	NASA DATA BASELINI NEV	A: E [V [X]	
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 377 HE OX	TK	PRES	5-1 F	PRESS	SEN	SOR		i .
LEAD ANA	LYST	:	D. HAI	RTMA	N						-
ASSESSME	NT:										
	CRIT		CTY	R	EDUN	DANCY	SCR	EENS	-	CIL	M
	HD	V/FUI	1C	A		E	3	(TIP	м
NASA IOA	[3 [3	/2R /3]]	[P []	[] [)]	[]	P]]	[[] *]
COMPARE	[/N]	[N]	[]	1]	[]	N]	[]
RECOMMEN	DATI	ons:	(If	dif	fere	nt fr	rom N	iasa)			
	[/]	[]	ſ]	[] (2] ELETE)
* CIL RE	TENT:	ION I	RATION	ALE:	(If	appl	licab	ole) IN	ADEQUATE ADEQUATE	[[]
IOA AGRE	ES W	ITH 1	NASA FI	ÆA.							

REPORT DATE 2/26/88

,

ASSESSME ASSESSME NASA FME	ATE: D:	1/29/88 FRCS-378 03-2F-103350 -1						NASA DATA: BASELINE [] NEW [X]								
SUBSYSTEM:FRCSMDAC ID:378ITEM:HE OX TK PRESS								P	RESS	SEN	ISO	R				
LEAD ANA	LYST	:	D.	HART	MA	N										
ASSESSMI	ent:															
	CRIT F	'ICAL 'LIGH'	ITY T		R	EDU	NDAN	CY	SCR	EENS	5			CII ITI	L EM	
		В			С											
NASA IOA	[3 [3	/2R /3]	[[P]]	[[P]	[[P]		[[]]	*
COMPARE	[/N]	(N]	[N]	[N]		[]	
RECOMMEN	IDATI	ons:	(If d	if	fer	ent	fr	om N	iasa)						
	[/]	[]	[]	[]	(A] 1\00] SELI	ETE)
* CIL RETENTION RATIONALE REMARKS: IOA AGREES WITH NASA FMEA							f ap	pl	icab	ole) IN	AD IAD	EQU	JATE JATE	[[]]	
TON NGKI	utio M	TTU	NUCN	F FIE	4 A TA											

REPORT DATE 2/26/88 C-337

_

ASSESSI ASSESSI NASA FI	íent Ient Iea	D2 II #:	ATE: D:	1/29 FRCS 03-2	/88 -379 F-10) 33!	50 -	1				NZ J	ASA DA BASELI N	TA: NE EW	[[x]	5 17 June - 1
SUBSYST MDAC II ITEM:	TEM:):			FRCS 379 HE O	X TR	(PI	RESS	-2	PI	ESS	SEI	NSC	OR				
LEAD AN	IALY	ST	:	D. H	ARTM	IAN											
ASSESSI	IENT	:															
		ITI Fl HDV	ICALI LIGHI N/FUN	ITY F IC		REI A	DUND	ANC	CY B	SCRI	EENS	s C			CIL ITE	M	
NASI IOI	A [A [3 3	/2R /3]	[[P]]	[[P]]	[[P]]		[[]]	*
COMPARI	5 (/N]	נ	N]	נ	N]	[N]		[]	
RECOMMI	ENDA	TIC	ONS:	(I	f di	ff	eren	t 1	r	om NZ	ASA))					
	[/]	[]	[]	[]	(AD	[0D/D] ELI	ETE)
* CIL I	RETE	NTI	ION P	RATIO	NALE	::	(If	apr)]j	[cab]	le) Il	IA IAN	DEQUAT DEQUAT	Έ	[[]]	
REMARK																	

IOA AGREES WITH NASA FMEA.

REPORT DATE 2/26/88

C-338

== =

_

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-380 03-2F-103350 -1	NASA DATA: BASELINE [] NEW [X]						
SUBSYSTEM: MDAC ID: ITEM:	FRCS 380 HE OX TK PRESS-2 PRESS SI	ENSOR						
LEAD ANALYST:	D. HARTMAN							
ASSESSMENT:								
CRITICAL FLIGH	ITY REDUNDANCY SCREEN	NS	CIL ITEM					
HDW/FU	NC A B	С						
NASA [3 /2R IOA [3 /3] [P] [P]] [] []	[P] []	[] * []					
COMPARE [/N] [И] [И]	נא]	[]					
RECOMMENDATIONS:	(If different from NAS)	A)						
, , , , /] [] []	[] (A	[] DD/DELETE)					
* CIL RETENTION REMARKS: IOA AGREES WITH	RATIONALE: (If applicable)) ADEQUATE INADEQUATE						

- -

5------di

-

C-339

· • •

and the second

•

.

____ .

-

- --

÷,

-

-

-

____ ----

53' -

والمعادي ويهو معتد

ASSESSMI ASSESSMI NASA FMI	ent Ent Ea #		ATE:):	1/29 FRC 03-2	9/88 S-381 2F-1033	60	-1	NASA DATA: BASELINE [] NEW [X]								
SUBSYSTE MDAC ID: ITEM:	: M :			FRCS 381 HE (S DX TK I	EMP)-1 TE	MP S	ENSOR							
LEAD ANA	LYS	ST :	:	D. 1	HARTMAN	r										
ASSESSME	ENT:	1										-		-		
	CRI	[T]		ITY	RE	DUN	IDANCY	SCR	EENS			CI	L			
	E	IDV	V/FU	NC	A		В		c			ΤT	EM			
NASA IOA	[[3 3	/3 /3]]	[[]	[[]]	[[]]		[[]	*		
COMPARE	[/]	[]	[]	[]		[]			
RECOMMEN	IDAJ	T	ons:	(If diff	ere	ent fr	om N	IASA)							
	[/]	[]	[]	ſ]	(Al] DD/] DEL	ETE)		
* CIL RI	ETEN	VT I	ION	RATI	ONALE:	(If	appl	icab	ole) A INA	DEQU DEQU	ATE ATE] []			
REMARKS	: Eren	ICI	ES.								-					

REPORT DATE 2/26/88 C-340

ASSESSME ASSESSME NASA FME	NT DATE: NT ID: A #:	1/29/88 FRCS-382 03-2F-10	3360	-1		N	ASA DA' BASELII NI	TA: NE [EW []) K]
SUBSYSTE MDAC ID: ITEM:	M:	FRCS 382 HE OX TK	TEMP	-1 TE	MP SE	NSOR			
LEAD ANA	LYST:	D. HARTM	AN						
ASSESSME	NT:								
	CRITICAL	JITY	REDUN	DANCY	SCRE	ENS		CI	L रा म
	HDW/FU	INC	A	B	•	c		***	
NASA IOA	[3 /3 [3 /3] [] []	[[]]	ן נ]	[[] *]
COMPARE	[/] []	[]	[]	[]
RECOMMEN	DATIONS:	(If di	ffere	nt fr	om NA	SA)			
	[/	3 []	[]	[]] (ADD/1] DELETE)
* CIL RE	TENTION	RATIONALE	: (If	appl	icabl	e) A INA	DEQUAT DEQUAT	E [E []]

NO DIFFERENCES.

-

-

E.2

=

REPORT DATE 2/26/88

=

_

-

-

-

.

.

-

3

-

=

õ

ASSESSME ASSESSME NASA FME	NT NT A	D2 I1 #:	ATE: D:	1/29 FRCS	/88 -383			NASA DATA: BASELINE [] NEW [X]									
SUBSYSTE MDAC ID: ITEM:	M:			FRCS 383 HE O	х тк 1	reme	?−1 TE	MP S	ENSO	R							
LEAD ANA	LY	ST	:	D. H	ARTMA	N											
ASSESSME	NT	:															
	CR:	IT:	ICAL	ITY	R	EDUN	IDANCY	SCR	EENS		CI	L E M					
]	HD	N/FU	NC	A	2	***										
NASA IOA	[[3	/ /3]	[[]	[[]	[[]]	[[]]	*				
COMPARE	נ	N	/N]	[]	[]	[]	[]					
RECOMMEN	'DA	TI	ONS:	(I	f dif	fere	ent fr	om N	ASA)								
	נ		/	1	[]	C]	[]] (ADD/1] DELE	ETE)				
* CIL RE	TE	NT:	ION	RATIO	NALE:	(11	f appl	icab.	le) INZ	ADEQUATI ADEQUATI	3 [3 []]					
AUTIANNO -	-																

REDUNDANT TO FRCS 381.

REPORT DATE 2/26/88

C-342

ASSESSMENT DATE: 1/29/88 NASA DATA: ASSESSMENT ID: FRCS-384 BASELINE [] NASA FMEA #: NEW [X]											
SUBSYSTEM: MDAC ID: ITEM:	FRCS 384 HE OX TK	TEMP-1 TE	MP SENS	SOR							
LEAD ANALYST:	D. HARTMA	N									
ASSESSMENT:											
CRITICAL	ITY R	EDUNDANCY	SCREEN	is	CIL						
HDW/FU	NC A	В	C								
NASA [/ IOA [3 /3] [] [] [] [] [[]*						
COMPARE [N /N	J [] [] [ני	[]						
RECOMMENDATIONS:	(If dif	ferent fr	om NASA	v)							
[/	J [] [] [[] (A	[] .DD/DELETE)						
* CIL RETENTION	RATIONALE:	(If appl	icable) I	ADEQUATE NADEQUATE	[] []						
REMARKS: REDUNDANT TO FRC	S 382.										

- - -

.

-

€∵÷

•

<u>....</u> ∓~~••

ASSESSME ASSESSME NASA FME	NT D. NT I: A #:	ATE: D:	1/29/ FRCS- 03-2F	88 385 -1033	360 -	1]	NASA DATA BASELINI NEV	\: E [V [}] []	
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 385 HE FU	тк з	remp-	1 TE	MP SE	NSO	R			·
LEAD ANA	lyst	:	D. HA	RTMAI	4							
ASSESSME	NT:										·	÷
	CRIT	ICAL	ITY	RI	EDUND	ANCY	SCRE	ENS		CII	L M	
en en i	HD	W/FU	NC	A		B	i		C		2	
NASA IOA	[3 [3	/3 /3]]	[[]]	[[]]	[[]]	[[] *] .	
COMPARE	[/]	[]	נ]	[]	[]	
RECOMMEN	DATI	ons:	(If	dif	feren	t fr	om NA	SA)				
	[1]	[]	[]	נ] (1] ADD/I] DELETH	2)
* CIL RE	TENT	ION	RATION	ALE:	(If	appl	icabl	.e) IN	ADEQUATE ADEQUATE	[[]]	
NO DIFFE	RENC	ES.								÷ ++		• •

-

-

-

≣

, 222 199

,

ASSESSMI ASSESSMI NASA FMI	ENT ENT EA	D/ I) #:	ATE: D:	1/29/ FRCS- 03-21	/88 -386 7-103	3360	-1	TA: NE EW	4: 3 [] ₩ [X]					
SUBSYSTI MDAC ID: ITEM:	EM : :			FRCS 386 HE FU	ј тк	TEMP	2-1 TE	MP S	ENSOR	ł				
LEAD ANA	ALY	ST	:	D. H2	RTM	AN								
ASSESSMI	ENT	:												
	CR	IT	ICAL	ITY	I	REDUN	IDANCY	SCR	EENS			CIL	v	
	1	F. HD	W/FU	NC	1	A	B	6	Ċ	2		T.L.E.	m	
NASA IOA	[[3 3	/3 /3]]	[[]]	[[]	[[]]		[[]]	*
COMPARE	[/]	[]	[]	ſ]		[]	
RECOMMEN	NDA'	FI (ons:	(I1	f dif	fere	ent fr	om N	ASA)					
1 · · ·	ι						ſ	1	[]	(AD	[D/D] ELE	TE)
* CIL RI	ETE	NT	ION	RATION	JALE :	: (If	f appl	icab	le)		5	-	,	
				States and a second sec					INZ	ADEQUAT ADEQUAT	E	[]	
REMARKS	: ERE	NC	ES.											
ų -		Ϋ́,	a 19.	1 V.	: .									

REPORT DATE 2/26/88

Ξ...

_

-

-

C-345

ASSESS ASSESS NASA F	MEN] MEN] MEA	C D2 C I1 #:	ATE: D:	1/29 FRCS 05-6	/88 -387 KF-2	NASA DATA: 7 BASELINE [] 2151 -1 NEW [X]											
SUBSYS MDAC I ITEM:	TEM: D:	;		FRCS 387 HE O	X &	FU	ISC)L V	AL7	7 A	OR	 B	SWITCH	ТА	LKBA	CK	č
LEAD A	NALY	ST	:	D. H	ARTI	IAN											
ASSESS	MENI	::															
	CF		RE	DUNE	ANG	CY	SCR	EEN	s			CIL ITEM	ſ				
		HD	N/FUN	1C		A			в			С					
NAS IO	A [A [3 3	/3 /1R]] [P]	[[P]	[[P]]		[[]]	*
COMPAR	E (•	/N]	[N]	[N]	[N]		[]	
RECOMM	ENDA	TIC	ONS:	(I	f di	lff	erer	nt i	fro	om N	ASA)					
	(3	/2R]	[P]	[P]	[P]	(AC	[D/DE] ELE	TE)
* CIL	RETE	ENT	ION I	RATIO	NALI	3:	(If	apı	91 1	lcab	le) T	AI NAT	DEQUAT	E	[r]	
REMARK	s:										-			_		1	

Ξ

≣

ļ

.

.

And the second s

THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

ASSESSMENT DATE: 1/29/88 NASA DATA: ASSESSMENT ID: FRCS-388 BASELINE [] NEW [X] NASA FMEA #: 05-6KF-2253 -1 SUBSYSTEM: FRCS MDAC ID: 388 ITEM: DIODE LEAD ANALYST: D. HARTMAN ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL ITEM FLIGHT HDW/FUNC A В С [2/1R] [P] [3/3] [] [F] [P] [] [] [X] * NASA IOA [3/3]] [[N] COMPARE [N/N] [N] [N] RECOMMENDATIONS: (If different from NASA) [3/3] [] [] [] [D] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [INADEQUATE [1 REMARKS: NASA FMEA CONTAINS MULTIPLE FAILURES. THIS FAILURE ALONE HAS NO

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

EFFECT.

ASSESSMI ASSESSMI NASA FMI	ent Ent Ea	D/ I) #:	ATE: D:	1/29 FRCS 05-6	9/88 5-389 5KF-22	53 -	-2	NASA DATA: BASELINE [] NEW [X]					
SUBSYSTI MDAC ID ITEM:	EM : :			FRCS 389 DIOI	S DE					- 		···	
LEAD AND	ALYS	ST	:	D. H	IARTMA	N		÷					
ASSESSM	ENT	:											
	CR	IT		LITY	R	EDUN	IDANCY	SCR	EENS		CII	J	
	1	HDI	W/FU	INC	A	•	E)	c	• • • • • • • • • • • •	11	214	
NASA IOA	[[3 3	/3 /3]	[[]]	[[]	[[]	[[] *]	
COMPARE	۵		/]	נ]	[]	[]	[]	
RECOMMEN	NDAT	FI	ONS:	()	(f dif	fere	ent fr	om N	ASA)				
	נ		/	3	ſ]	[]	[] (2	[ADD/I] DELET	E)
* CIL R	etei	T	ION	RATIC	ONALE:	(If	appl	icab	le) A	DEQUATE	٢	1	
REMARKS	: Erei	NC	ES.	-					INA	DEQUÀTE	[]	
			1							.			·, .

ունը հարձականը։ Դեն հարձականը։

Z

≣

_

REPORT DATE 2/26/88 C-348

ASSE ASSE NASA	SSESSMENT DATE: 1/29/88 SSESSMENT ID: FRCS-390 ASA FMEA #: 05-6KF-2253C															NA E	asa Bas:	DA ELI N	TA: NE EW	; [[x]]	
SUBS MDAC ITEM	YSTEI C ID: I:	м:			FR 39 DI	CS 0 ODE																	
LEAD	ANA	LYS	r:		D.	HAI	RTI	MAN	1														
ASSE	SSME	NT:																					
CRITICALITY REDUNDANCY SCREENS C FLIGHT J											CIL ITEM												
		H	DW,	/FUN	1C			A				В				С							
N	NASA IOA	[:	3,	/1R /1R]]		[[P F]]		[[P P]		[P P]]			[[X]]	×
COMF	PARE	[4	/]		[N]		[ן	1	[]			[N]	
RECO	OMMEN	DAT	10	NS:		(If	d:	if	fei	rent	: 1	fro	om	NASZ	A)								
	· •	נ	4	/]		[]		[]		[]		(A)] ,00	/D1] ELI	ΞTĒ)
* CI REMA IOA	IL RE ARKS: AGRE	ten Es 1	TI WI	ON I	RAT NAS	ION A FI	ALI ME	E: A.	(]	[fa	apı	91 :	ica	ble;) IN	AI IAI	DEQ DEQ	UAT UAT	E E	[[]	

REPORT DATE 2/26/88

-

-

.

ASSESSMEN ASSESSMEN NASA FMEZ	1T DA 1T II 1 #:	ATE: D:	1/29/4 FRCS-3 05-6K	88 391 F-22	53C-	2		NASA BASE	DATA: LINE [] NEW [X]	
SUBSYSTEN MDAC ID: ITEM:	1:		FRCS 391 DIODE							
LEAD ANAI	LYST	:	D. HA	RTMA	N					
ASSESSMEN	NT:									
C	CRIT: F	ICALI LIGHT	CTY C	R	EDUN	DANCY	SCR	REENS	CIL ITEM	
	HD	W/FUI	1C	Α		B		C		
NASA IOA	[3 [3	/3 /1R]	[[F]]	[[P]]	[] [P]	[] * [X]	ł
COMPARE	[/N]	[N]	[N]	[א]	[N]	
RECOMMENI	DATI	ONS:	(If	dif	fere	nt fre	om N	IASA)		
	[/]	[]	נ]	[]	[] (ADD/DELEI	ſE)
* CIL REI	CENT:	ION H	RATION	ALE:	(If	appl	icab	ole) ADEQU INADEOU	ATE [] ATE []	
REMARKS: TOA AGREI	ES W	ITH 1	NASA FI	MEA.					L J	

ī

_

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-392 05-6KF-22	53C-1			NASA BASE	DATA: LINE [] NEW [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 392 DIODE					
LEAD ANALYST:	D. HARTMA	N		e		a tha tha tha tha she
ASSESSMENT:						
CRITICAL	ITY R	EDUND	ANCY	SCREE	INS	CIL ITEM
HDW/FU	NC A		В		С	
NASA [3 /1R IOA [3 /1R] [P] [F]]	[P [P]	[P] [P]	[] * [X]
COMPARE [/	א] [א]	[]	[]	[И]
RECOMMENDATIONS:	(If dif	feren	t fro	om NAS	SA)	
] []	[]	[]	[] (ADD/DELETE)
* CIL RETENTION REMARKS:	RATIONALE:	(If	appl:	icable	e) ADEQU INADEQU	ATE [] ATE []
IOA AGREES WITH	NASA FMEA.					

REPORT DATE 2/26/88

-- ·

- -

с : 10.

-

T.

ASSESSMEI ASSESSMEI NASA FMEI	NT D. NT I: A #:	ATE: D:	1/29/ FRCS- 05-6K	88 393 F-2	25	53C-	2				NA	ASA DATA BASELINE NEW	: []	x]]	
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 393 DIODE	1												
LEAD ANA	lyst	:	D. HA	RTM	AN	Ĩ				· · ·						
ASSESSME	NT:															
CRITICALITY REDUNDANCY SCREENS C FLIGHT I													C: T'	IL PEN	ſ	
	HD	W/FUI	NC		A			В			С		±.	LUT	•	
NASA IOA	[3 [3	/3 /1R]	[[F]]	[[P]]	[[P]	[[x] ']	ł
COMPARE	C	/N]	נ	N]	[N]	[N]	[N]	
RECOMMEN	DATI	ons:	(If	di	f1	ere	nt 1	fro	om 1	NASA)						
	[/]	[]	[]	ַ [] (A] DD,	/DI] ELE:	ſE)
* CIL RE	TENT		RATION	ALE	:	(If	ар	91 :	lcal	ble) IN	AI IAI	DEQUATE DEQUATE	[[]]	
IOA AGRE	ES W	ITH]	NASA F	MEA												

3

÷.

REPORT DATE 2/26/88

C-352

ASSESSME ASSESSME NASA FME	NT D NT I A #:	ATE: D:	1/29 FRCS 05-6	/88 -394 KF-22	53F-	NASA DATA: BASELINE [] 3F-1 NEW [X]								
SUBSYSTE MDAC ID: ITEM:	М:		FRCS 394 DIOD) DE										
LEAD ANA	LYST	:	D. H	IARTMA	N									
ASSESSME	NT:													
	CRIT	ICAI	JITY	F	EDUN	IDANCY	SCR	REENS			CII			
	F HD	W/FU	IT INC	A	1	ВС					1.1.1	SM		
NASA IOA	[3 [3	/3 /3]	[[]]	[[]]	[[]]		[[] *]		
COMPARE	[/]	ſ]	[]	נ]		[]		
RECOMMEN	DATI	ONS :	(1	f dif	fere	ent fro	om N	IASA)						
	[/]	ſ]	Γ]	[]	(A] 1/00] DELETE)		
* CIL RE REMARKS: NO DIFFE	TENT RENC	ION	RATIC)NALE:	(11	f appl.	icab	ole) A INA	DEQU	ATE ATE	[]]		

C-353

- ---- ·

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-395 05-6KF-2	; 2531	F-2		NASA DATA BASELINE NEW	: [[X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 395 DIODE				• • •	·	
LEAD ANALYST:	D. HARTN	IAN		18 A			
ASSESSMENT:							
CRITICAL	CIL	r					
HDW/FU	NC	A	В		С	J. 1 141	
NASA [3/3 IOA [2/1R] [] F]	[[F] [] [] P]	[[x] *]
COMPARE [N /N	J [И]	[N] [N]	[N]
RECOMMENDATIONS:	(If di	ffei	rent fr	om NASA))		
C /] []	Ľ] [] (A)	[DD/DE] LETE)
* CIL RETENTION	RATIONALI	S: (I	If appl	icable) Il	ADEQUATE NADEQUATE	[]
REMARKS: IOA AGREES WITH	NASA FMEA	Α.			·		_

ī

REPORT DATE 2/26/88
	I
CIL ITEM	
[] []	*
[]	l
[] (ADD/DEI	LETE)
TE [TE []
	CIL ITEM []] [] (ADD/DEI E [] E []

IOA AGREES WITH NASA FMEA.

-

€- i

≞ .

REPORT DATE 2/26/88

ASSESSMENT D ASSESSMENT I NASA FMEA #:	ATE: D:	1/29/8 FRCS-3 05-6KH	88 97 7-22	253D-	-2		NZ I	ASA D. BASEL	ATA: INE NEW	[X]]	
SUBSYSTEM: MDAC ID: ITEM:		FRCS 397 DIODE											
LEAD ANALYST	:	D. HAR	NT	AN									
ASSESSMENT:													
CRIT	ICAL	TY]	REDUN	IDANCY	SCF	REENS			C]	[L		
r HD	W/FUN	1C	2	A	В		с			1	l'Er	1	
NASA [3 IOA [3	/3 /1R]	[[]] F_]	[[P]	[[P]		ן נ	X]]	*
COMPARE [/N]	ני	[И	[N]	[N]		[N]	
RECOMMENDATI	ons:	(If	dī	ffere	ent fro	om N	NASA)						
ſ	/]	[]	[]	[]	(AI] ,00	/DI] SLE	ETE)
* CIL RETENT REMARKS:	ION I	RATION	ALE	: (I1	f appl:	icał	ole) AI INAI	DEQUA DEQUA	TE TE	[[]	
IOA AGREES W	ITH 1	NASA FN	ÍEA	•				-					

REPORT DATE 2/26/88 C-356

,... är

. . . .

ASSESSMENT DATE: 1/29/88 NASA DATA: ASSESSMENT ID: FRCS-398 BASELINE [] NEW [X] NASA FMEA #: 05-6KF-2253B-1 FRCS SUBSYSTEM: MDAC ID: 398 ITEM: DIODE LEAD ANALYST: D. HARTMAN ASSESSMENT: REDUNDANCY SCREENS CIL CRITICALITY FLIGHT ITEM HDW/FUNC A в С [P] [P] [P] [F] [P] [P] [P] NASA [3 /2R]] * [IOA [3 /1R]] COMPARE [/N] [N] [] [] [] **RECOMMENDATIONS:** (If different from NASA) [3/1R] [P] [NA] [P]] [(ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE l INADEQUATE [1 **REMARKS:** LOSE GPC COMMAND TO OPEN THE VALVE. MANUAL COMMANDING STILL AVAILABLE. LOSS OF ALL REDUNDANCY MAY CAUSE INABILITY TO EXPEL PROPELLANTS TO MEET CG LIMITS. ISSUE NOT RESOLVED AT THE 1/20/88 MEETING WITH THE SUBSYSTEM MANAGER.

REPORT DATE 2/26/88

C-357

a de composición de c

_

÷.

ASSESSMI ASSESSMI NASA FMI	ENT I ENT J EA # :	DATE: [D:	1/29/ FRCS- 05-6K	253	B-2				NZ F	ASA DAT BASELIN NI	FA: NE EW	[[x]		
SUBSYSTE MDAC ID: ITEM:	E M : ;		FRCS 399 DIODE												
LEAD AND	LYSI	C:	D. HA	RTM/	AN										
ASSESSMI	ent :														
	CRIT	TICAL FLIGH	ITY T	1	RED	UNDAN	CY	SCRE	ENS	5			CIL ITE	M	
	HI	₩/FU	NC	2	A		В			С					
NASA IOA	[3	3 /3 3 /1R]]	[[]] F]	[[P]]	[[P]]		[[]]	*
COMPARE	[/N]	[]	4]	(N]	[N]		[]	
RECOMMEN	NDAT]	CONS:	(If	di	ffe	rent	fro	om NA	SA)					
	[1]	[]	[]	[]	(AI	[DD/D] ELF	CTE)
* CIL R	eten:	rion :	RATION	ALE	: (If ap	pl	icabl	e) Il	IA IAN	DEQUATI DEQUATI	E	[[]	
REMARKS	: Ees V	WITH	NASA F	MEA	•	e .									

REPORT DATE 2/26/88

- ----

C-358

ASSESSMENT DATE: 1/29/88 NASA DATA: BASELINE [ASSESSMENT ID: FRCS-400] NEW [X] NASA FMEA #: 05-6KF-2253B-1 SUBSYSTEM: FRCS MDAC ID: 400 ITEM: DIODE LEAD ANALYST: D. HARTMAN ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL ITEM FLIGHT HDW/FUNC Α В С

 NASA
 [3/2R]
 [P]
 [P]
 [P]
 [] *

 IOA
 [3/1R]
 [F]
 [P]
 [P]
 [X]

COMPARE [/N] [N] [] [N] **RECOMMENDATIONS:** (If different from NASA) [3/1R] [P] [NA] [P] Γ (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE Γ INADEQUATE [1 **REMARKS:** LOSE GPC COMMAND TO OPEN THE VALVE. MANUAL COMMANDING STILL AVAILABLE. LOSS OF ALL REDUNDANCY MAY CAUSE INABILITY TO EXPEL PROPELLANTS TO MEET CG LIMITS.

ISSUE NOT RESOLVED AT THE 1/20/88 MEETING WITH THE SUBSYSTEM MANAGER.

REPORT DATE 2/26/88

1.....

C-359

1

na sin saar

ASSESSM ASSESSM NASA FM	IENT IENT IEA #	DA IE :	ATE:):	1/29/8 FRCS-4 05-6KF	8 01 '-2	L 225	53B-2					NZ I	ASA DATA BASELINE NEW	: []	x]
SUBSYST MDAC II ITEM:	TEM:):			FRCS 401 DIODE												
LEAD AN	IALYS	ST:	-	D. HAF	T	ian	T									
ASSESS	ENT :	1														
	CRI	TI	CAL	TY		RE	EDUNDA	AN	CY	SCREE	ENS	3		CI TT	L EM	r
	E	IDW	/FUN	iC		A			в			С				
NASI IOI	A [A [3 3	/3 /1R]	[[F]	[[P]	[[P]	[[x] *]
COMPARI	S (/N]	[N]	נ	N]	[N]	[N]
RECOMMI	ENDAT	CIC.	ONS:	(If	d	iff	ferent	t	fro	om NAS	SA))				
	[/]	[]	נ]	[] (A] DD/	DE] ELETE)
* CIL I	RETEN 5: REES	TTI TTI	(ON]	RATIONA	LI ŒZ	E:	(If a	ap	pli	icable	≥) Il	ia Iar	DEQUATE DEQUATE	[[]
													_			,

-

.

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	NT NT A	D/ I) #:	ATE: D:	1/2 FRC 05-	9/8 S-4 6KF	8 02 -22	53A-	·1			N	IASA DATA BASELINI NEV	A: E [W []] x]	
SUBSYSTE MDAC ID: ITEM:	M:			FRC 402 DIO	S DE										
LEAD ANA	LY	ST	:	D.	HAR	TMA	N								
ASSESSME	NT	:													
CRITICALITY REDUNDANCY SCREENS FLIGHT														L EM	
	FLIGHT HDW/FUNC A B C														
NASA IOA	ן נ	3 3	/3 /3	NC A]]	[[]	[[]]	*
COMPARE	[/]		[]	נ]	٢]	[]	
RECOMMEN	DA'	TI	ons:	(If	dif	fere	ent f	r	om N.	ASA)				
. .	ן ק		/]		[]	[]	[] (4] ADD/] DEL	ETE)
* CIL RE	TE	NT	ION	RATI	ONA	LE:	(11	f app	11	icab	le) J INZ	ADEQUATE ADEQUATE	[[]]	
REMARKS: LOSE CAP AVAILABI THRUSTEP	PAB LE. R L	IL EA	ITY LOSS K.	TO C OF	LOS ALL	E V. RE	ALVI DUNI	E WIT DANCY	H J	GPC PREV	. M2 Ents	NUAL CO ISOLATI	MMAN ON O	DIN F A	G STILL
SUBSYSTE	M	MA	NAGE	R SI	ATE	DT	HAT	THE	GI	PC I	S NOT	USED T	o is	OLA	TE A

SUBSYSTEM MANAGER STATED THAT THE GPC IS NOT USED TO ISOLATE A THRUSTER LEAK BECAUSE TIME TO TAKE EFFECT CAN BE UP TO 24 HOURS. SOFTWARE HAS TO BE MANUALLY LOADED. IOA WITHDRAWS THEIR ISSUE BASED ON THIS RATIONALE.

REPORT DATE 2/26/88

-

1

Ē

ASSESSI ASSESSI NASA FI	ient Ient Iea	D2 I1 #:	ATE: D:	1/29 FRC9 05-0	9/88 5-40 6KF-	3 22!	53A-	-2				N7 1	ASA DZ BASELI N	ATA: INE NEW	[[x]	
SUBSYST MDAC II ITEM:	TEM: D:			FRCS 403 DIOI	S DE													
LEAD AN	IALY:	ST	:	D. 1	HART	MAI	N											
ASSESSI	IENT	:																
	CR	IT) F]	ICALI LIGHI	TY T		R	EDUN	NDAN	ICY	SCI	REENS	5			CI II	:L 'EM	1	
	1	HDV	/FUN	IC		A			В			С						
NASI IOI	A [A [3 3	/3 /1R]	ן נ	F]]	[Р]]	[[P]		[[x]]	*
COMPARI	5 [/N]	[N]	[N]	۵	N]		[N]	
RECOMM	ENDA	FI C	ONS:	(1	If d	if	fere	ent	fr	om N	NASA)	I						
-	[1]	<u>ן</u>]	(]	[]	(AD	[D/	'DE] :LE	TE)
* CIL I	RETEI	T	ION F	RATIC	ONAL	E:	(11	f ap	pl	icat	ole)	7.1	NEOTING		r		1	
	• .										IN	IAI	DEQUAL	re Pe	[]	
IOA AGI	REES	W]	CTH N	IASA	FME	A.								_				
				-				1.1.1.1										

_

-

•

-

F F

÷.,

....

REPORT DATE 2/26/88

- - -

ASSESSMENT DATE: 1/29/88 NASA DATA: BASELINE [] ASSESSMENT ID: FRCS-404 NEW [X] 05-6KF-2253A-1 NASA FMEA #: SUBSYSTEM: FRCS 404 MDAC ID: ITEM: DIODE LEAD ANALYST: D. HARTMAN ASSESSMENT: CIL CRITICALITY REDUNDANCY SCREENS ITEM FLIGHT ВС HDW/FUNC A IASA [3/3] [] [] [] IOA [3/3] [] [] [] NASA 1 COMPARE [/] [] [] ſ 1 **RECOMMENDATIONS:** (If different from NASA) [] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE Ε and and the same INADEQUATE [1 **REMARKS:**

LOSE CAPABILITY TO CLOSE VALVE WITH GPC. MANUAL COMMANDING STILL AVAILABLE. LOSS OF ALL REDUNDANCY PREVENTS ISOLATION OF A THRUSTER LEAK.

SUBSYSTEM MANAGER STATED THAT THE GPC IS NOT USED TO ISOLATE A THRUSTER LEAK BECAUSE TIME TO TAKE EFFECT CAN BE UP TO 24 HOURS. SOFTWARE HAS TO BE MANUALLY LOADED. IOA WITHDRAWS THEIR ISSUE BASED ON THIS RATIONALE.

REPORT DATE 2/26/88

_

_

-

_

1

ASSES ASSES NASA	SSME SSME FME	NT NT A ‡	DZ II ‡:	ATE: D:	1/29 FRC9 05-0	9/88 5-405 6KF-2:	253A-	2		N	ASA DATA BASELINI NET	A: E [W []	(]	
SUBSY MDAC ITEM:	(STEI ID:	M:			FRCS 405 DIOI	S DE								
LEAD	ANA	LYS	ST :	:	D. 1	HARTM	AN							
ASSES	SME	NT:	:											
CRITICALITY REDUNDANCY SCREENS FLIGHT													, 	
		E	F1 IDV	/FUI	NC	ż	A	В		с		TUF	M	
NA I	HDW/FUNC A B C NASA $3/3$ [] [] [] IOA $3/3$ [] [] [] PARE [] [] []] '	*
COMPA	RE	נ		/]	נ]	[]	[1	[]	
RECOM	MENI	DAI	IC	ons:	(]	[f di:	ffere	nt fr	om 1	NASA)				
		[/]	C]	[]	[] (2	[ADD/I] DELE:	FE)
* CII	L RE	ren	IT]	ION I	RATIC	ONALE	: (If	appl	icab	ole) A	DEQUATE	[]	
REMAR	RKS:	REN	ICE	cs.		. g. at	·····	47. 2221	·Z	INA	DEQUATE	[]	21
											· · · · · ·			
				1000 - 100 - 11			-12	1.1.14g		·	a an I			÷ .
										÷.,÷				

REPORT DATE 2/26/88

·

n de la Nome de la composition C-364

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-406 05-6KF-2253 -1		NASA DATA: BASELINE NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 406 DIODE			
LEAD ANALYST:	D. HARTMAN			
ASSESSMENT:				
CRITICAL	ITY REDUNDA	NCY SCREEN	S	CIL
HDW/FU	NC A	В	С	11201
NASA [2 /1R IOA [3 /3] [P]] []	[F] [[] [P]]	[X]* []
COMPARE [N /N] [И]	[м]	N]	[N]
RECOMMENDATIONS:	(If different	from NASA	.)	
[3 /3] []	ניז נ] (Al	[D] DD/DELETE)
* CIL RETENTION	RATIONALE: (If a	opplicable) I	ADEQUATE NADEQUATE	
REMARKS: NASA FMEA CONTAI EFFECT.	NS MULTIPLE FAII	URES. THI	S FAILURE	ALONE HAS NO

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

-

ASSESSME ASSESSME NASA FME	NT 1 NT 1 A #	DATE: ID: :	1/29/ FRCS- 05-61	′88 •407 (F-22	253 -	-2		1	VASA DATA BASELINE NEV	1: 5 [7 []] (]	
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 407 DIODE	E					-	-		
LEAD ANA	LYS'	r:	D. H2	RTM	N							
ASSESSME	NT:											
	CRI	FICAL	ITY T	F	REDUN	IDANCY	SCF	REENS		CII	EM	
	CRITICALITY REDUNDANCY SCREENS FLIGHT HDW/FUNC A B C											
NASA IOA	[: [:	3 /3 3 /3]	[[]]	[[]]	[[]]	[[]]	*
COMPARE	[/]	[]	[]	[]	[]	
RECOMMEN	DAT:	IONS:	(If	dif	fere	ent fr	om N	IASA)				
-	נ	/]	Ι]	נ]	. [] (A] DELE	TE)
* CIL RE	TEN	FION	RATION	IALE:	(If	appl	.icab	ole) A INA	DEQUATE DEQUATE	[[]	
NO DIFFE	RENG	CES.	· · · · · · · · · · · · · · · · · · ·			-						

تک

502 F

.

REPORT DATE 2/26/88 C-366

ASSESSMENT DATE: 1/29/88 NASA DATA: ASSESSMENT ID: BASELINE [FRCS-408 1 NEW [X] NASA FMEA #: 05-6KF-2253E-1 SUBSYSTEM: FRCS MDAC ID: 408 ITEM: DIODE LEAD ANALYST: D. HARTMAN ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL ITEM FLIGHT C HDW/FUNC В A IASA [3 /1R] IOA [3 /3] [P] [P] NASA [P] E] Ē 1 Î. 1 1 1 COMPARE [/N] Γ] **RECOMMENDATIONS:** (If different from NASA) [(ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE ſ 1 **REMARKS:** NASA FMEA CONSIDERS MULTIPLE FAILURES. THIS FAILURE ALONE HAS NO EFFECT.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

C-367

and a second

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-409 05-6KF-2253E-2	NASA DATA: BASELINE [] NEW [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 409 DIODE	
LEAD ANALYST:	D. HARTMAN	

ASSESSMENT:

	CRI	TICAL	JTY	R	EDUN	DANCY	C SCR	EENS			CII TTT	L RM	
	H	DW/FU	NC	A		I	3	(2		± ± ±	JX ¹	
NASA IOA	[[3 /3 3 /3]	[[]]	[[]]	[[]]		[[] *]	
COMPARE	[1]	[].	[]	[]		[]	
RECOMME	NDAT:	IONS:	()	f dif	fere	nt fi	com N	IASA)					
-	[/	1	[]	[]	[]	(A	[DD/I] DELETI	E)
* CIL R	eten	TION	RATIC	ONALE:	(If	app]	licab	le)	ADEQU.	ATE	[]	
REMARKS	:							INA	ADEQU.	ATE	[]	

____ ·

=

.

NO DIFFERENCES.

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	NT NT A	D/ I) #:	AT D:	E:	1/ FR 05	29/8 CS-4 -6KI	88 11(7-2	0 225	53 -:	L				N2 I	ASA DA BASEL: 1	ATA: INE NEW	[[x]]	
SUBSYSTE MDAC ID: ITEM:	M:				FR 41 DI	CS 0 ODE														
LEAD ANA	LY	ST	:		D.	HAI	۲T	MAN	1											
ASSESSME	NT	:																		
	CR	IT		AL	[TY	,		RI	DUNI	DÄN	CY	SCR	EENS	5			CI TT	L FEN	,	
]	HD	W/	FUN	1C			A			в			С					•	
NASA IOA	[[2 3	/	'1R '3]]		[[P]	[[F]	[[P]]		[[х]	*
COMPARE	[N	/	'N]		[N]	[N]	נ	N]		[N]	
RECOMMEN	DA'	FI	ON	is:		(If	đ	if	fere	nt	fre	om N.	ASA)						
	[3		3]		[]	[]	[]	(AI	[)D/	D /DI] SLF	ETE)
* CIL RE	TE)	NT	10)N I	RAT	ION	AL)	E:	(If	ap	pl :	icab	le) I	ai Nai	DEQUA' DEQUA'	re Fe	[[]]	
REMARKS:																				

NASA FMEA CONTAINS MULTIPLE FAILURES. THIS FAILURE ALONE HAS NO EFFECT.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

2

: 2...5

ASSESSMENT DAT ASSESSMENT ID: NASA FMEA #:	E: 1/29/80 FRCS-42 05-6KF	B 11 -2253 -	·2		NASA DAT BASELIN NE	A: E (W (X]						
SUBSYSTEM: MDAC ID: ITEM:	FRCS 411 DIODE												
LEAD ANALYST:	D. HART	MAN											
ASSESSMENT:													
CRITIC	ALITY	REDUN	DANCY S	CREENS	5	CIL) 17.5						
HDW/	FUNC	A	В		С	TLE	M						
NASA [3 / IOA [3 /	3] 3][]	[] []	[[]]	[[] *]						
COMPARE [/] [: J	[]	[]	[]						
RECOMMENDATION	S: (If d	liffere	nt from	NASA)	1								
[/] []	[]	[]	[ADD/D] ELETE)						
(ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE [] REMARKS: NO. DIFFERENCES													

•••=

= -

REPORT DATE 2/26/88

. ÷ '

.

ASSESSMENT DATE: 1/29/88 NASA DATA: BASELINE [ASSESSMENT ID: FRCS-412] NEW [X] 05-6KF-2253F-1 NASA FMEA #: SUBSYSTEM: FRCS MDAC ID: 412 ITEM: DIODE LEAD ANALYST: D. HARTMAN ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM HDW/FUNC A В С] * NASA [3 /3] Ţ IOA [3 /3] 1 COMPARE [/] [] [] [] **RECOMMENDATIONS:** (If different from NASA)] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE Γ] INADEQUATE [] **REMARKS:** NO DIFFERENCES.

REPORT DATE 2/26/88

: =:::

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	: 1/29/88 FRCS-413 05-6KF-2	253F-2	2	NASA DAT BASELIN NE	A: E [] W [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 413 DIODE				
LEAD ANALYST:	D. HARTN	IÀN			al a su
ASSESSMENT:					
CRITICAL	LITY	REDUNI	ANCY SCRI	EENS	CIL
HDW/FU	JNC	A	В	C	1 I CM
NASA [3/3 IOA [2/11	a] [] F]	[] [F]	[] [P]	[] * [X] .
COMPARE [N /N] [N]	[N]	[N]	[N]
RECOMMENDATIONS:	: (If di	fferen	t from NA	ASA)	
[/] []	[]	[]]	[] ADD/DELETE)
* CIL RETENTION	RATIONALE	: (If	applicab	Le) Adequate Inadequate	[] []
IOA AGREES WITH	NASA FMEA	L •			1

Ξ

==

REPORT DATE 2/26/88

÷.

.....

ASSESSME ASSESSME NASA FME	-1					N/ F	ASA BASE	DAT ELIN NE	A: E W	[[X]						
SUBSYSTE MDAC ID: ITEM:	E M :		FR 41 DI	CS 4 ODE									-				
LEAD ANA	LYS	r:	D.	HART	MA	N											
ASSESSME	en t :																
	CRI	TICAL FLIGH	ITY T NC		R A	EDU	NDA	NC	2	SCRE	ENS	S C				CIL ITE	M
NA CA		2 /17	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		 			- -		1	r	ъ	٦			r	1 *
IOA	L [3 / 1 R 3 / 3]	ļ]		[]	5]	ĺ	E	1			[- <u>j</u> -
COMPARE	[/N]	1	N]		[]	J]	נ	N]			נ	1
RECOMMEN	NDAT	IONS:		(If d	lif	fer	ent	f	ro	m NA	SA)					e sta
	נ	1]	I]		[]	נ]	(AD	[0/D] ELETE)
* CIL RI	eten	TION	RAT	IONA	LE:	(1	fa	pp:	li	cabl	e) Il	AI NAI	DEQU	JATE JATE		[[]]
REMARKS																	

IOA AGREES WITH NASA FMEA.

1

5-7

Warrs Warrs

.

-

-

-

REPORT DATE 2/26/88

ASSESSMI ASSESSMI NASA FMI	ENT ENT EA	D. I #:	ATE: D:	1/ FR 05	29/88 CS-415 -6KF-22	53D-	-2		1	NASA DA' BASELII NI	FA: NE (EW []] x]	
SUBSYST MDAC ID ITEM:	ем: :			FR(41) DI(CS 5 ODE								
LEAD AND	ALY	ST	:	D.	HARTMA	N							
ASSESSM	ENT	:											
	CR	IT		JTY	R	EDUN	IDANCY	SCR	EENS		CI	L	
		HD	W/FU	IT INC	A		E	3	(3	11	<u>- 191</u>	
NASA IOA	[[3 3	/3 /3]]	[[]]	[[]]	[[]	[[]]	*
COMPARE	[/]	ſ]	[3	[]	[]	
RECOMMEN	NDA'	TI	ons:		(If dif	fere	ent fr	om N	ASA)		e len et l'è		
	נ		/]	ľ]	C]	נ]] (ADD/I] DELE	TE)
* CIL RI	ETE)	NT	ION	RAT	IONALE:	(If	appl	icab	le) INZ	ADEQUATI ADEQUATI	2 [2 []	-
REMARKS	: ERE	NC	ES.							···	 		

=

-

_

_

-

REPORT DATE 2/26/88

ASSESSMENT DATE ASSESSMENT ID: NASA FMEA #:	: 1/29/88 FRCS-41 05-6KF-	6 -225	3D-1]	NASA DA BASELI 1	ATA INE NEW	: [x]]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 416 DIODE									
LEAD ANALYST:	D. HARI	MAN								
ASSESSMENT:										
CRITICA FLIG	LITY HT	RE	DUNDAI	NCY	SCREE	ens			CIL ITE	M
HDW/F	UNC	A		В		(С			
NASA [3 /1 IOA [3 /3	R] [] [P]	[P []	[]	P]]]		[[] *]
COMPARE [/N] [N]	[א]	[]	N]		[]
RECOMMENDATIONS	: (If d	liff	erent	fro	om NAS	SA)				
] [ו	[]	[]	(A	[DD/D] ELETE)
* CIL RETENTION REMARKS:	RATIONAL	LE:	(If a	ppli	icable	≥) IN	ADEQUA' ADEQUA'	re Fe	[]
IUA AGREES WITH	MADA IMI	· ^ ·								

REPORT DATE 2/26/88

- -

-

100 1917

_

ASSESSMI ASSESSMI NASA FMI SUBSYSTI	ENT D ENT I EA #: EM:	ATE: D:	1/29/0 FRCS 05-6K	88 417 F-22!			N	IASA DATA BASELINI NEV	A: 5 [7 []] X]		
MDAC ID ITEM:	:		417 DIODE									
LEAD AN	ALYST	•	D. HAI	RTMAI	A							
ASSESSM	ENT:											
	CRIT F	ICAL	ITY F	RI	EDUNDA	NCY	SCREI	ens		CI IT	L EM	
	HD	W/FUI	NC	A		В		C	2			
NASA IOA	[3 [3	/3 /3].	[[]	[[]	[[]]	[[]	*
COMPARE	נ	/]	[]	[]	[]	[]	
RECOMME	NDATI	ons:	(If	dif	ferent	: fro	om NAS	SA)				
	[/]	[]	[]	[]	[\DD/] DELE	TE)
* CIL R REMARKS NO DIFF	ETENT : ERENC	ION H ES.	RATION	ALE:	(If a	appli	icable	e) A INA	DEQUATE DEQUATE	[[]]	

널

ē

_

Ī

REPORT DATE 2/26/88

• ,

C-376

12

· · · · · · · · · · ·

ASSESSMENT DATE: 1/29/88 NASA DATA: ASSESSMENT ID: FRCS-418 BASELINE [] NEW [X] NASA FMEA #: 05-6KF-2253E-1 SUBSYSTEM: FRCS MDAC ID: 418 ITEM: DIODE LEAD ANALYST: D. HARTMAN ASSESSMENT: REDUNDANCY SCREENS CIL CRITICALITY FLIGHT ITEM C HDW/FUNC Α В [P] [P] [P] [3 /1R] NASA IOA [3/3] [] [1] [N] [N] [N] COMPARE [/N] Γ 1 **RECOMMENDATIONS:** (If different from NASA) [3/3][][] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [INADEQUATE [1 **REMARKS:** NASA FMEA CONSIDERS MULTIPLE FAILURES. THIS FAILURE ALONE HAS NO EFFECT.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

C-377

· · · · · · · · · · · ·

ASSESSME ASSESSME NASA FME	ENT ENT EA #	D/ II :	ATE: D:	1/2 FRC 05-	29/88 CS-419 -6KF-22	2			NASA DA BASELI 1	ATA: INE NEW	[[X]]	-	
SUBSYSTE MDAC ID: ITEM:	E M :			FRO 419 DIC	CS 9 DDE				-					
LEAD ANA	LYS	ST	:	D.	HARTMA	N								
ASSESSME														
	CRI	רד) די		ITY	R	DANCY	SCR	REENS	3		CIL	м		
	F	ID	W/FU	NC	A		F	3		С		- - - -		
NASA IOA	[[3 3	/3 /3]	[[]	[[]]	[[]		[[]]	*
COMPARE	[/]	ſ]	[]	[]		[]	
RECOMMEN	IDAJ	CI (ONS:	l	(If dif:	fere	nt fr	om N	IASA)) ·				
	[/]	[]	[]	[]	(AD	[D/ D)] ELE	TE)
* CIL RE	ETEN	T	ION	RATI	EONALE:	(If	appl	licab	ole) IN	ADEQUA NADEQUA	re Fe	[]]	
REMARKS: NO DIFFE	EREN	IC]	ES.											

.

REPORT DATE 2/26/88

-

C-378

and the second of the second
ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-42 05-6KF-	0 2253 -1	L	NASA I BASEI	DATA: LINÉ [] NEW [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 420 DIODE				
LEAD ANALYST:	D. HART	MAN	=	.	
ASSESSMENT:					
CRITICAL	ITY	REDUNI	ANCY SC	REENS	CIL
HDW/FU	NC	A	В	С	ITEM
NASA [2 /1F IOA [3 /3	;] [] [P]]	[F] []	[P] []	[X]* []
COMPARE [N /N] [N]	[N]	[N]	[N]
RECOMMENDATIONS:	(If d	ifferer	t from	NASA)	
[3 /3] []	[]	[]	[D] (ADD/DELETE)
* CIL RETENTION	RATIONAL	E: (If	applica	ble) ADEQUA	ATE []
REMARKS: NASA FMEA CONTAI EFFECT.	NS MULTI	PLE FAI	LURES.	THIS FAILU	JRE ALONE HAS NO
AT MEETING WITH	SUBSYSTE	M MANAG	ER ON 1	/20/88, NSI	S 22206 WAS

AT MEETING WITH SUBSISTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

. .

==

-

64

C-379

· · · · · · · · · ·

ASSESSMEI ASSESSMEI NASA FMEI	NT E NT I A #:	DATE:	1/29/ FRCS- 05-6K	88 421 F-22	53 -2	2		1	NASA DAT. BASELIN NE	A: E [W [X]]
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 421 DIODE								
LEAD ANA	lysi	::	D. HA	RTMA	N						
ASSESSME	NT:										
(CRIT	ICAL	ITY	R	EDUNI	DANCY	SCR	EENS		CIL	M
	HC	W/FU	NC	A		B	1	(2	±10	
NASA IOA	[3 [3	3 /3 3 /3]]	[[]]	[[]]	[[]]	[[] *]
COMPARE	[/]	[]	נ]	[]	[]
RECOMMEN	DATI	IONS:	(If	dif	ferei	nt fr	om N	iasa)			
	נ	1]	[]	[ן	נ] (] ADD/D] ELETE)
* CIL RE	TENI	NOI	RATION	ALE:	(If	appl	icab	ole) IN	ADEQUATE ADEQUATE	[[]]
REMARKS:		-									

1

_

-1_____

NO DIFFERENCES.

REPORT DATE 2/26/88

C-380

and a second

ASSESSME ASSESSME NASA FME	ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-422 NASA FMEA #: 05-6KF-2253A-										N	IASA BASE	DATA LINE NEW	: [[}] (]		
SUBSYSTE MDAC ID: ITEM:	EM	:			FF 42 DI	RCS 2 CODE											
LEAD ANA	Ľ	YS	T	:	D.	HAF	RTM	AN									-
ASSESSME	EN	r :															
	C	RI ਸ	T) F]	ICAI LIGH	LITY IT	Z		REDÙNI a	DANC	Y SCR	EENS	•		CII ITH	L E M		
	HDW/FUNC A											· .		r	,	-	
NASA IOA		[[3	/3 /3]		L []	Ľ]	[]		L []	*	
COMPARE		[/]		[]	[]	[1		[]		: <u>-</u>
RECOMMEN	1D	AT	I	ons:	;	(If	di	fferer	nt fi	rom N	IASA)						
\$		[/]		[]	[]	[]	(A)	[DD/I] DELE	TE)
* CIL RI	ET.	EN	T:	ION	RAI	TON	LE	: (If	app	licab	ole)						
				·							7 In7	ADEQU ADEQU	IATE IATE	[[]		
REMARKS LOSE CAI AVAILABI THRUSTEI	PA LE R	BI • LE	L:] A]	ITY LOSS K.	TO 5 OI	CLOS ALI	SE L R	VALVE EDUNDA	WITI NCY	H GPC PREV	. MA VENTS	NUAL ISOL	, COM ATIO	MANI N OI	DING F A	5 S'	TILL
SUBSYSTI THRUSTEI SOFTWARI BASED OI	em R E N	M LE HA TH	Al Al S	NAGI K BI TO S RJ	ER S ECAU BE ATIC	STATI JSE 7 MANU DNALI	ED FIM UAL E.	THAT 1 E TO 1 LY LOI	THE (TAKE ADED	GPC I EFFE . IC	S NOT CT CA DA WIT	r use An be Thdra	D TO UP (WS T	ISC TO 2 HEII	DLAT 24 H R IS	IOU SSU	A RS. E

τ. -

-

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA # :	1/29/88 FRCS-423 05-6KF-2253A-	2	NASA DATA: BASELINE NEW	[] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 423 DIODE			. . .
LEAD ANALYST:	D. HARTMAN			
ASSESSMENT:				
CRITICAL	ITY REDUN	DANCY SCREE	NS	CIL
FLIGH HDW/FUN	IC A	В	C	TIEM
NASA [3 /3 IOA [3 /1R] []] [F]	[] [P]	[] [P]	[] * [X]
COMPARE [/N] [N]	[И]	[N]	[N]
RECOMMENDATIONS:	(If differe	nt from NAS	A)	
[/] []	[]	[] (AI	[] DD/DELETE)
* CIL RETENTION F	RATIONALE: (If	applicable) ADEQUATE INADEOUATE	[]
REMARKS: IOA AGREES WITH M	NASA FMEA.	•		

;

REPORT DATE 2/26/88

÷...

C-382

<u>.</u>

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-424 NASA FMEA #: 05-6KF-2254 -1 SUBSYSTEM: FRCS														N2 I	ASA DATA BASELINE NEW	: []	x]		
SUBSYSTE MDAC ID: ITEM:	M:			FR 42 DI	CS 4 ODE													-		
LEAD ANA	LYS	ST :	:	D.	HAI	RTI	MAI	N							··· .	· · · · ·				
ASSESSMENT:																				
CRITICALITY REDUNDAN FLIGHT										ĊY		SCRE	ENS	3	ang pertenang en ser s	Ċ]	L	r		
	F	HDV	N/FUI	NC			A			E	3			С		T 1	LEP	1		
NASA IOA	[[2 3	/1R /3]]	NC A B C] [P] [F] [P]] [] [] []]	[[X]	*		
COMPARE	[N	/N]		נ	N]	נ	N	ſ]	[N]	[N]		
RECOMMEN	DA'	FI (ONS:		(If	đ	if	fei	rent	fr	:0	m NA	sa))						
	נ	3	/3]		[]	[]	[] (A)] DD,	D /DI] ELI	ETE)	
* CIL RE	TEI	NT:		RAI	ION	AL	E:	(1	If ap	pl	.i	cabl	.e)			r		٦		
			÷ .	1	-								II	IAN IAN	DEQUATE	[] 1		
REMARKS: NASA FME EFFECT.	A (201	NSID	ERS	MU	LT:	IP	LE	FAIL	UF	ε	s.	TH	IS	FAILURE	A]	Loi	ΝE	HAS	NO
										_									_	

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

E. 3

ad is sure a

C-383

1997 - 19

·· .

ASSESSMI ASSESSMI NASA FMI	ENT D. ENT I EA #:	ATE: D:	1/29/8 FRCS-4 05-6KH	38 125 7-225	54 -2		NASA DATA: BASELINE [] NEW [X]						
SUBSYSTI MDAC ID: ITEM:	EM : :		FRCS 425 DIODE										
LEAD ANA	ALYST	:	D. HAP	RTMAN	T								
ASSESSMI	ent :												
	CRIT	ICAL	ITY	RE	EDUND	ANCY	SCREE	ens		CIL ITEM			
	HD	W/FUI	NC	A		В		С			-		
NASA IOA	[3 [3	/3 /3]]	[[]]	[[]	[[]]	[[] *]		
COMPARE	[/]	[]	[]	[]	[]		
RECOMMEN	NDATI	ons:	(If	diff	feren	t fro	om NAS	SA)					
	[/]	[]	[]	[] (Al] נס/סס] ELETE)		
* CIL R	ETENT	ION	RATION	ALE:	(If	appl:	icable	≥) Al INAI	DEQUATE DEQUATE	[]		
REMARKS NO DIFF	: ERENC	ES.											

and a second second second second second

-

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-426 05-6KF-22	254C-1		NASA DATA: BASELINE [] NEW [X]							
SUBSYSTEM: MDAC ID: ITEM:	FRCS 426 DIODE										
LEAD ANALYST:	D. HARTMA	N									
ASSESSMENT:											
CRITICAL		EDUND	ANCY SCRI	EENS	CIL ITEM						
HDW/FU	NC A	L	В	С							
NASA [3 /1R IOA [3 /1R	[] [F	?] ?]	[P] [P]	[P] [P]	[] * [X]						
COMPARE [/	א] [•]	[]	[]	[N]						
RECOMMENDATIONS:	(If dif	fferen	t from NA	ASA)							
[/] []	[]	[]	[] ADD/DELETE)						
* CIL RETENTION REMARKS:	RATIONALE:	: (If	applicab	le) ADEQUATE INADEQUATE	[] []						
IOA AGREES WITH	NASA FMEA.	•									

REPORT DATE 2/26/88

÷ :

C-385

ASSESSME ASSESSME NASA FME	ASSESSMENT DATE: 1/29/8 ASSESSMENT ID: FRCS-4 IASA FMEA #: 05-6KF							54C-	-2					N .	asa Basi	DATA: ELINE NEW	: [[x]	
SUBSYSTE MDAC ID: ITEM:	M:			FF 42 DI	RCS 7 CODE									-				. 312.		·
LEAD ANA	LYS	T:	:	D.	HAI	۲T	MAI	R												
ASSESSME	NT:																			
	CRI	T] TI	ICAL	ITY r			RJ	EDUI	NDA	NC	CY	sc	REENS	5			C:	L PEN	Л	
	H	DV	V/FUI	NC			A				В			С		-			•	
NASA IOA	[[3 3	/3 /1R]]		[[F]]		[[P]]	[[P]]		[[x]]	*
COMPARE	C		/N]		[N]		[N]	[N]		۵	N]	
RECOMMEN	DAT	'IC	ons:		(If	d:	if	fere	ent	1	fro	m	NASA)	I						
	[/	ן		[]		[]	נ]	(AI	[)D/	⁄DI] CLF	ETE)
* CIL RE	TEN	TI	ION 1	rat	ION	11	:3	(11	faj	PF	51 i	Lca	ble) IN	a Iai	DEQU DEQU	JATE JATE	[[]]	
REMARKS: IOA AGRE	ES	WJ	(TH)	NAS	A FN	ŒΖ	A.													

REPORT DATE 2/26/88

±.7

·

 _

÷2.

e de s

.

ASSESSME ASSESSME NASA FME	L/29/88 NASA I FRCS-428 BASEJ D5-6KF-2254C-1								ASA DA BASEL	DATA: LINE [] NEW [X]									
SUBSYSTEM:FRCSMDAC ID:428ITEM:DIODE																			
LEAD ANA	LY:	5T	:	D.	HAR	T	MAN	4											
ASSESSME	ENT	:																	
	CR	IT: F:	ICAL LIGH	ITY F			RI	EDU	ND	ANC	Y	SCR	EENS	5			C] I]	IL TEM	[
]	HD	W/FUI	NC			A				B			С					
NASA IOA	[[3 3	/1R /1R]]		[[P F]]		[[P P]	[[P P]]		[[x] *
COMPARE	[/]		[N]		[]	נ]		[N]
RECOMMEN	IDA'	rI(ons:		(If	đ	if	fer	ent	t f	r	om N.	AŚĂ))	4 .⊽				
	נ		/]		[]		[]	נ]	(A)] DD,	/DE] LETE)
* CIL RI	ETE)	NT:	ION	RAT	IONA		Е:	()	[fa	app	11	lcab	le) Il	A IA	DEQUA DEQUA	TE TE	[[]]
TOA AGRI	: FES	W	тты 1	NAS	A FN	E)	Δ_										-	-	

REPORT DATE 2/26/88

F

ASSESSME ASSESSME NASA FME	-2				NZ I	ASA DA BASEL	ATA: INE NEW	[[x]]	. 1						
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 429 DIOD	E													
LEAD ANA	lyst	:	D. H	ARTI	MAN	T											
ASSESSME	NT:																
(CRIT	ICAL	ITY		RE	DUN	IDAN	CY	SC	REENS	5			CI	L	-	
	F HD	W/FUI	I' NC		A			в			С			1.1	. Er	1	
NASA IOA	[3 [3	/3 /1R]	[[F]]	[[P]]	[[P]]		[[x]	*
COMPARE	נ	/N]	נ	N]	[N]	[N]		[N]	
RECOMMEN	DATI	ons :	(I	f d:	iff	ere	ent	fr	om I	NASA)							
	[/]	<u>ן</u>]	נ]]]	(AE	[)D/	'DE] SLE	TE)
* CIL RE	TENT	ION I	RATIO	NALI	2:	(If	f ap	pl :	ical	ble) TN	AI IAT	DEQUA	re re	[]	
REMARKS: IOA AGRE	ES W	ITH 1	NASA	FME/	A .						•••••			L		L	

F

1

Ī

ź

· 🖬 👌

REPORT DATE 2/26/88 C-388

a setter and

· ++ . . .

.

÷...

ASSESSME ASSESSME NASA FME	NT DA NT II A #:	ATE: D:	1/29 FRC9 05-6	9/88 5-430 5KF-22	54F-	·1		N	DATA LINE NEW	: [[X]		
SUBSYSTE MDAC ID: ITEM:	:M:	FRCS 430 DIOI					• • •			:			
LEAD ANA	LYST	:	D. H	IARTMA	N								-
ASSESSME	NT:												
	CRIT		ITY	R	EDUN	IDANCY	SCR	EENS			CIÌ	ı M	
	HD	W/FU	NC	NC A				c	:		TIC	11	
NASA IOA	[3 [3	/3 /3]]	[[]	[[]	[[]		[[]]	*
COMPARE	[/]	ſ]	Ľ]	[]		[]	
RECOMMEN	DATI	ons:	(1	f dif	fere	ent fro	om N	ASA)		.,	۰ <u>۵</u>		
e lut el 1.1	<u> </u>	/	1	ſ]	[]	C]	(A] DELE	TE)
* CIL RE REMARKS: NO DIFFE	TENT	ION ES.	RATIO	DNALE:	(If	f appl	icab	le) / IN/	ADEQU ADEQU	ATE ATE	[[]	

REPORT DATE 2/26/88

C-389

na mana any amin'ny ana amin'ny fanana amin'ny fanana amin'ny fanana amin'ny fanana amin'ny fanana amin'ny fan Ana amin'ny fanana ami Ana amin'ny fanana ami

ASSESSMENT ASSESSMENT NASA FMEA #	DATE: ID: :	1/29/88 FRCS-43 05-6KF	8 31 -225	4F-2				NASA DA BASELII NI	FA;_ NE [EW [x]]	
SUBSYSTEM: MDAC ID: ITEM:		FRCS 431 DIODE										
LEAD ANALYS	ST:	D. HAR	rman	r								
ASSESSMENT:												
CRI	TICAL	ITY r	RE	DUNDA	NCY	SCRE	ENS		C T	IL TEN	ſ	
H	IDW/FUI	NC	A		в			С	*	-	•	
NASA [IOA [3 /3 2 /1R]]	((F]	[[F]]	[[] P].	[נ	x] *]	ţ
COMPARE [N /N]	(N]	[N]	[N]	ĩ	N]	
RECOMMENDAI	lons:	(If d	diff	erent	: fr	om NAS	SA)					
C	/]	נ]	[]	[]] (ADD	/DF] ELET	'E)
* CIL RETEN	TION I	RATIONA	LE:	(If a	ppl	icable	e) IN	ADEQUATI ADEQUATI	E [E []]	
REMARKS: IOA AGREES	WITH I	NASA FMI	EA.						-			

REPORT DATE 2/26/88 C-390

· · ·

the state of the

- Bialden

= ;
ASSESSMENT DATE: 1/29/88 NASA DATA: BASELINE [ASSESSMENT ID: FRCS-432 1 05-6KF-2254D-1 NEW [X] NASA FMEA #: SUBSYSTEM: FRCS MDAC ID: 432 ITEM: DIODE LEAD ANALYST: D. HARTMAN ASSESSMENT: CIL CRITICALITY REDUNDANCY SCREENS FLIGHT ITEM HDW/FUNC A В С [P] NASA [3/1R][P] [P]] * [IOA [3/3] [] [] [] ſ 1 COMPARE [/N] [N] [N] [] **RECOMMENDATIONS:** (If different from NASA)] [] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [INADEQUATE [j **REMARKS:** IOA AGREES WITH NASA FMEA.

REPORT DATE 2/26/88

.

12

_

_

-

-

-

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-433 NASA FMEA #: 05-6KF-2254D-2							NASA DATA: BASELINE [] NEW [X]					
SUBSYSTEM:		FRCS										
MDAC ID:		433										
ITEM:		DIODE										
LEAD ANALYS	C:	D. HAP	RTMAN	I			: -					
ASSESSMENT:												
CRI	TICAL	ITY	RI	EDUNDA	NCY	SCRE	EENS		CIL			
1	FLIGH	Г	_		-			_	ITEM			
H	W/FU	NC	A		В	5		C				
NASA [3 /3	1	ſ	1	ſ	1	ſ	1	[]*			
IOA [3 /1R	j	Γ̈́Γ	j	[P	j	Ē	рĵ	[X]			
	/1-7				e		,		r N 1			
COMPARE [/N]	[N]	ĹN]	l	NJ	[N]			
		/ 7 £		Forant								
RECOMMENDAT.	LONS:	(11	airi	rerent		OII NA	19M)					
ſ	1	1	[]	[]	[]	[]			
		•	-	-	-	-		(2	DD/DELETE)			
* CIL RETEN	TION 1	RATIONA	LE:	(If a	ppl	icabl	le)					
							T 11	ADEQUATE				
DENADES .							TN.	ADEQUATE	LJ			
IOA AGREES	WITH I	NASA FN	ÆA.						. .			

C-392

747 A, 1999 - 1999 - ---

ASSESSMENT DATE: 1/29/88 NASA DATA: ASSESSMENT ID: FRCS-434 BASELINE [1 NEW [X] NASA FMEA #: 05-6KF-2254B-1 SUBSYSTEM: FRCS MDAC ID: 434 DIODE ITEM: LEAD ANALYST: D. HARTMAN ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL ITEM FLIGHT В С HDW/FUNC A IASA [3/2R] [P] IOA [3/1R] [F] NASA [3/2R][P] [P] [P] [P] COMPARE [/N] [N] [] [] ſ] RECOMMENDATIONS: (If different from NASA) [3/1R] [P] [NA] [P] Γ] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [INADEQUATE 1 ſ **REMARKS:** LOSE GPC COMMAND TO OPEN THE VALVE. MANUAL COMMANDING STILL

LOSE GPC COMMAND TO OPEN THE VALVE. MANUAL COMMANDING STILL AVAILABLE. LOSS OF ALL REDUNDANCY MAY CAUSE INABILITY TO EXPEL PROPELLANTS TO MEET CG LIMITS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

- ANY 1

C-393

ASSESSMENT DATE: 1/29/88 NASA DATA: ASSESSMENT ID: FRCS-435 BASELINE [] NEW [X] NASA FMEA #: 05-6KF-2254B-2 FRCS SUBSYSTEM: MDAC ID: 435 ITEM: DIODE LEAD ANALYST: D. HARTMAN ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL ITEM FLIGHT A в с HDW/FUNC NASA [3 /3] [] [P] [] [P] [] [F] IOA [3/IR] i x j COMPARE [/N] [N] [N] [N] **RECOMMENDATIONS:** (If different from NASA) ſ (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE [1 **REMARKS:** IOA AGREES WITH NASA FMEA. ~

REPORT DATE 2/26/88

20

C-394

ASSESSMENT DATE: 1/29/88 NASA DATA: BASELINE [ASSESSMENT ID: FRCS-436 1 NEW [X] NASA FMEA #: 05-6KF-2254B-1 FRCS SUBSYSTEM: MDAC ID: 436 ITEM: DIODE LEAD ANALYST: D. HARTMAN ASSESSMENT: CIL REDUNDANCY SCREENS CRITICALITY FLIGHT ITEM В С HDW/FUNC A [3 /2R] [P] [P] [P] NASA [3 /1R] [F] [P] [P] IOA COMPARE [/N]] Г 1 **RECOMMENDATIONS:** (If different from NASA) [3/1R] [P] [NA] [P] 1 [(ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE Ĩ INADEQUATE Γ] **REMARKS:**

LOSE GPC COMMAND TO OPEN THE VALVE. MANUAL COMMANDING STILL AVAILABLE. LOSS OF ALL REDUNDANCY MAY CAUSE INABILITY TO EXPEL PROPELLANTS TO MEET CG LIMITS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

C-395

and the second second

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-437 05-6KF-2254B-2	VASA DATA: BASELINE [] NEW [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 437 DIODE	a taitor a taitor ann an ann an ann an ann an ann an ann an a
LEAD ANALYST:	D. HARTMAN	
ASSESSMENT:		
CRITICAL	ITY REDUNDANCY SCREENS	CIL
HDW/FU	NC A B	C
NASA [3 /3 IOA [3 /1R] [] [] []] [F] [P] []] []* ?] [X]
COMPARE [/N] [N] [N] [1	4] [И]
RECOMMENDATIONS:	(If different from NASA)	
[/	3 [] [] [] [] (ADD/DELETE)
* CIL RETENTION H REMARKS: IOA AGREES WITH P	RATIONALE: (If applicable) // IN/ NASA FMEA.	ADEQUATE [] ADEQUATE []

Ĩ

i, †

~ *

REPORT DATE 2/26/88

ASSESSMENT DATE: 1/29/88 NASA DATA: ASSESSMENT ID: FRCS-438 BASELINE [NEW [X] 05-6KF-2254A-1 NASA FMEA #: SUBSYSTEM: FRCS 438 MDAC ID: ITEM: DIODE LEAD ANALYST: D. HARTMAN ASSESSMENT: CRITICALITY REDUNDANCY SCREENS ĆÍL ITEM FLIGHT C HDW/FUNC A В NASA [3 /3 [[] I] [[IOA [3 /3] 1 COMPARE [/] 1 ſ 1 **RECOMMENDATIONS:** (If different from NASA) (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [

REMARKS: LOSE GPC COMMAND TO CLOSE THE VALVE. MANUAL COMMANDING STILL AVAILABLE. LOSS OF ALL REDUNDANCY MAY CAUSE THE INABILITY TO ISOLATE A LEAK.

INADEQUATE [

1

SUBSYSTEM MANAGER STATED THAT THE GPC IS NOT USED TO ISOLATE A THRUSTER LEAK BECAUSE TIME TO EFFECT IS UP TO 24 HOURS (SOFTWARE HAS TO BE MANUALLY LOADED). IOA WITHDRAWS THEIR ISSUE BASED ON THIS RATIONALE.

REPORT DATE 2/26/88

ASSESSMEI ASSESSMEI NASA FMEI	NT DA NT II A #:	ATE: D:	1/29/8 FRCS-4 05-6KH	/88 -439 KF-2254A-2					NASA DATA: BASELINE [] NEW [X]]]	
SUBSYSTEN MDAC ID: ITEM:	4:		FRCS 439 DIODE													
LEAD ANA	LYST	•	D. HAF	NTS	AN											
ASSESSME	NT:															
(CRIT	[CAL]	[TY	1	RE	DUNDA	N	CY	SCRE	ENS	3		CI	L		
	F1 HDV	N/FUN	1C	j	A			B			С		IT	EM		
NASA IOA	[3 [3	/3 /1R]	[[]	F]	[[P]	[[P]	[[х] *]	
COMPARE	[/N]	[]	N]	נ	N]	[N]	[N].	
RECOMMENI	DATIC	ONS:	(If	di:	ff	erent	: 1	fro	om NA:	SA))					
	[/]	[]	[]	[] (A] DD/	DE] LETE	:)
* CIL RET	FENT	ION I	RATIONA	LE	:	(If a	p	91 j	cabl	e) Il	AI JAI	DEQUATE DEQUATE	[]]	
REMARKS: IOA AGREI	es W:	ITH N	NASA FN	ſΕΑ	•							-	-		-	

REPORT DATE 2/26/88

.....

Ξ...Ξ

- - - -

MDAC ID: ITEM:	:M :		440 DIOI	FRCS 440 DIODE							
LEAD ANA	LYS	T:	D. H	IARTM	AN						
ASSESSME	NT:						-				
	TICAL FLIGH	JITY T	ITY REDUND. T			DANCY SCREENS			CIL ITEM		
	H	DW/FU	NC	2	A	E	3	(2		
NASA IOA	[[3 /3 3 /3]	[[]]	[[]]	[[]]]	1
COMPARE	[/]	[]	[]	[]	t :	ł
RECOMMEN	IDAT	'IONS:	()	f di:	ffere	ent fr	on l	IASA)			
	נ	/]	Γ]	Γ]	ſ]	[(ADD/DE	 1 E J
* CIL RE	TEN	TION	RATIC	NALE	: (If	appl	licak	ole)			
					·			IN	ADEQU <i>I</i> ADEQU <i>I</i>	ATE [ATE []
REMARKS: LOSE GPC AVAILABI ISOLATE	CO E. A L	MMAND LOSS EAK.) TO (; OF)	LOSE	THE EDUNI	VALVE DANCY	E. N May	(ANUA) CAUS	l Comn E The	IANDING ST INABILITY	ווז ר ז
SUBSYSTE THRUSTEF HAS TO E	EM M R LE BE M	IANAGE IAK BE IANUAI	CAUSI	ATED (E TIM DADED)	THAT E TO).]	THE G EFFEC OA WI	PC 1 T IS THDE	IS NO? S UP ? RAWS ?	r usei 1024 Their) TO ISOLA HOURS (SO ISSUE BAS	NTE OFJ SEI

REPORT DATE 2/26/88 C-399

...

and the second secon

ASSESSME ASSESSME NASA FME	NT I NT I A #:	DATE:	1/29/ FRCS- 05-61	54A-	NASA DATA: BASELINE [] NEW [X]							
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 441 DIODI	5								
LEAD ANA	LYSI	:	D. H2	ARTMA	N				=			
ASSESSME	NT:											
	CRIĨ	ICAL	ITY	R	EDUN	IDANCY	SCR	EENS			CII	
	HĽ	W/FU	NC	А	•	E	3	Ċ	2		111	2M
NASA IOA	[3 [3	/3 /3]	[[]	[[]]	[[]]		[[] *]
COMPARE	C	/]	[]	[]	[]		[]
RECOMMEN	DATI	ONS:	(11	t dif	fere	ent fr	om N	ASA)				
	[/]	[]	[]	C]	(AI	[0D/1] DÉLETE)
* CIL RE	TENI	NOIS	RATIO	VALE:	(If	f appl	icab.	le) / IN/	ADEQUA ADEQUA	TE TE	[[]
NO DIFFE	RENC	ES.										

REPORT DATE 2/26/88

C-400

.

NASA DATA: ASSESSMENT DATE: 1/29/88 BASELINE [ASSESSMENT ID: FRCS-442 NEW [X] NASA FMEA #: 05-6KF-2254 -1 SUBSYSTEM: FRCS MDAC ID: 442 DIODE ITEM: LEAD ANALYST: D. HARTMAN ASSESSMENT: REDUNDANCY SCREENS CIL CRITICALITY ITEM FLIGHT В С HDW/FUNC Α [F] [] [P] [] NASA [2 /1R] IOA [3 /3] [P] [X]* Ī 1 1 COMPARE [N/N] [N] [N] [N] **RECOMMENDATIONS:** (If different from NASA) [D] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE [1 **REMARKS:** NASA FMEA CONSIDERS MULTIPLE FAILURES. THIS FAILURE ALONE HAS NO EFFECT.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-443 05-6KF-2254 -2		NASA DATA BASELINE NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 443 DIODE		· · · · ·	
LEAD ANALYST:	D. HARTMAN			
ASSESSMENT:				
CRITICALI	ITY REDUNDA	NCY SCRE	ENS	CIL
HDW/FUN	IC A	B	C	
NASA [3 /3 IOA [3 /3] []	[] []		[] * []
COMPARE [/] []	[]	[]	[]
RECOMMENDATIONS:	(If different	from NA	SA)	
[/] []	[]	[] (AI	[] DD/DELETE)
* CIL RETENTION F REMARKS: NO DIFFERENCES.	RATIONALE: (If a	pplicabl	e) ADEQUATE INADEQUATE	

;

-----.

REPORT DATE 2/26/88 C-402

C - 7

ASSESSMENT DAT ASSESSMENT ID: NASA FMEA #:	E: 1/29/88 FRCS-44 05-6KF-	4 2254E-:	1	NASA DA' BASELII Ni	TA: NE [] EW [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 444 DIODE				
LEAD ANALYST:	D. HART	MAN			
ASSESSMENT:					
CRITIC	ALITY	REDUN	DANCY SC	REENS	CIL
FL. HDW/	GHT FUNC	A	В	C	1.1.EM
NASA [3 / IOA [3 /	'3]['3][]	[] []	[] []	[] *
COMPARE [/	′) []	[]	[]	[]
RECOMMENDATION	IS: (If d	liffere	nt from :	NASA)	
[/	') (]	[]	[]	[] (ADD/DELETE)
* CIL RETENTION REMARKS: NO DIFFERENCES	ON RATIONAL	LE: (If	applica	ble) ADEQUAT INADEQUAT	E [] E []

REPORT DATE 2/26/88

=

Ξ.___

ASSESSMI ASSESSMI NASA FMI	SSESSMENT DATE: 1/29/88 SSESSMENT ID: FRCS-445 ASA FMEA #: 05-6KF-2254E-2								4	IASA BASE	DATA: LINE NEW	[[}] []	
SUBSYSTI MDAC ID: ITEM:	EM : :]	FRC: 445 DIO	S DE									
LEAD ANA	ALYS	ST:	1	D . 1	HARTM	AN								
ASSESSMI	en t :	:												
	CRI	TIC	ALI	TY	F	REDUN	DANCY	SCR	EENS			CII	J	
	H	IDW/	FUN	с	1	A	F	3	c	2		TUE	m	
NASA IOA	[[3 / 3 /	3]	[[]]	[[]]	[[]		[[]]	*
COMPARE	[1]	[]	Ľ]	[]		[]	

RECOMMENDATIONS: (If different from NASA)

[/	·]	j i	[]] [[]	i l	[]		[]	
								(ADI)/DEL	ETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE	[]
INADEQUATE	[]

REMARKS: NO DIFFERENCES. 15

1

.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-446 05-6KF-2254	-1	NASA DATA: BASELINE [] NEW [X]						
SUBSYSTEM: MDAC ID: ITEM:	FRCS 446 DIODE								
LEAD ANALYST:	D. HARTMAN								
ASSESSMENT:									
CRITICAL	ITY REDU	NDANCY SCREE	INS	CIL					
HDW/FUI	NC A	В	С						
NASA [2 /1R IOA [3 /3] [P]] []	[F] []	[P] []	[X]* []					
COMPARE [N /N] [N]	[N]	[N]	[N]					
RECOMMENDATIONS:	(If differ	ent from NAS	A)						
[3 /3] []	[]	[] (A	[D] DD/DELETE)					
* CIL RETENTION]	RATIONALE: (I	f applicable) ADEQUATE INADEQUATE	[]					
REMARKS: NASA FMEA CONSID EFFECT.	ERS MULTIPLE	FAILURES. T	HIS FAILURE	ALONE HAS NO					

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-447 IASA FMEA #: 05-6KF-2254 -2								NASA DATA: BASELINE [] NEW [X]							
SUBSYSTE MDAC ID: ITEM:	:M:		FRCS 447 DIOI	; DE					 				· · · · · · · ·			
LEAD ANA	LYSI	::	D. H	IARTM	AN											
ASSESSME	NT:															
	CRIT	ICAL	LITY	1	REDUN	DANCY	SCR	REENS			CII	, , ,				
	HI	W/FU	IT INC	2	A	В		c	2		1.1.1	-141				
NASA IOA	[3 [3	/3]	[[]]	[[]	[[]]		[[]	*			
COMPARE	[/]	[]	[]	ſ	1		[]				
RECOMMEN	DATI	ons:	(1	f di	ffere	nt fr	om N	iasa)								
	[/]	[]	נ]	Γ.]	(Al	[DD/[] DELF	ETE)			
* CIL RE	TENI	TION	RATIC	DNALE	: (If	appl	icab	ole) P INP	DEQUA'	re re	[]]				
WO DTLLE	, 1 , 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,	ه چانده														

REPORT DATE 2/26/88

공동 승규의 이 전 이 이름 문제품이다.

-

â

ī

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-448 05-6KF-2254F-	1	NASA DATA BASELINE NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 448 DIODE			
LEAD ANALYST:	D. HARTMAN			
ASSESSMENT:				
CRITICAL	ITY REDUN	DANCY SCRE	ENS	CIL
HDW/FU	NC A	В	С	115M
NASA [3 /3 IOA [3 /3] []	[] []	[] []	[] * []
COMPARE [/] []	[]	[]	[]
RECOMMENDATIONS:	(If differe	ent from NA	SA)	
[/] []	[]	[] (A	[] .DD/DELETE)
* CIL RETENTION	RATIONALE: (If	applicabl	e) ADEQUATE INADEQUATE	[] []

NO DIFFERENCES.

_

-

ASSESSMEI ASSESSMEI NASA FMEA SUBSYSTEI MDAC ID: ITEM:	NT NT A # M:		ATE: D:	1/ FR 05 FR 44 DI	29/8 CS-4 -6KI CS 9 ODE	38 149 7-2) 225	54F	-2						NA B	SA D BASEL	ATA: INE NEW	[[х]	
LEAD ANA	LYS	ST :	:	D.	HAF	2TI	IAN	1													
ASSESSME	NT :																				
(CRI	T: F]	ICALI LIGHI	CTY C			RI	EDU	NDA	NO	CY	sc	REEN	12				C] I]	IL TEM	I	
	F	ID	V/FUI	1C			A				В				С						
NASA IOA	[[3 2	/3 /1R]]		[[F]	-	[[F]	[P]		[[x]]	*
COMPARE	[N	/N]		[N]		[N]	[[N]		۵	N]	
RECOMMEN	DAI		ONS:		(If	d:	if	fer	ent	: 1	fro	m	NASA	4)							
	[/]		[]		[]	[[]	(AI	[)D/	DE] :LE	TE)
* CIL RE	ren -	IT:	ION I	RAT	IONF	L	E :	(1	fa	ıpı	pl j	LCa	ble) I) EN	AD AD	EQUA	TE TE	[]	
IOA AGRE	ES	W.	ITH 1	NAS	A FN	ſE2	Α.														

REPORT DATE 2/26/88

_

-

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-450 NASA FMEA #: 05-6KF-2254D-1											N	ASA BAS	DAT ELIN NEV	A: E [V [x]]						
	SUBSY MDAC ITEM:	(STE ID:	M:			FF 45 DI	CS 0 CODE															
	LEAD	ANA	LYS	5T	:	D.	HAI	RTI	MAI	N												
	ASSES	SME	N'T :	:																		
		(CR	IT: F]	ICAL	ITY F			RI	EDU	NDAI	NC	Y	SCI	REEN	s			CI IT	CL CEN	4	
			1	HDI	W/FUI	NC			A				B			С					-	
	N <i>A</i> I	ISA IOA	[[3 3	/1R /3]]		[[P]	1	[[P]]	((P]]		[[]]	*
	COMPA	RE	[/N]		נ	N]	1	[N]	נ	N]		[]	
	RECOM	IMENI	DA'I	FI (ONS:		(If	d:	if	fei	rent	f	rc	om l	NASA)						
			נ		/]		[]	[[]]]	(2	[ADD/	/DI] SLE	TE)
	* CII REMAR	KS:	ren Ss	TT:	[ON]	RAT	IONA A FM		E:	(]	f a <u>r</u>	p	1j	.cat	ole) I	A NAI	DEQ DEQ	UATE UATE	[[]]	

REPORT DATE 2/26/88

......

= =

ASSESSME ASSESSME NASA FME	DATE: ID: :	1/29, FRCS- 05-61	2		Ň	iasa 1 Basei	DATA LINE NEW	: [}] (]				
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 451 DIODI	E				-					
LEAD ANA	LYS	г:	D. H	ARTMA	N								
ASSESSME	NT:												
	CRI	FICAL	ITY	R	EDUN	DANCY	C SCR	EENS			CII TTF	M	
	H	DW/FU	NC	A		E	3	C	2		***	34 A	
NASA IOA	[[3 /3 3 /3]]	[[]]]]]]	[[]]		[[] *	k
COMPARE	[1]	[]	ſ]	[]		[]	
RECOMMEN	DAT	IONS:	(I	f dif	fere	ent fi	com N	ASA)					
	ľ	/]	C]	[]	[]	(A)] 1\00] DELET	ΓE)
* CIL RE	'TEN'	TION	RATIO	NALE:	(If	appl	Licab	le) / IN/	ADEQU ADEQU	ATE ATE	[[]	
NO DIFFE	REN	CES.											

=

-

_

_

_

_

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-452 05-6KF-22		NASA DATA BASELINE NEW	: [] [X]	
SUBSYSTEM: MDAC ID: ITEM:	FRCS 452 DIODE				
LEAD ANALYST:	D. HARTMA	N			
ASSESSMENT:					
CRITICAL	ITY R	EDUNDA	NCY SCRE	ENS	CIL
HDW/FU	NC A		B	с	<u>i i em</u>
NASA [3 /1R IOA [3 /3] [P]]]	[P] []	[P] []	[]* []
COMPARE [/N] [N]	[N]	[א]	[]
RECOMMENDATIONS:	(If dif	ferent	from NA	SA)	
[/] []	[]	[] (A	[] DD/DELETE)
* CIL RETENTION T REMARKS: IOA AGREES WITH	RATIONALE: NASA FMEA.	(If a	pplicabl	e) ADEQUATE INADEQUATE	[] []

REPORT DATE 2/26/88

÷....

ASSESSME ASSESSME NASA FME SUBSYSTE MDAC ID: ITEM:	NT D NT I A #: M:	ATE: D:	1/29 FRCS 05-6 FRCS 453 DIOD	/88 -453 KF-22 E	54D-	-2		N	ASA DATA BASELINE NEW] K]
LEAD ANA	LYST	:	D. H	ARTMA	N						
ASSESSME	NT:										
	CRIT F	ICAL LIGH	ITY T	R	EDUN	IDANCY	SCR	EENS		CII ITI	L E m
	HD	W/FU	NC	А	•	E	3	C	2		
NASA IOA	[3 [3	/3 /3]	[[]]	[[]]	[[]]	[[] *]
COMPARE	[/]	C]	C]	ľ]	[]
RECOMMEN	DATI	ONS:	(I	f dif	fere	ent fr	om N	iasa)			
	[/]	[]	[]	[]	[]] DELETE)
* CIL RE REMARKS: NO DIFFE	TENT	ES.	RATIO	NALE:	(11	appl	icab.	ole) A INA	DEQUATE DEQUATE	[]]

REPORT DATE 2/26/88

.....

-

#

_

ASSESSME ASSESSME NASA FME	-1		1	NASA BASE	DATA LINE NEW	: [[]] (]						
SUBSYSTE MDAC ID: ITEM:	2 M :		FRCS 454 DIOD	Е									
LEAD ANA	LYST:	:	D. H	ARTMA	N			· •					
ASSESSME	ENT:												
	CRITI	CAL	ITY	R	EDUN	IDANCY	SCR	EENS			CII	J	
	HDW	I/FU	NC	A		I	3	(2		1.1.1	M	
NASA IOA	[3 [3	/3 /3]	[[]]	[[]]	[[]]		[[] '	*
COMPARE	[/]	[]	[]	[]		[]	
RECOMMEN	DATIC)NS:	(1	f dif	fere	ent fr	com N	ASA)					
	[/]	נ]	[]	C]	(A	[DD/1] DELE:	ΓE)
* CIL RE REMARKS: NO DIFFE	TENTI	ON	RATIO	NALE:	(11	app]	licab	le) / IN/	ADEQU ADEQU	ATE ATE	[[]]	

REPORT DATE 2/26/88

-

- -

• •

-

_

-

هة

-

÷

-

=

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-455 05-6KF-22			N.	ASA DATA: BASELINE NEW	: [x]	
SUBSYSTEM: MDAC ID: ITEM:	FRCS 455 DIODE							
LEAD ANALYST:	D. HARTMA	N						
ASSESSMENT:								
CRITICAL	TY R	EDUND	ANCY	SCREE	INS		CIL	r
HDW/FUN	IC A		В		С		T T Dir	Ł
NASA [3 /3 IOA [3 /3] [] []]	[[]]	[[]]	[[] *]
COMPARE [/] []	[]	[]	[]
RECOMMENDATIONS:	(If dif	feren	t fro	om NAS	SA)			
[/] []	נ]	נ] (A)] DD/DE] ELETE)
* CIL RETENTION I REMARKS: NO DIFFERENCES.	RATIONALE:	(If	appl:	icable	e) A INA	DEQUATE DEQUATE	[[]

REPORT DATE 2/26/88

NASA DATA: ASSESSMENT DATE: 1/29/88 FRCS-456 BASELINE [] NEW [X] ASSESSMENT ID: NASA FMEA #: 05-6KF-2254 -1 SUBSYSTEM: FRCS MDAC ID: 456 ITEM: DIODE LEAD ANALYST: D. HARTMAN ASSESSMENT: REDUNDANCY SCREENS CIL CRITICALITY FLIGHT ITEM HDW/FUNC В С A [F] [] [P] [X] * [2 /1R] NASA [P] IOA [3/3] ſ 1 [1 [N] COMPARE [N /N] **RECOMMENDATIONS:** (If different from NASA) [3/3] [] [] [] [D] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [1 INADEQUATE [] **REMARKS:** NASA FMEA CONSIDERS MULTIPLE FAILURES. THIS FAILURE ALONE HAS NO EFFECT.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

E. 3

_

_

Ξ

ta da constructiona

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-457 NASA FMEA #: 05-6KF-2254A-2								1	NASA DA BASELI N	TA: NE [EW []	X]	
SUBSYSTE MDAC ID: ITEM:	EM:		FRCS 457 DIOI	5 De								
LEAD ANA	LYS	r:	D. I	IARTMAI	N							
ASSESSME	ENT :											
	CRI	FICAL	ITY	RI	EDUN	IDANCY	SCR	EENS		CI	L EM	
	H	DW/FU	NC	A		E	3	C	C			
NASA IOA	[3 /3 3 /3]	[[]	[[]]	[[]	[[]]	*
COMPARE	[/]	ſ]	[]	[]	[]	
RECOMMEN	IDAT:	IONS:	(]	[f dif:	fere	ent fr	om N	ASA)				
	ľ	/]	[]	[]	[]	[(ADD/)] DELE	TE)
* CIL RE	ETEN'	TION	RATIC	ONALE:	(If	appl	.icab	le) / IN/	ADEQUAT ADEQUAT	E [E []	
REMARKS: NO DIFFE	EREN	CES.								- 	-	

REPORT DATE 2/26/88

diata in the second
NASA DATA: ASSESSMENT DATE: 1/29/88 BASELINE [] NEW [X] ASSESSMENT ID: FRCS-458 05-6KF-2254A-1 NASA FMEA #: SUBSYSTEM: FRCS MDAC ID: 458 ITEM: DIODE LEAD ANALYST: D. HARTMAN ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM B C C A HDW/FUNC NASA [3/3] [] IOA [3/3] [] [Г 1 COMPARE [/] [] [] r ı RECOMMENDATIONS: (If different from NASA) ſ] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE Γ INADEQUATE [1 REMARKS: LOSE GPC COMMAND TO CLOSE THE VALVE. MANUAL COMMANDING STILL AVAILABLE. LOSS OF ALL REDUNDANCY MAY CAUSE THE INABILITY TO ISOLATE A LEAK.

SUBSYSTEM MANAGER STATED THAT THE GPC IS NOT USED TO ISOLATE A THRUSTER LEAK BECAUSE TIME TO EFFECT IS UP TO 24 HOURS (SOFTWARE HAS TO BE MANUALLY LOADED). IOA WITHDRAWS THEIR ISSUE BASED ON THIS RATIONALE.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-459 05-6KF-2254 -2	NASA DATA: BASELINE NEW	[] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 459 DIODE		n in articum
LEAD ANALYST:	D. HARTMAN		
ASSESSMENT:			
CRITICAL	ITY REDUNDA	NCY SCREENS	CIL
FLIGH HDW/FUN	r NC A	B C 200 M	LIEM
NASA [3 /3 IOA [3 /1R] []] [F]	[] [] [P] [P]	[X] *
COMPARE [/N] [N]	[N] [N]	
RECOMMENDATIONS:	(If different	from NASA)	
[/] []	[] [] (AD	[] D/DELETÉ)
* CIL RETENTION I	RATIONALE: (If a	pplicable) ADEQUATE INADEQUATE	[]
REMARKS: IOA AGREES WITH 1	NASA FMEA.		

REPORT DATE 2/26/88 C-418

=

-

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-460 05-6KF-2206 -	-1	NASA DATI BASELINI NEV	A: E [] V [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 460 DRIVER, HYBRI	D		
LEAD ANALYST:	D. HARTMAN			
ASSESSMENT:				
CRITICAI FLIGH	LITY REDUN	IDANCY SCRE	ENS	CIL ITEM
HDW/FU	INC A	В	C	
NASA [3 /3 IOA [3 /3] []	[] []	[]	[] * []
COMPARE [/] []	[]	[]	[]
RECOMMENDATIONS:	(If differe	ent from NA	SA)	· · <u>· · · · · · · · · · · · · ·</u>
[3 /2R	[P]	[₽]	[P] (#	[] ADD/DELETE)
* CIL RETENTION	RATIONALE: (If	applicabl	e) ADEQUATE INADEQUATE	
REMARKS: THIS FAILURE MAY POSITION. REDUN TO FALSELY FAILI OPERATIONS.	CAUSE LOSS OF DANCY PROVIDED NG THE VALVE C	ACCURATE LOSS OF LOSED, POS	INDICATION (ALL REDUNDA SIBLY EFFECT	OF THE VALVE ANCY MAY LEAD TING MISSION
ISSUE NOT RESOLV	ED AT MEETING	WITH SUBSY	STEM MANAGER	R ON 1/20/88.

.

REPORT DATE 2/26/88

-

ASSESSME	D	ATE:	1/29/	/88			NZ	ASA DATA	.: ! r	1		
NASA FME		<u> </u>		05-61	KF-22	06 -	2			NEW	ר <u>ו</u> א	;]
SUBSYSTE MDAC ID: ITEM:	EM:			FRCS 461 DRIVI	ER, H	YBRI	D					
LEAD ANA	LYS	5 T :	:	D. H2	ARTMA	N						
ASSESSME	ENT	:										
	CRI	ÍT:	ICAL	ITY	R	EDUN	DANCY	SCI	REENS		CII	' M
	I	F) HDI	W/FUI	I' NC	A		В		С		115	.1.1
NASA IOA	[[3 3	/3 /3]]	[[]]	[[]]	[[]]	[[] *]
COMPARE	[/]	C]	[]	Γ]	Γ]
RECOMMEN	IDA:	FI (ons:	(I:	f dif	fere	ent fro	om 1	NASA)			
	[3	/2R]	[₽]	[P]	[P]] .DD/D] DELETE)
* CIL RE	etei	NT	ION	RATIO	NALE:	(If	appl	ical	ole) Al	OFOUATE	r	1
									INA	DEQUATE	້ເ	j
REMARKS: THIS FAI		RE	MAY	CAUS	E LOS	S OF	ACCU	RATI	E INDIO	CATION C	F TH	E VALVE

POSITION. REDUNDANCY PROVIDED. LOSS OF ACCORATE INDICATION OF THE VALVE TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

ASSESSMENT DATE: 1/29/88 NASA DATA: BASELINE [ASSESSMENT ID: FRCS-462 NASA FMEA #: 05-6KF-2206 -1 NEW [X] SUBSYSTEM: FRCS MDAC ID: 462 ITEM: DRIVER, HYBRID LEAD ANALYST: D. HARTMAN **ASSESSMENT:** CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM HDW/FUNC A В С NASA [3 /3] [] [] []] IOA [3/3] 1 1 1 ſ ٦ COMPARE 1 ſ ſ ſ 1 1 ſ] **RECOMMENDATIONS:** (If different from NASA) [3/2R] [P] [P] [P] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [1 INADEQUATE [1 **REMARKS:** THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS. ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

÷....

ASSESSMI ASSESSMI NASA FMI	ENT ENT EA (DA II #:	ATE: D:	1/29/8 FRCS-4 05-6KH	88 63 7-22	:06 - 2				NASA DAT BASELIN NI	'A: IE SW	[x] ·]	
SUBSYSTI MDAC ID ITEM:	EM : :			FRCS 463 DRIVER	х, Н	IYBRID)							
LEAD AND	ALYS	ST	:	D. HAI	RTMA	N								
ASSESSM	ENT	:												
		TY REDUNDANCY SCREEN					EENS		(CIL ITEM				
	1	F1 HDV	N/FU	NC	7	7	В			С	•		•	
NASA IOA	[[3 3	/3 /3]]	[[]	[[]]	[]		[] ;	*
COMPARE	[/]	[]	[]	[]		נ]	
RECOMMENDATIONS: (If different from NASA)														
	[3	/2R]	[]	?]	[P]	[P]	(AD	[D/D:] ELE'	TE)
* CIL R	ETE:	NT	ION	RATION	ALE:	: (If	appl	icab]	le) IN	ADEQUATI	E	[]]	

Ξ

2:2

 \equiv

REMARKS:

THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-464 05-6KF-22	07 -1		NASA DATA: BASELINE [] NEW [X]						
SUBSYSTEM: MDAC ID: ITEM:	FRCS 464 DRIVER, H	YBRID		··· ··· ··· ··· ··· ··· ··· ··· ··· ··	 Remains the second secon					
LEAD ANALYST:	D. HARTMA	N								
ASSESSMENT:										
CRITICAL	JITY R	EDUNDANC	SCREEN	15	CIL TTEM					
HDW/FU	INC A	. 1	3	С	7 7 <u>1 1</u> 1					
NASA [3 /3 IOA [3 /3] [] [] [] [] [] [[]*					
COMPARE [/] [] [] ([]]	[]					
RECOMMENDATIONS:	(If dif	ferent fi	com NASP	A)						
[3 /2R	L] [P	, j [j	۹ آ ۹	[P] (A	[] DD/DELETE)					
* CIL RETENTION	RATIONALE:	(If app)	licable)		<i>r</i> ,					
REMARKS:			I	ADEQUATE INADEQUATE						
THIS FAILURE MAY POSITION. REDUN TO FALSELY FAILI OPERATIONS.	CAUSE LOS DANCY PROV NG THE VAL	S OF ACCU IDED. LA VE CLOSEI	JRATE IN DSS OF A D, POSSI	IDICATION O ALL REDUNDA IBLY EFFECT	F THE VALVE NCY MAY LEAD ING MISSION					

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88 C-423

Ξ.

₹.3 =

-

z_7

- -

3

-

.

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-465 NASA FMEA #: 05-6KF-2207 -2							NASA DATA: BASELINE [] NEW [X]									
SUBSYST MDAC ID ITEM:	EM: :			FRCS 465 DRIVEI	R, I	IYBI	RID									
LEAD AND	ALY	ST	:	D. HAI	RTM	лN										
ASSESSM	ENT	:														
CRITICALITY REDUND						JNDA	DANCY SCREENS					CIL ITEM				
]	HD	W/FU	NC	1	A		B			С					
NASA IOA	[נ	3 3	/3 /3]]	[[]]		[[]]] []]		[[]]	*
COMPARE	נ		/]	[]		[]	C]		[]	
RECOMME	NDA'	TI	ons:	(If	di	ffei	rent	fr	d mc	IASA)						
	ľ	3	/2R]	[]	P]		[P]	[P]	(A] /DD	'DE] :LE	TE)
* CIL R	ETE	NT	ION	RATION	ALE	: (:	[f a	ppl	ical	ole) IN	ADE IADE	QUATE QUATE	[[]	

REMARKS: THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

C-424

_

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-466 05-6KF-220	07 -1		NASA DATA: BASELINE [] NEW [X]						
SUBSYSTEM: MDAC ID: ITEM:	FRCS 466 DRIVER, HY	YBRID								
LEAD ANALYST:	D. HARTMAI	N								
ASSESSMENT:										
CRITICAL FLIGH	ITY RI T	EDUNDANCY	SCREEN	15	CIL ITEN	4				
HDW/FU	NC A	В		С						
NASA [3 /3 IOA [3 /3] [] [] [] []		[[] *]				
COMPARE [/] [] []	[]]	ſ]				
RECOMMENDATIONS:	(If dif:	ferent fro	om NASI	A)						
[3 /2R] [P] [P]	[P] (A] .DD/DI] Elete;				
* CIL RETENTION	RATIONALE:	(If appl:	icable)	ADEQUATE	[]				
REMARKS:			-	LINDUQUALL	L	L				

THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

1

.

ASSESSME ASSESSME NASA FME			ATA: INE NEW	[[x] = ===================================								
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 467 DRIVE	х, НУ	BRID			-	-				
LEAD ANA	LYST	:	D. HAI	RTMAN	ł								
ASSESSME	NT:												
CRITICALITY REDUNDANCY SCRI							SCREE	ENS			CIL ITEM		
	IC A			В		C							
NASA IOA	[3 [3	/3 /3]	[[]	[[]]	[[]		[[] *]	
COMPARE	[1]	[]	[]	[]		[]	
RECOMMEN	DATI	ONS:	(If	dif	ferent	: fro	om NAS	SA)					
	[3	/2R	1	[₽]	[₽]	[P]	(AI	[D/D] ELETE)	
* CIL RE	TENT	ION I	RATION	LE:	(If a	appli	icable	≥) Ai TNA	DEQUA	TE TE	[]	
REMARKS:									Sayon		L	L	

THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88
ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-468 05-6KF-20	03 -1		NASA D BASEL	ATA: INE [] NEW [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 468 FUSE, 1A				
LEAD ANALYST:	D. HARTMA	N	1 g. 1,4		a na sa
ASSESSMENT:					
CRITICAI FLIGH	ITY R T	EDUNDAN	CY SCR	EENS	CIL ITEM
HDW/FU	NC A		В	C	
NASA [3 /1R IOA [3 /3] [P]] [] [] [P]]	[P] []	[] * []
COMPARE [/N) [N] [ן א	[M]	[]
RECOMMENDATIONS:	(If dif	ferent :	from N.	ASA)	
/ <mark>٦</mark>] [J []	[]	[] (ADD/DELETE)
* CIL RETENTION REMARKS: IOA AGREES WITH	RATIONALE: NASA FMEA.	(If ap)	plicab	le) ADEQUA INADEQUA	TE [] TE []

REPORT DATE 2/26/88 C-427

-

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-469 05-6KF-2003 -1	NASA DATA: BASELINE NEW	[x]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 469 FUSE, 1A		
LEAD ANALYST:	D. HARTMAN		-
ASSESSMENT:			
CRITICALI FLIGHT	TY REDUNDANCY	SCREENS	CIL ITEM
HDW/FUN	IC A B	с	
NASA [3 /1R IOA [3 /1R] [P] [P] [P] [P] [P]] [P]	[] * []
COMPARE [/] [] [] []	[]
RECOMMENDATIONS:	(If different fro	m NASA)	
[/] [] [] [] (AI	[] DD/DELETE)
* CIL RETENTION H	RATIONALE: (If appli	cable) ADEQUATE INADEQUATE	[]]

_

=

_

.

.....

NO DIFFERENCES.

REPORT DATE 2/26/88

ASSESSMENT DATE ASSESSMENT ID: NASA FMEA #:	: 1/29/ FRCS- 05-6K	88 470 F-200	04 -1			N	ASA DAT BASELIN NI	CA: NE [EW []] x]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 470 FUSE,	1A							
LEAD ANALYST:	D. HA	RTMA	N						
ASSESSMENT:									
CRITICA FLIG	LITY HT	RI	EDUNDA	NCY	SCREI	ens		CII	L Em
HDW/F	JNC	A		В		С			
NASA [3 /1] IOA [3 /3	R]]	[P []	[P []	[P []	[[] *
COMPARE [/N	נ	[N]	[]]	[N]	נ]
RECOMMENDATIONS	: (If	dif	ferent	fro	om NAS	SA)			
[/]	Γ]	[]	[]] (ADD/1] DELETE)
* CIL RETENTION	RATION	ALE:	(If a	ppli	icable	≥) A INA	DEQUATI DEQUATI	E [E []]
REMARKS: IOA AGREES WITH	NASA F	MEA.							

REPORT DATE 2/26/88

-

ASSESSME ASSESSME NASA FME	ENT ENT EA	D/ I) #:	ATE: D:	1/ FR 05	29/8 CS-4 6-6K1	38 17 7-1	1 20(04 -	-1				N2]	ASA BAS	DATZ ELINI NEV	A: E [V [x]]	
SUBSYSTE MDAC ID: ITEM:	EM :			FR 47 FU	RCS 1 ISE,	12	A												
LEAD ANA	LY	ST	:	D.	HAI	RTI	IAM	4											
ASSESSME	ENT	:																	
	CR	IT F	ICAL	ITY F			R	EDUN	IDAI	ICY	SCI	REEN	S			C I	IL TEN	1	
]	HD	W/FUI	NC			A			В			С						
NASA IOA	[[3 3	/1R /1R]]		[[P P]]		P P]	[[P P]]		[[]	*
COMPARE	[/]		[]	(•]	[]		[]	
RECOMMEN	IDA!	TI	ons:		(If	đ	if	fere	ent	fr	om 1	NASA)						
	[/]		[]	l	•]	ſ]	(1		/DF] SLF	ETE
* CIL RE	TE	NT	ION	RAT	ION	ΥL	E:	(If	fap	pl	ical	ble) I	AI NAI	DEQ	UATE UATE	[r]	
REMARKS: NO DIFFE	: ERE	NC	ËS.											4		L			

-

-

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-472 05-6KF-2126 -1	NASA BASE	DATA: LINE [] NEW [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 472 RELAY		
LEAD ANALYST:	D. HARTMAN		
ASSESSMENT:			
CRITICAL	ITY REDUNDANC	CY SCREENS	CIL ITEM
HDW/FU	NC A	ВС	
NASA [3 /1R IOA [2 /1R] [P] [] [P] [P] [P] F] [P]	[] * [X]
COMPARE [N /	J [] [м][]	[N]
RECOMMENDATIONS:	(If different	from NASA)	er en
[2 /1R] [P] [P] [P]	[A] (ADD/DELETE)
* CIL RETENTION	RATIONALE: (If ap)	plicable)	
		ADEQU INADEQU	ATE [] ATE []
REMARKS: WITH THE LOSS OF TO OPEN VALVE PR PROPELLANTS TO M	THIS RELAY, VALV EVENTS OPERATION (EET CG LIMITS.	E CANNOT BE OPE DF JETS REQUIRE	NED. INABILITY D FOR TO EXPEL

ISSUE IS TIED TO IOA HARDWARE CRITICALITY FOR THE TANK ISOLATION VALVE 1/2 FAILED CLOSED.

REPORT DATE 2/26/88

= :

1 B----

ASSESSMENT DATE: 1/29/88 NASA DATA: BASELINE [] NEW [X] ASSESSMENT ID: FRCS-473 NASA FMEA #: 05-6KF-2126 -2 SUBSYSTEM: FRCS 473 MDAC ID: ITEM: RELAY LEAD ANALYST: D. HARTMAN ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL ITEM FLIGHT HDW/FUNC A B С [P] [X]* NASA [2/1R][F] [P] IOA [3/3] ſ 1 ſ 1 ſ 1 COMPARE [N/N] [N] [N] [N] RECOMMENDATIONS: (If different from NASA) [3/1R] [P] [P] [P] [D] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE [] **REMARKS:** NASA FMEA CONTAINS MULTIPLE FAILURES. THIS, COUPLED WITH THE

LOSS OF ALL HARDWARE REDUNDANCY PREVENTS ISOLATION OF A THRUSTER LEAK.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

i

REPORT DATE 2/26/88

and the second
ASSESSME ASSESSME NASA FME	NT I NT I A #:	DATE:	1/29, FRCS 05-6	/88 -474 KF-2	126A-	-1		NASA BASE	DATA: LINE [NEW [X]
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 474 RELA	Y					• ;	an dona <u>an a</u>
LEAD ANA	LYSI	C:	D. H	ARTM	AN					<u> </u>
ASSESSME	NT:									
	CRIJ	TICAL TLIGH	ITY T		REDUN	IDANCY	SCF	EENS	CII ITE	EM .
	HI	W/FU	NC		A	В		C		
NASA IOA	[3	3 /1R 3 /3]]	[]	P]]	[P []]	[P] []	[[] *]
COMPARE	[/N]	[]	ן א	[N]	[N]	Ĩ]
RECOMMEN	DATI	cons:	(I	f di	ffere	ent fr	om N	IASA)		
	[/]	[]	C]	[]	[(ADD/I] DELETE)
* CIL RE	TENJ	TION	RATIO	NALE	: (If	f appl	icak	ole) ADEQU INADEQU	ATE [ATE []
IOA AGRE	ES V	VITH	NASA	FMEA	•					

· - - .

REPORT DATE 2/26/88

1

- - --

ASSESSMI ASSESSMI NASA FMI	ENT ENT EA	D) I) #:	ATE: D:	1/ FR 05	29/8 CS-4 -6KI	88 175 7-2	5 212	26A	-2					-	NZ E	ASA DAT BASELIN NE	ra: Ne Ew	[[x]]		
SUBSYST MDAC ID ITEM:	EM: :			FR 47 RE	CS 5 LAY																	
LEAD AN	ALY	ST	:	D.	HAF	۲T)	1A)	ł														
ASSESSM	ENT	:																				
	CR	IT F HD	ICAL LIGH W/FU	ITY T NC			RF A	EDU	NDA	NC	CY B	sc	REE	NS	с			CI IT	'L 'EN	1		
NASA IOA	[[3 3	/1R /1R]]		[[P P]]		[[F F]]		[[P P]		[[X X]	*	
COMPARE	נ		/]		[]		[]		[]		נ]		
RECOMME	NDA	TI	ons:		(If	đ	iff	fer	ent	: 1	fro	m	NAS	A)	I							
	[3	/3]		[]		[]		[]	(AI	[)D/	D DI] ELE	ETE)	
* CIL R	ete	NT	ION	RAT	IONZ	L	E :	(I	fa	p	pl i	Lca	able) Ir	AI IAI)EQUATI)EQUATI	E E	[]]		
REMARKS NASA FM EFFECT.	: Ea	CO	NSID	ERS	MUI	UT:	[P]	ĿE	FAI	Ľ	JRI	es.	, T	HJ	s	FAILUF	RE	AI	<i>.</i> 01	ΙE	HAS	NO
AT MEET DISCUSS DUE TO	ING ED. DIF	W Fe	ITH IT W RENT	SUB AS IN	SYSI AGRI TERI	EEI PRI	M N D U ETZ	IAN JPO ATI	AGE N I ONS	R HZ	OI AT OF	I TH NS	L/20 IE I STS	/8 55 22	88, SUE 220	NSTS RAISE 06. TH	22 ED HEF	20 AB REF	6 Ю\ ЮI	WA 7e re,	NS WAS THI	2

Ē

- -

REPORT DATE 2/26/88

ISSUE REMAINS OPEN.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-47 05-6KF-	9 76 -2126A-1	NASA DAT BASELIN NE	A: E [] W [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 476 RELAY			
LEAD ANALYST:	D. HART	MAN		
ASSESSMENT:				
CRITICAL FLIGH	ITY T	REDUNDANC	Y SCREENS	CIL ITEM
HDW/FU	NC	A I	ВС	
NASA [3 /1R IOA [3 /3] [] [P] [1	P] [P]] []	[]*
COMPARE [/N] [N] [N]	м] [М]	[]
RECOMMENDATIONS:	(If d	lifferent fi	rom NASA)	
[/] [] [] [] ([] ADD/DELETE)
* CIL RETENTION	RATIONAL	E: (If app)	licable) ADEQUATE	[]
REMARKS:	NASA FME	'A .	INADEQUATE	LJ
TOR AGAILD WITH		<i>.</i>		
and a strange of the second	a taidi		un dita fullitaria di Al- 1911. E di Constanti di Al-	n felomen and order of the second s

REPORT DATE 2/26/88

ASSESSMEN ASSESSMEN NASA FMEA	Т 1Т 1 1 1	DZ II ‡:	ATE: D:	1/ FR 05	29/88 CS-47 -6KF-2	7 212	26A-	·2				N2 I	ASA DATA BASELINE NEW	: [[x]
SUBSYSTEN MDAC ID: ITEM:	1:			FR 47 RE	CS 7 LAY											
LEAD ANAI	LYS	ST	:	D.	HARTI	MAN	1							• •		
ASSESSMEN	IT:	;														752 () 8
C	R	T] F]	ICALI LIGHI	CTY P		RI	EDUN	IDANO	CY	SC	REENS	;		C: I'	IL Fen	1
	F	IDV	V/FUI	4C		A			B			С				
NASA IOA	[[3 2	/1R /1R]]	[[P P]	[[F F]]	[[P P]	[[X X] *]
COMPARE	נ	N	1]	Ţ]	נ]	נ]	נ]
RECOMMENI	DA:	FI	ONS:		(If d	if	fere	ent i	fro	om 1	NASA)					
	[2	/1R]	[P]	נ	F]	[P] (A] ,DD,	A /DI] Elete)
* CIL RE	rei	n T :	ION I	RAT	IONAL	E:	(If	apı	91 :	ical	ble) IN	A IA	DEQUATE DEQUATE	[[]
REMARKS: NASA FME	A (COI	NSID	ERS	MULT	IP]	LE F	AIL	JR	ES.	THI	s	FAILURE	C	AUS	SES

Ξ

_

=

- --

-

==

-

INABILITY TO OPEN THE VALVE. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY CAUSES INABILITY TO EXPEL PROPELLANTS TO MEET CG LIMITS.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-478 05-6KF-2	126 -1		NASA DAT. BASELIN NE	A: E[] W[X]	
SUBSYSTEM: MDAC ID: ITEM:	FRCS 478 RELAY			 		
LEAD ANALYST:	D. HARTM	AN				
ASSESSMENT:						
CRITICAL FLIGH HDW/FU	ITY I T NC I	REDUNDA	ANCY SCRE	C	CIL ITEM	
NASA [3 /1R IOA [2 /1R] []	P] P]	[P] [F]	[P] [P]	[] [X]	*
COMPARE [N /] []	[N]	[]	[N]	
RECOMMENDATIONS:	(If di	fferent	: from NA	SA)		
[2 /1R] []	P]	[P]	[P] ([A] ADD/DELI	ETE)
* CIL RETENTION	RATIONALE	: (If a	applicabl	.e) ADEQUATE INADEQUATE	[]	
REMARKS: WITH THE LOSS OF TO OPEN VALVE PR PROPELLANTS TO M	THIS REL EVENTS OP EET CG LI	AY, VAI ERATION MITS.	LVE CANNO N OF JETS	T BE OPÉNÉD REQUIRED F	. INABI OR TO EI	LLITY KPEL

ISSUE IS TIED TO IOA HARDWARE CRITICALITY FOR THE TANK ISOLATION VALVE 1/2 FAILED CLOSED.

REPORT DATE 2/26/88

5.3

ASSESSMEN		DA	TE:	1/	29/8	88	`								NZ	ASA	D7	TA	: r		٦	
NASA FMEA	₩. #	:		05	5-6KI		9 212	26 -	•2						. 4		1	IÈŴ	l	X	j	
SUBSYSTEM MDAC ID: ITEM:	[:			FF 47 RF	RCS 79 ELAY																	
LEAD ANAI	'XS'	т:		D.	HAF	۲T	MAN	I														
ASSESSMEN	T:																					
c	RI	TI FI	CALI	CTY r	Z		RI	EDUN	IDA	NC	CY	sc	REE	NS	5				C: I'	IL Fei	M	
	H	DW	/FUN	1C			A				В				С						-	
NASA Ioa	[2 3	/1R /3]		[[P]]		[[F]]		[[P]]			[[X]]	*
COMPARE	[]	N	/N]		[N]		[N]		[N]			נ	N]	
RECOMMEND	AT	IC	NS:		(If	đ	iff	ere	ent	1	fro	m	NAS	A))							
	[3	/1R]		נ	P]		נ	P]		[P]		(A)] DD,	D /DI	ן בדו	ETE)
* CIL RET	EN	TI	ON P	RAJ	TION	L	E:	(If	a	pı	pl i	lca	ble) I1	ia Iai	DEQ	UAI	re re	[[]	
REMARKS:	C .	~ N	נידא דא	JC	MITT	• •	DT.T	גית ה	тт	TT	2110	2	ጥዝ	TS	2	co	וסוז	.ED	- W	נידיז	- म'	гнг

FAILURES. NASA FMEA CONTAINS MULTIPL COULT LOSS OF ALL HARDWARE REDUNDANCY PREVENTS ISOLATION OF A THRUSTER LEAK.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88 C-438

1991年2月2日**安市**寿門(1991年1月)

10.00

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-480 05-6KF-21	L26A-1		NASA DATA BASELINI NEV	A: 5 [] 4 [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 480 RELAY				
LEAD ANALYST:	D. HARTMA	N			
ASSESSMENT:					
CRITICAL	ITY R	REDUNDAN	NCY SCRE	ENS	CIL
HDW/FU	NC A	1	В	с	ITEM
NASA [3 /1R IOA [3 /3] [P]]) [[P] []	[P] []	[]*
COMPARE [/N] [N	ו ני	נא]	[и]	[]]
RECOMMENDATIONS:	(If dif	ferent	from NA	SA)	
[/] [] ([]	[]	[] ADD/DELETE)
* CIL RETENTION REMARKS: IOA AGREES WITH	RATIONALE:	(If ar	plicabl	e) ADEQUATE INADEQUATE	[]

A state of the sta

REPORT DATE 2/26/88

- -

7

-

-

ASSESSME ASSESSME NASA FME	ENT D ENT I EA #:	DATE:	1/29/8 FRCS-4 05-6KF	8 81 -212	6A-2			N 2	ASA DAT BASELIN NE	A: E W	נ ניז	x]	
SUBSYSTE MDAC ID: ITEM:	E M :		FRCS 481 RELAY										·	
LEAD ANA	Lysi	:	D. HAF	RTMAN	ſ									
ASSESSME	ent :													
	CRIT F	ICALI LIGHT	ETY F	RE	DUND	ANCY	SCREE	NS			CI IT	L EM	[
	HE	W/FUI	NC	A		В		C	1					
NASA IOA	[3 [3	3 /1R 3 /1R]	[P [P]]	[F [F]]	[P [P]		[[X X] *]	
COMPARE	[/]	ſ]	٢]	נ]		[]	
RECOMMEN	NDATI	cons:	(If	diff	ferer	nt fro	om NAS	SA)			• •			
	[3	3 /3]	[]	[]	[] (AD	[D/	D DE] :LET	E)
* CIL R	ETENI	TION 1	RATION	ALE:	(If	appl	icable	≥) A INA	DEQUATE DEQUATE		[]	
REMARKS	:								-		-		-	

-

-

.

-

Ξ

_

 $\overline{}$

_

_

NASA FMEA CONSIDERS MULTIPLE FAILURES. THIS FAILED ALONE HAS NO EFFECT.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

C-440

ASSESSMENT ASSESSMENT NASA FMEA	T DATE: T ID: #:	1/29/8 FRCS-4 05-6KF	8 82 -212	26 A -:	1				NA E	SA DATA ASELINE NEW	: [[X]]	
SUBSYSTEM: MDAC ID: ITEM:	:	FRCS 482 RELAY											
LEAD ANALS	(ST:	D. HAF	TMAN	1									
ASSESSMENT	C:												
CI	RITICAL FLIGH	ITY F	RI	EDUN	DANC	CY	SCRI	ĒENS	;		CIL ITE	M	
	HDW/FU	NC	A			B			С		54		
NASA IOA	[3 /1R [3 /3]]	[P []]	[[P]]	[[Ρ]]	[[]]	*
COMPARE	[/N]	[N]	[N]	נ	N]	[]	
RECOMMENDA	ATIONS:	(If	difi	fere	nt 1	fro	om NZ	ASÀ)		. 2.	z≜		
]	E]	[]	[] (A	[DD/D] ELI	ETE)
* CIL RETH	ENTION	RATION	LE:	(If	app	51 i	icab:	le) IN	AI IAI	EQUATE	[r]]	
REMARKS: IOA AGREES	5 WITH	NASA FI	TEA.							- 	• 	-	e e a com Como de como

REPORT DATE 2/26/88

-

-

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-48 05-6KF-	3 2126 A- 2			NA E	SA DATA: BASELINE NEW	[[X]]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 483 RELAY							
LEAD ANALYST:	D. HART	MAN		·				
ASSESSMENT:								
CRITICAL FLIGH	ITY F	REDUNDA	NCY	SCREEN	S		CIL ITEM	[
HDW/FU	NC	A	В		С			
NASA [3 /1R IOA [2 /1R] [] [P] P]	[F [F] [] [P P]	[X [X] *]
COMPARE [N /] []	[] []	[]
RECOMMENDATIONS:	(If d	ifferent	: fro	om NASA)			
[2 /1R] [P]	[F] [P] (AI	[A DD/DE] LETE)
* CIL RETENTION	RATIONAL	E: (If a	ppli	cable) Il	AC NAC	EQUATE EQUATE	[[]
REMARKS: NASA FMEA CONSID INABILITY TO OPE REDUNDANCY CAUSE LIMITS.	ERS MULT N THE VA S INABIL	IPLE FAI LVE. RE ITY TO E	LURI DUNI XPEI	ES. TH DANCY PI DANCY PI	IS ROV LLA	FAILURE VIDED. I NTS TO M	CAUS OSS IEET	ES OF ALL CG
AT MEETING WITH DISCUSSED. IT W DUE TO DIFFERENT	SUBSYSTE AS AGREE INTERPR	M MANAGE D UPON I ETATIONS	ER ON THAT 5 OF	1/20/0 THE IS: NSTS 2:	88, SUE 220	NSTS 22 RAISED 6. THEF	206 ABOV EFOR	WAS E WAS E, THE

≣

-

-

= :

ISSUE REMAINS OPEN.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-484 05-6KF-21	27A-1			N	ASA DATA: BASELINE NEW	: []	x]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 484 RELAY								- · , ···
LEAD ANALYST:	D. HARTMA	И							
ASSESSMENT:									
CRITICAL	ITY R	EDUNDA	NCY	SCREE	NS		C]	L	r
HDW/FU	NC A	•	В		с		T		1
NASA [3 /1R IOA [2 /1R] [P]] [P]]	[P [F]	[P [P]]	[[x] *]
COMPARE [N /	J [3	[N]	[]	נ	N]
RECOMMENDATIONS:	(If dif	ferent	fro	om NAS	A)				
[2 /1R] [P]	[F]	(P] (AI] DD/	A 'DE] CLETE)
* CIL RETENTION	RATIONALE:	(If a	ppli	cable)				_
· · · · · · · · · · · · · · · · · · ·				:	A INA	DEQUATE DEQUATE	[[]
REMARKS: WITH THE LOSS OF TO OPEN VALVE PR PROPELLANTS TO M REDUNDANCY FOR M	THIS RELA EVENTS OPE EET LANDIN ANIFOLD 5	Y, VAL RATION G CG L (VERNI	VE C OF IMIJ ERS	ANNOT JETS S. A - 2/2	BE REQI LSO) .	OPENED. UIRED TO THEIR IS	I Ež S N	INA (PE IO	BILITY L
ISSUE IS TIED TO CLOSED TANK ISOL REMAINS OPEN AS N	THE IOA H ATION VALV WELL.	ARDWAR E 3/4/	E CF 5.	RITICA THE VI	LIT ERN:	Y FOR THE IER ISSUE		'AI [2/	LED 2)

- -

-

÷ :

•-----

ASSESSME ASSESSME NASA FME	NT NT	D2 II #:	ATE: D:	1/ FR 05	29/8 CS-4 -6KB	8 8 8: 7-2	5	27A-2	2					NZ H	ASA DATA BASELINI NEV	\: ∃ [▼ [x]]	
SUBSYSTE MDAC ID: ITEM:	: :	n -		FR 48 RE	CS 5 LAY				-					8. 			a		
LEAD ANA	LY	ST	:	D.	HAF	S.L.I	IAN	I											
ASSESSME	ENT	:																	
	CR	IT	ICAL	ITY			RI	EDUNE	DAN	IC3	Ľ	SCREE	:NS	5		C	IL	ar a	
]	F. HDI	W/FU	NC I.			A			E	3			С		لل 		-1	
NASA IOA	[[2 3	/1R /3]]		[[P]]	[I	7]	[[P]]	[[х]	*
COMPARE	[N	/N]		נ	N]	[1	1]	[N]	[N]	
RECOMMEN	1DA'	TI	ons:		(If	d:	if1	ferer	nt	fı	cc	om NAS	A)					
s	נ	3	/1R]		[P]	(1	2]	[P] ()) ADE	D / D] ELI	ETE)
* CIL RI	ETE	NT	ION	RAI	ION	ALJ	E:	(If	aŗ	go]	Li	icabl€	≥) I	A NA	DEQUATE DEQUATE	[]]	
REMARKS NASA FMI REDUNDAI	EA NCY	CO P	NSID REVE	ERS NTS	MU IS		IPI ATI	LE FI	AII DF	LUI A	RE 7	es. H Thrusi	IO	WE R	VER, LOS LEAK.	SS	OF	AI	
AT MEET	ING ED.	W	ITH IT W	SUE AS	AGR	re Ee	M I D T	MANA JPON	GEI Ti			1/20 THE 1)/ [S	88 SU	, NSTS E RAISE	222 D A	06 BO	W2 VE	AS WAS

DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

C-444

_

5

-

_

Ī

_

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-486 05-6KF-2127 -1	NASA DATA BASELINI NEV	A: E [] W [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 486 RELAY		
LEAD ANALYST:	D. HARTMAN		
ASSESSMENT:			
CRITICAL FLIGH	ITY REDUNDANC	Y SCREENS	CIL ITEM
HDW/FU	NC A	B C	
NASA [3 /1R IOA [3 /3	C] [P] [] [] [P] [P]] []	[] * []
COMPARE [/N] [N] [נא] [א]	[]
RECOMMENDATIONS:	(If different f	rom NASA)	
[/] [] [] [] (/	[] ADD/DELETE)
* CIL RETENTION	RATIONALE: (If app	licable) ADEQUATE INADEOUATE	[]
REMARKS: IOA AGREES WITH	NASA FMEA.		

REPORT DATE 2/26/88

10. 3 10. 10 10. 10

- -

C-445

-

ASSESSMI ASSESSMI NASA FMI	ent Ent Ea	D/ I) #:	ATE: D:	1/ FR 05	29/3 CS-4 -6K	88 48: F-2	7 212	27 ·	-2				N2	ASA DAT BASELIN NE	A: E [W [x]		
SUBSYSTI MDAC ID: ITEM:	EM: :			FR 48 RE	CS 7 LAY														
LEAD ANA	ALY	ST	:	D.	HAI	RTI	MAI	1											
ASSESSMI	ent	:																	
	CR	IT	ICAL	ITY			RI	EDUI	NDAN	CY	sc	REEN	s		c	IL			
	1	HD!	W/FU	NC			A			В			С		L	L.E.	M		
NASA IOA	[[2 3	/1R /1R]]] [P P]]	[F F]]	[[P P]]	[[X X]]	*	
COMPARE	[N	/]		[]	[]	[]	[]		
RECOMMEN	NDA'	TI	ons:		(If	d	if	fere	ent	fr	om	NASA)						
	[3	/3]		[]	[]	[] (] ADD	D / D) ELI	ETE)
* CIL RI	ETE)	NT:	ION	RAT	ION	ALI	E :	(I:	f ap	pl	ica	ble) I	AI NAI	DEQUATE DEQUATE	[]]		
REMARKS: NASA FMI EFFECT.	EA (CO	NSID	ERS	MU	LTI	IPI	LE I	FAIL	UR	ES.	TH	IS	FAILED	AL	ON	EI	IAS	NO
AT MEETI	ING	W	ITH	SUB	SYS	ren	M N	(AN)	AGER	0	N 1	./20/8	88,	, NSTS	222	06	WZ	AS	

_

= †

Ē

DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

NASA DATA: BASELINE [] ASSESSMENT DATE: 1/29/88 FRCS-488 ASSESSMENT ID: NEW [X] NASA FMEA #: 05-6KF-2127 -1 SUBSYSTEM: FRCS MDAC ID: 488 ITEM: RELAY LEAD ANALYST: D. HARTMAN ASSESSMENT: CIL CRITICALITY REDUNDANCY SCREENS ITEM FLIGHT В С HDW/FUNC A NASA [3/1R][P] [P] [P] [] * IOA [3/3] [] [] Ι 1 1 Γ COMPARE [/N] [N] [N] [1 **RECOMMENDATIONS:** (If different from NASA) []] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [INADEQUATE [1 **REMARKS:** IOA AGREES WITH NASA FMEA. services and the service of the serv · 7 the state of the s

REPORT DATE 2/26/88

F ...

≣ 1 ∎

C-447

· · · · · ·

Ξ

=]

ASSESSMENT DATE:	1/29/88			NASA DATA:	<u> </u>
ASSESSMENT ID: NASA FMEA #:	FRCS-48 05-6KF-	9 2127 -2		BASELINE NEW	[X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 489 RELAY				
LEAD ANALYST:	D. HART	MAN			
ASSESSMENT:					
CRITICAL FLIGH	ITY F	REDUNDAN	ICY SCREE	ns	CIL ITEM
HDW/FU	NC	A	Б		
NASA [2 /1R IOA [2 /1R] [] [P] P]	F] F]	[P] [P]	[X]* [X]
COMPARE [/] []]	[]	[]
RECOMMENDATIONS:	(If d	ifferent	from NAS	A)	
[2 /1R] [P]	F]	[P] (AI	[A] DD/DELETE)
* CIL RETENTION	RATIONAL	E: (If ap	oplicable		r 1
				TNADEQUATE	
REMARKS:				UTC PATTIDE	CAUGES
NASA FMEA CONSID INABILITY TO OPE REDUNDANCY CAUSE LIMITS.	ERS MOLT N THE VA S INABIL	LVE. REI ITY TO EX	UNDANCY (PEL PROP	PROVIDED. I ELLANTS TO N	CAUSES OF ALL MEET CG
AT MEETING WITH	SUBSYSTE	M MANAGER	R ON 1/20	/88, NSTS 22	2206 WAS

AT MEETING WITH SUBSISTEM MANAGER ON 1/20/88, NSIS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

. .

NASA DATA: ASSESSMENT DATE: 1/29/88 BASELINE [ASSESSMENT ID: FRCS-490 NASA FMEA #: NEW [X] 05-6KF-2127A-1 SUBSYSTEM: FRCS 490 MDAC ID: ITEM: RELAY LEAD ANALYST: D. HARTMAN **ASSESSMENT:** CIL CRITICALITY REDUNDANCY SCREENS ITEM FLIGHT С В HDW/FUNC A [P] [P] [P] [P] NASA [3/1R]ſ] * ίΧj [F] IOA [2/1R][P] COMPARE [N /] [] [N] [] [N] **RECOMMENDATIONS:** (If different from NASA) [2/1R] [P] [F] [P] [A] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE L INADEQUATE [1 **REMARKS**: WITH THE LOSS OF THIS RELAY, VALVE CANNOT BE OPENED. INABILITY TO OPEN VALVE PREVENTS OPERATION OF JETS REQUIRED TO EXPEL PROPELLANTS TO MEET LANDING CG LIMITS. ALSO THEIR IS NO REDUNDANCY FOR MANIFOLD 5 (VERNIERS -2/2). ISSUE IS TIED TO THE IOA HARDWARE CRITICALITY FOR THE FAILED CLOSED TANK ISOLATION VALVE 3/4/5. THE VERNIER ISSUE (2/2) REMAINS OPEN AS WELL.

REPORT DATE 2/26/88

10 - 11 11 - 12

NASA DATA: ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-491 BASELINE []-----NEW [X] NASA FMEA #: 05-6KF-2127A-2 FRCS SUBSYSTEM: MDAC ID: 491 ITEM: RELAY LEAD ANALYST: D. HARTMAN ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL ITEM FLIGHT B С HDW/FUNC A [P] [X] * [F] NASA [2/1R][P] IOA [3/3] Γ 1 [1 Г ſ 1 COMPARE [N/N] [N] [N] [N] RECOMMENDATIONS: (If different from NASA) [3/1R] [P] [P] [P] [D] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [INADEQUATE [] **REMARKS:**

NASA FMEA CONTAINS MULTIPLE FAILURES. THIS, COUPLED WITH THE LOSS OF ALL HARDWARE REDUNDANCY PREVENTS ISOLATION OF A THRUSTER LEAK.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

C-450

ASSESSME ASSESSME NASA FME	NT DA NT ID A #:	TE:	1/29/8 FRCS-4 05-6K	88 492 F-2	2 21:	27 - 1					NZ I	ASA DAT BASELIN NE	A: E [W [X]
SUBSYSTE MDAC ID: ITEM:	м:		FRCS 492 RELAY											.
LEAD ANA	LYST:		D. HAI	RTN	1A)	N								
ASSESSME	NT:													
	CRITI	CAL	CTY T		ŔJ	EDUNÊ	AN	СҮ	SCRE	EN	5		CII TTF	T M T
	HDW	/FUI	1C		A			В			С			111
NASA IOA	[3 [3	/1R /3]]] [P]	[[P]]	[[P]]	[[] *]
COMPARE	[/N]	[N]	[N]	[N]	[]
RECOMMEN	DATIO	NS:	(If	di	if	feren	it	fro	om NA	SA)			
	[/]	[]	[]	[]] ADD/I] DELETE)
* CIL RE	TENTI	ON I	RATION	ALF	E:	(If	ap	pl:	LCable	e) I	AI NAI	DEQUATE DEQUATE	[[]]
REMARKS: IOA AGRE	ES WI	TH 1	NASA FI	MEZ	Α.									a sena e se s

REPORT DATE 2/26/88

C-451

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-493 05-6KF-2127	-2	NASA DATA: BASELINE NEW	[x]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 493 RELAY			
LEAD ANALYST:	D. HARTMAN			
ASSESSMENT:				
CRITICAL	ITY REDU	NDANCY SCREENS	;	CIL
HDW/FUI	IC A	В	с	1 I EM
NASA [2 /1R IOA [3 /1R] [P]] [P]	[F] [[F] [P] P]	[X]* [X]
COMPARE [N/] []	[][]	[]
RECOMMENDATIONS:	(If differ	ent from NASA)		
[3 /3] []	[][] (AD	[D] D/DELETE)
* CIL RETENTION 1	RATIONALE: (I	f applicable) IN	ADEQUATE IADEQUATE	[]
REMARKS: NASA FMEA CONSIDI EFFECT.	ERS MULTIPLE	FAILURES. THI	S FAILED A	LONE HAS NO

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

-

ASSESSMENI ASSESSMENI NASA FMEA	T DATE: T ID: #:	1/29/8 FRCS-4 05-6KI	38 194 7-21	27 -1			N	IASA DATA BASELINE NEW	2: 5 [7 [X]
SUBSYSTEM: MDAC ID: ITEM:	1	FRCS 494 RELAY								
LEAD ANALY	(ST:	D. HAI	RTMA	N				-		
ASSESSMENT	::									
CI	RITICAL FLIGH	ITY T	R	EDUND	ANCY	SCRE	ens		CIL ITE	M
	HDW/FU	NC	A		В		C	2		
NASA (IOA (3 /1R 3 /3]	[P []]	[P []]	[I [)	[[] *
COMPARE [[/N]	[N]	[N]	[]	T]	[]
RECOMMEND	ATIONS:	(IĪ	dif	feren	t fr	om NA	SA)			
]	[]	נ]	[]	[ADD/D] DELETE)
* CIL RETH	ENTION	RATION	ALE:	(If	appl	icabl	e) // IN/	ADEQUATE ADEQUATE	[[]]
REMARKS: IOA AGREES	5 WITH	NASA FI	MEA.							

REPORT DATE 2/26/88

.

-

: =

-

_.

C-453

a second seco

ASSESSMENT DATE: 1/29/88 NASA DATA: ASSESSMENT ID: FRCS-495 BASELINE [] NEW [X] NASA FMEA #: 05-6KF-2127 -2 SUBSYSTEM: FRCS MDAC ID: 495 ITEM: RELAY LEAD ANALYST: D. HARTMAN ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL ITEM FLIGHT С HDW/FUNC Α В [P] [F] [P] [X]* NASA [2/1R][P] [P] [F] [X] IOA $\begin{bmatrix} 2 \\ 1R \end{bmatrix}$ COMPARE [/] [] [] [] [] RECOMMENDATIONS: (If different from NASA) [2/1R] [P] [F] [P] [A] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [INADEQUATE [] **REMARKS:** NASA FMEA CONSIDERS MULTIPLE FAILURES. THIS FAILURE CAUSES INABILITY TO OPEN THE VALVE. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY CAUSES INABILITY TO EXPEL PROPELLANTS TO MEET CG

= :

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

LIMITS.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-496 05-6KF-208	33 -1		NASA DATA BASELINE NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 496 RESISTOR,	1.2K 2W	-		
LEAD ANALYST:	D. HARTMAN	1			
ASSESSMENT:					
CRITICAL FLIGH	ITY RI T	EDUNDANCY	SCREENS		CIL
HDW/FU	NC A	I	3	С	1 1 4 41
NASA [3 /1R IOA [3 /3] [P]]] []	'] [] [P]]	[X]* []
COMPARE [/N] [N] []] [N].	[N]
RECOMMENDATIONS:	(If diff	ferent fr	om NASA)		
[3 /2R] [P] []) [P] (Al	[D] DD/DELETE)
* CIL RETENTION 1	RATIONALE:	(If appl	icable) IN	ADEQUATE ADEQUATE	
REMARKS: NASA FMEA CONSID REDUNDANCY TO MO THE VALVE CLOSED	ERS MULTIPI NITOR VALVE	E FAILUR POSITIC	es. How In May Le	EVER, LOSS AD TO FALS	5 OF ALL SELY FAILING
AT MEETING WITH S DISCUSSED. IT WA DUE TO DIFFERENT ISSUE REMAINS OPI	SUBSYSTEM M As Agreed u Interpreta En.	IANAGER C IPON THAI TIONS OF	N 1/20/8 THE ISS NSTS 22	8, NSTS 22 UE RAISED 206. THEI	2206 WAS Above Was Refore, The

REPORT DATE 2/26/88

÷. .

_ ----

_

_

ASSESSMEI ASSESSMEI NASA FMEI SUBSYSTEI MDAC ID: ITEM:	NT D NT I A #: M:	ATE: D:	1/29 FRCS 05-6 FRCS 497 RESI	/88 -497 KF-208 STOR,	33 - 1.2	2 K 2W		N	ASA DA BASELI N	ATA: INE [IEW []] X]		
LEAD ANALYST: D. HARTMAN													
ASSESSME	NT:												
	CRIT	ICAL	ITY	RI	EDUN	DANCY	SCR	EENS		CI IT	CIL ITEM		
	NC	. A		E	l I	. C							
NASA IOA	[3 [3	/3 /3]]	[[]	[[]]	[[]	[[] *]		
COMPARE	[/]	[]	ſ	.]	[]	[]		
RECOMMEN	DATI	ONS:	(I	f dif	fere	nt fr	om N	ASA)					
	٢	/]	τ]	Γ]	Γ]	[(ADD/] DELETE)		
* CIL RE REMARKS: NO DIFFE	TENT RENC	ION ES.	RATIO	NALE:	(If	appl	icab	ole) A INA	DEQUAI	TE (TE (]]		

صة

-

-

-

-

____ Ī

ASSESSMENT DATE: 1/29/88 NASA DATA: ASSESSMENT ID: FRCS-498 BASELINE [NASA FMEA #: 05-6KF-2083 -1 NEW [X] SUBSYSTEM: FRCS MDAC ID: 498 ITEM: RESISTOR, 1.2K 2W LEAD ANALYST: D. HARTMAN **ASSESSMENT:** CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM HDW/FUNC В C A NASA [3/1R][P] [F] [P] [X] * IOA [3/3] [] 1 [[]] COMPARE [/N] [N] [N] [N] [N] RECOMMENDATIONS: (If different from NASA) [3/2R] [P] [P] [P] [D] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE Γ INADEQUATE Γ 1 **REMARKS:**

NASA FMEA CONSIDERS MULTIPLE FAILURES. HOWEVER, LOSS OF ALL REDUNDANCY TO MONITOR VALVE POSITION MAY LEAD TO FALSELY FAILING THE VALVE CLOSED.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME SUBSYSTE	ENT DA ENT II EA #: EM:	ATE: D:	1/29/88 FRCS-499 05-6KF-2083 -2 FRCS					NASA DATA: BASELINE [] NEW [X]						
MDAC ID: ITEM:	DAC ID: 499 TEM: RESISTOR, 1.2K 2W													
LEAD ANALYST: D. HARTMAN						ing an an angaran angaran an angaran ang angaran ang ang ang ang ang ang ang ang ang a								
ASSESSMI	ent:													
	CRIT	ICAL	ITY	DUNDA	NCY	SCREI	ens		CIL					
	HDW/FUNC			A		B		С						
NASA IOA	[3 [3	/3 /3]	[[]	[[]]	[[]	ן נ] *]			
COMPARE	[/	1	[]	[]	[]	[]			
RECOMMEN	NDATI	ONS:	(If	difi	ferent	: fro	om NAS	SA)						
	[/]	נ]	נ]	[] (A)	[מ/סכ] ELETE)			
* CIL RI REMARKS NO DIFFI	* CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE [] REMARKS: NO DIFFERENCES.													
n en			**** 12.000			يعتبر برقار بعدارات	स् अनुपर भ		a caso ee co	e viz	್ ಕನ್ನಡ ಗಳು			

REPORT DATE 2/26/88

C-458

-

-

ASSESSMENT DATE: 1/29/88 NA ASSESSMENT ID: FRCS-500 B NASA FMEA #: 05-6KF-2083 -1						ASA DA BASELI N	TA: NE EW	[[X]									
SUBSYSTEM: MDAC ID: ITEM:				FR 50 RE	CS 0 SISI	'OI	R,	1.2K	2	W								
LEAD ANALYST: D. HA				HAF	T	IAN	T				• •					~		
ASSESSMI	ENT	:																
CRITICAL FLIGH				TY REDUNDA					ÂN	ANCY SCREENS					CIL ITEM			
	1	HD	/FU	NC			A			В			С					
NASA IOA	[[3 3	/1R /3]]		[[P]	[[F]]	[[P]]		[X []]	*
COMPARE	- [/N]		[N]	נ	N]	[N]		[N]	
RECOMMEN	NDA'	FI (ons:		(If	đ	iff	feren	t	fro	om NAS	SA)					
	נ	3	/2R]		[P]	[P]	[P]	(AI	[D DD/D1] ELF	ETE)
* CIL RI	ete)	NT:	ION	RAT	IONA	L	E:	(If	ap	pli	icable	≥) II	IA IAN	DEQUAT DEQUAT	'E 'E	[[]	

REMARKS: NASA FMEA CONSIDERS MULTIPLE FAILURES. HOWEVER, LOSS OF ALL REDUNDANCY TO MONITOR VALVE POSITION MAY LEAD TO FALSELY FAILING THE VALVE CLOSED.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

in. ce

ASSESSMENT DATE:	1/29/88	NASA DATA:
ASSESSMENT ID:	FRCS-501	BASELINE []
NASA FMEA #:	05-6KF-2083 -2	NEW [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 501 RESISTOR, 1.2K 2W	· • • • • • • •

-

-

ļ

.

1

.

LEAD ANALYST: D. HARTMAN

ASSESSMENT:

	CRIT	FICA:	LITY HT	F	REDUNDANCY SCREENS							CIL		
	HI	W/F	UNC	A	1	В	В		С		I I CM			
NASA IOA	[3	3 /3 3 /3]]	[[]	[[]]	[[]]		[[] *]		
COMPARE	٢	1]	[]	[]	[]		[]		
RECOMMEN	IDATI	ONS	: (]	f dif	fere	nt fr	om N	IASA)						
	[/]	C]	[]	[]	(AI	[)D/1] DELET	E)	
* CIL RI	ETENI	NOI	RATIC)NALE:	(If	appl	icab	ole) J INZ	DEQU	ATE ATE	[[]		

REMARKS:

NO DIFFERENCES.

REPORT DATE 2/26/88 C-460

and the second
ASSESSME ASSESSME NASA FME	NT DAT NT ID: A #:	E: 1/29 FRCS 05-0	9/88 5-502 5KF-2081 -	-1	NASA DATA: BASELINE [] NEW [X]				
SUBSYSTE MDAC ID: ITEM:	M:	FRCS 502 RESI	5 ISTOR, 5.1						
LEAD ANA	LYST:	D. I	HARTMAN						
ASSESSME	NT:								
	CRITIC FLI	ALITY GHT	REDUN	DANCY SCR	EENS	CIL ITEM			
	HDW/	FUNC	A	В	С				
NASA IOA	[3/ [3/	3] 3]	[] []	[] []	[] []	[] * []			
COMPARE	[/]	[]	[]	[]	[]			
RECOMMEN	DATION	S: (] 2R]	[f differe [P]	ent from N [P]	ASA) [P]	[] (ADD/DELETE)			
* CIL RE	TENTIO	N RATI(DNALE: (If	applicab	le) ADEQUA INADEQUA	TE [] TE []			
THIS FAI POSITION TO FALSE OPERATIO	LURE M . RED Ly fai NS.	AY CAUS UNDANCY LING TH	SE LOSS OF Y PROVIDED HE VALVE C	ACCURATE LOSS O LOSED, PO	INDICATIO F ALL REDU SSIBLY EFF	N OF THE VALVE NDANCY MAY LEAD ECTING MISSION			
ISSUE NO	T RESO	LVED AT	I MEETING	WITH SUBS	YSTEM MANA	GER ON 1/20/88.			
REPORT D	ATE 2/	26/88		C-461					

+ DUID

=3 - - -

₹ 3 -----

____ —

----. انتریکا

ASSESSME ASSESSME NASA FME	NT D NT I A #:	ATE: D:	1/29 FRCS 05-6	29/88 NASA DATA: RCS-503 BASELINE [] 5-6KF-2081 -1 NEW [X]										
SUBSYSTE MDAC ID: ITEM:	:M:		FRCS 503 RESI	s Istor,	, 5.1	K 1/4	łW							
LEAD ANA	LYST	•	D. H	IARTM/	N									
ASSESSME	NT:													
	CRIT	ICAL	JTY	I	REDUN	DANCY	SCR	EENS	S			CIL		
	r HD	W/FU	NC	C A			3	C	C			11-1		
NASA IOA	[3 [3	/3 /3]]	[[]]	[[]]	[[]]		[]	*	
COMPARE	[/]	[]	[]	[]		[]		
RECOMMEN	IDATI	ONS:	(]	[f dif	ffere	nt fi	com N	IASA)						
	Ľ	1]	ſ]	[]	[1	(AI	[]/[]] DELE	TE)	
* CIL RE	TENI	ION	RATIC	ONALE:	: (If	app]	licab	ole) / IN/	ADEQU ADEQU	ATE ATE] []]		
REMARKS: A SHORT IOA RECO FMEA.	ACRO	ids f	RLR EMOVI	TYPE AL OF	RESI THE	STOR "SHOI	IS N RT" F	IOT A 'AILUI	CRED RE MO	IBLE DE FI	FAI ROM	LUR THI	E. S	

ISSUE RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88 (SHORT FAILURE MODE TO BE REMOVED).

REPORT DATE 2/26/88
ASSESSME ASSESSME NASA FME	NT D NT I A #:	ATE: D:	1/29/0 FRCS-9 05-6K	38 504 F-208	82 - 1	L		N	ASA DAT BASELII NI	FA: NE (EW [X]
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 504 RESIS	ror,	5.11	x 1/4	W				
LEAD ANA	LYST	:	D. HAI	RTMAI	N						
ASSESSME	NT:										
	CRIT	ICAL	ITY	RI	EDUNI	DANCY	SCRI	EENS		CIL	
	F HD	W/FU	NC	A	A B			С		TIF	1 FI
NASA IOA	[3 [3	/3 /3]]	[[]]	[[]	[[]	C C] *]
COMPARE	[/]	[]	[]	[]	C]
RECOMMEN	DATI	ons:	(If	dif	ferer	nt fr	om N	ASA)		ng an the second se	
a a	[3	/2R]	[P]	[P)	[P]	[(ADD/D] ELETE)
* CIL RE	TENT	ION	RATION	ALE:	(If	appl	icab:	le) A INA	DEQUAT DEQUAT	E [E []]
THIS FAI	LURE	MAY	CAUSE	LOS	5 OF	ACCU	RATE	INDI	CATION	OF TH	E VALV

THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

-

2.55

ASSESSME ASSESSME NASA FME	ent i ent j ea #:	DATE: [D: :	1/29/ FRCS- 05-61	/88 -505 (F-20	082 -	1		NA B	SA DATA ASELINE NEW	: [x]	
SUBSYSTE MDAC ID: ITEM:	EM :		FRCS 505 RESIS	STOR	, 5.1	K 1/4	W					
LEAD ANA	lysj	[:	D. H2	ARTM2	AN							
ASSESSME	ent:											
	CRII	TICAL	ITY	I	REDUN	DANCY	SC	REENS		CIL	м	
	H	W/FU	NC	2	ł	В		С			F. 4	
NASA IOA	[3	3 /3 3 /3]	[[]]	[[]]	[[]	[[]]	*
COMPARE	[/]	[]	[]	ſ]	[]	
RECOMMEN	IDAT]	IONS:	(II	e din	fere	nt fr	om	NASA)				
	[/]	[]	[]	ſ] (A)	[DD/D] ELF	ETE)
* CIL RE	TENJ	CION I	RATION	IALE :	(If	appl	ica	ble)	FOILARE	r	٦	
								INAD	EQUATE	[j	
A SHORT IOA RECO FMEA.	ACRO	DSS A NDS R	RLR 1 EMOVAI	TYPE J OF	RESI THE	STOR "SHOR	IS F [#]	NOT A C FAILURE	REDIBLE MODE FI	FAI ROM	LUF THI	æ. s

.....

and the second sec

ISSUE RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88 (SHORT FAILURE MODE TO BE REMOVED).

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	NT DA NT II A #:	ATE: D:	1/29 FRC9 05-0	9/88 5-506 5KF-20	81 -	1		N	IASA DA BASELI N	TA: NE [EW [X]	
SUBSYSTE MDAC ID: ITEM:	:M :		FRCS 506 RESI	s Istor,	5.1	K 1/4	W	:	* . <u>* * #</u>			
LEAD ANA	LYST	:	D. H	IARTMA	N		. 3	· · · · · · · · · · · · ·			1999 - San	
ASSESSME	NT:											
	CRITI FI	CAL LIGH	ITY T	R	EDUN	DANCY	SCF	REENS		CII	M	
	HDV	V/FU	NC	Α		В		c	:			
NASA IOA	[3 [3	/3 /3]]	[[]	[[]]	[[]]	[[] *]	
COMPARE	[/]	[]	[]	Γ]	ſ]	
RECOMMEN	IDATIC	ONS: /2R)]	[P	fere]	nt fr	om N]	IASA) [F	9]	[(ADD/D] DELETE	:)
* CIL RE	TENT	EON I	RATIC	ONALE:	(If	appl	icat	ole) A INA	DEQUAT DEQUAT	E [E []	
THIS FAI POSITION TO FALSE OPERATIC	LURE I. RI LY F2 NS.	MAY EDUN AILI	CAUS DANCY NG TH	SE LOS (PROV HE VAL)	S OF IDED VE C	ACCU LOSED	RATE SS C , PC	E INDI OF ALI OSSIBI	CATION REDUN Y EFFE	OF TH DANCY CTING	IE VAL MAY L MISSI	VE EAD ON
ISSUE NO	T RES	SOLV	ED A	r meet	ING	WITH	SUBS	YSTEM	MANAG	er on	1/20/	88.
									- ·			

REPORT DATE 2/26/88

-

-

_

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-507 NASA FMEA #: 05-6KF-2082 -1										NASA BASE	DATA: LINE NEW	: [[}]. []	::"""", "I v
SUBSYST MDAC ID ITEM:	EM: :			FRC 507 RES	S ISTOR,	5.1	.K 1/4	W						2 \.2
LEAD AN	ALYS	5T	:	D.	HARTMA	N		-		-		·		-
ASSESSM	ENT	:												
	CR	T F HD	ICA LIG W/F	LITY HT UNC	R	EDUN	IDANCY B	sc	REENS	с		CII ITH	E M	
NASA IOA	[[3 3	/3 /3]]	[[]]	[]]	[[]		[[]]	*
COMPARE	[/]	ſ]	ſ]	[]		[]	
RECOMME	NDA	FI	ONS	: (If dif	fere	ent fro	om	NASA)		-			
	[/]	[]	[]	[]	(AI	[)D/I] DELI	ETE)
* CIL R	etei	NT:	ION	RATI	ONALE:	(If	appl.	ica	ble) IN	ADEQU ADEQU	ATE ATE	[[]	
A SHORT IOA REC FMEA.	: ACI OMMI	ROS	ss Ds	a rlr Remov	TYPE AL OF	RESI THE	STOR	IS r"	NOT A FAILU	CRED RE MO	IBLE DE FF	FAI ROM	LUI TH	RE. [S
ISSUE R	ESO FAI		ED RE	AT ME MODE	ETING TO BE	WITH REMC	USUBS	YST	EM MA	NAGER	ON 1	./20)/88	3

. i

-

REPORT DATE 2/26/88

C-466

zici serta 1 i

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-508 05-6KF-20	82 -1			NZ E	ASA DATA BASELINE NEW	: [x]]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 508 RESISTOR,	5.1K	1/40	v				
LEAD ANALYST:	D. HARTMA	N						
ASSESSMENT:								
CRITICAL	ITY R	EDUNDA	NCY	SCREE	ens		ČIL ITE	M
HDW/FU	NC A	L	В		С		***	••
NASA [3 /3 IOA [3 /3] [] []]	[[]]	[[]	[[] *]
COMPARE [/	J []	[]	[]	[]
RECOMMENDATIONS:	(If dif] [P	ferent	fro [P	om NAS]	5A) [P] (A	[DD/D] ELETE)
* CIL RETENTION	RATIONALE:	(If a	appli	lcable	e) AI INAI	DEQUATE DEQUATE	[-]
THIS FAILURE MAY POSITION. REDUN TO FALSELY FAILI OPERATIONS.	CAUSE LOS DANCY PROV NG THE VAL	S OF A IDED. VE CLO	LOS DSED	RATE I SS OF , POSS	INDIC ALL SIBLY	CATION O REDUNDA (EFFECT	F TH NCY ING	E VALVE MAY LEAD MISSION
ISSUE NOT RESOLV	ED AT MEET	'ING WI	CTH S	SUBSYS	STEM	MANAGER	ON	1/20/88.

т. -

₽_3

- -

-

.

=

ASSESSMI ASSESSMI NASA FMI	ent d ent <u>i</u> ea #:	ATE: D:	1/29/ FRCS- 05-6F	'88 •509 (F-20)82 -	1		ľ	NASA DAT. BASELIN NE	A: E [W [}]	n an suidh
SUBSYSTI MDAC ID ITEM:	em : :		FRCS 509 RESIS	TOR,	5.1	K 1/4	W					
LEAD AND	ALYST	:	D. HA	RTMA	N							
ASSESSMI	ent :											
	CRIT	ICAL	ITY	F	EDUN	DANCY	SCF	REENS		CII	איי	
	HD	W/FU	NC	A	1	F	3	c	2	± ± ±	11.1	
NASA IOA	[3 [3	/3 /3]]	[[]]	[[]]	[[]]	[[] †]	t
COMPARE	Γ	/]	[]	[]	[]	[]	
RECOMMEN	NDATI	ons:	(If	dif	fere	nt fi	com N	iasa)				
	[/]	[]	[]	ľ] (4] ADD/I] DELET	ſE)
* CIL R	* CIL RETENTION RATIONALE: (If applicable)											
REMARKS A SHORT IOA REC	INADEQUATE [] REMARKS: A SHORT ACROSS A RLR TYPE RESISTOR IS NOT A CREDIBLE FAILURE. IOA RECOMMENDS REMOVAL OF THE "SHORT" FAILURE MODE FROM THIS											

ISSUE RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88 (SHORT FAILURE MODE TO BE REMOVED).

REPORT DATE 2/26/88

.

FMEA.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 NASA DATA: FRCS-510 BASELINE [] 05-6KF-2081 -1 NEW [X]								
SUBSYSTEM: MDAC ID: ITEM:	FRCS 510 RESISTOR,	5.1K 1/4	W						
LEAD ANALYST:	D. HARTMA	N							
ASSESSMENT:									
CRITICAL FLIGH	ITY R T	EDUNDANCY	SCREENS	-	CIL ITEM				
HDW/FU	NC A	. B	•	С					
NASA [3 /3 IOA [3 /3] [] [] [] [] []]	[]*				
COMPARE [/	J (] [] []	[]				
RECOMMENDATIONS:	(If dif	ferent fr	om NASA)						
[3 /2R] [P) [P	J [P] (AI	[] DD/DELETE)				
* CIL RETENTION	RATIONALE:	(If appl	icable)	ADEQUATE	[]				
REMARKS: THIS FAILURE MAY POSITION. REDUN TO FAISELY FAILT	CAUSE LOS DANCY PROV NG THE VAL	S OF ACCU IDED. LO VE CLOSED	RATE IND SS OF AL	ICATION OI L REDUNDAN	L J F THE VALVE NCY MAY LEAD ING MISSION				
OPERATIONS.									
ISSUE NOT RESOLV	ED AT MEET	ING WITH	SUBSYSTE	M MANAGER	ON 1/20/88.				

REPORT DATE 2/26/88

÷

-

÷

د میں

-

Ħ

. .

ASSESSME ASSESSME NASA FME	NT NT A	D2 II #:	ATE: D:	1/2 FRC 05-	9/88 S-511 6KF-20	81 -	1		N	IASA BASE	DATA: LINE NEW	[[X]	
SUBSYSTE MDAC ID: ITEM:	M:			FRC 511 RES	SISTOR,	5.1	.K 1/41	N						
LEAD ANA	LYS	5T	:	D.	HARTMA	И								
ASSESSME	NT	:												
	CR:	IT F HD	ICAI LIGH W/FU	LITY IT INC	F	EDUN	IDANCY B	SCF	REENS	2		CII ITH	M	
NASA IOA	[[3 3	/3 /3]]	[[]]	[[]]	[[]]		[[]]	*
COMPARE	נ		/]	[]	ſ]	[]		[]	
RECOMMEN	IDA'	FI	ons:	: ((If dif	fere	ent fr	om N	IASA)					
	[/]	[]	[]	[]	(A)] 0D/1] DELI	ETE)
* CIL RI	ete:	NT	ION	RAT	IONALE	tI)	f appl	icab	ole) INI	ADEQU ADEQU	JATE JATE	[[]	
REMARKS: A SHORT IOA RECO FMEA.	AC DMM	RO EN	SS 1 DS 1	A RLI REMOV	R TYPE Val of	RESI THE	ISTOR "SHOR	IS N T" H	IOT A FAILUI	CREI RE MO	DIBLE DDE F	FA: ROM	[LU] TH	RE. IS
ISSUE RI (SHORT I	eso Fai	LV LU	ED A RE 1	AT MI MODE	EETING TO BE	WITH REMO	H SUBS OVED).	YSTI	em mai	NAGEI	r on	1/20)/8 :	8

_

5

_

_

ally any the constant of the second s

NASA DATA: ASSESSMENT DATE: 1/29/88 BASELINE [ASSESSMENT ID: FRCS-512 1 NEW [X] NASA FMEA #: 05-6KF-2081 -1 FRCS SUBSYSTEM: والمتحد والمتحد والمتحد 512 MDAC ID: RESISTOR, 5.1K 1/4W ITEM: D. HARTMAN LEAD ANALYST: ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL ITEM FLIGHT С В A HDW/FUNC [] []]] [NASA [3 /3] [[] ٦ 1 IOA [3/3] COMPARE [/] 1 [] RECOMMENDATIONS: (If different from NASA) [3/2R] [P] [P] [P] Γ (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [INADEQUATE [1 **REMARKS:** THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE

THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

. .

. .

i i

;

.

· -

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-513 NASA FMEA #: 05-6KF-2081 -1							1		1	NASA BASE	DATA: LINÉ NEW	[[X	
SUBSYSTI MDAC ID: ITEM:	em : :			FRC: 513 RES:	S ISTOR,	5.1	K 1/4	W					
LEAD AND	ALYS	ST	:	D . 1	HARTMA	N			5.I		-		s#
ASSESSMI	ENT	:											
	CR	IT F HD	ICA LIGI W/F	LITY HT UNC	R	EDUN	DANCY I	SCR	eens (3		CIL ITE	, M
NASA IOA	[[3 3	/3 /3]]	[]]	[[]]	[[]]		[[] *]
COMPARE	[/]	[]	ĺ]	[]		[]
RECOMME	NDA	rI(ons	: (If dif	fere	nt fi	com N	iasa)				
	[/]	ſ]	ľ]	Γ]	(AI	[)D/D] DELETE)
* CIL RI	etei	NT:	ION	RATI	ONALE:	(If	app]	licab	ole) / IN/	ADEQU ADEQU	ATE ATE	[]]
REMARKS A SHORT IOA RECO FMEA.	: ACI OMMI	RO: EN	SS 2 DS 1	A RLR REMOV	TYPE AL OF	RESI THE	STOR "SHOP	IS N RT" F	IOT A VAILUI	CRED RE MO	IBLE DE FI	FAI ROM	LURE. THIS
ISSUE RI (SHORT	ESO FAI	LV LU	ED RE 1	AT ME MODE	ETING TO BE	WITH REMO	SUBS	Syste	IAM MA	NAGER	ON 1	L/20	/88

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-51 05-6KF-	4 2084 -1		NASA BASI	DATA: SLINE [] NEW [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 514 RESISTO	R, 1.2K	2W		. • · · · • • • • • • • • • • • • • • •
LEAD ANALYST:	D. HART	MAN			···· · · · · · · · · · · · · · · · · ·
ASSESSMENT:					
CRITICAL FLIGH	ITY T	REDUNDA	NCY SO	CREENS	CIL ITEM
HDW/FU	NC	A	В	С	
NASA [3 /1R IOA [3 /3] [] [P]]	[F] []	[P] []	[X]* []
COMPARE [/N] [М]	[N]	[N]	[א]
RECOMMENDATIONS:	(If d	ifferent	: from	NASA)	
[3 /2R	[]	P]	[P]	[P]	[D] (ADD/DELETE)
* CIL RETENTION	RATIONAL	E: (If a	pplica	able) ADEQU INADEQU	JATE [] JATE []
REMARKS: NASA FMEA CONSID REDUNDANCY TO MO THE VALVE CLOSED	ERS MULT NITOR VA	IPLE FAI LVE POSI	LURES	. HOWEVER MAY LEAD TO	, LOSS OF ALL D FALSELY FAILING
AT MEETING WITH	SUBSYSTE	M MANAGE	R ON	L/20/88, Na TE ISSUE RA	STS 22206 WAS

DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

= =

: =

<u>6.3</u>

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-515 NASA FMEA #: 05-6KF-2084 -2									ł	IASA I BASEI	DATA LINE NEW	: [[]] x]		
SUBSYSTE MDAC ID: ITEM:	EM:			FRCS 515 RESIS	STOR,	1.2	2K 2W								r <_
LEAD ANA	LYS	ST	:	D. HI	ARTM/	N			∑⊥ 9° a ·	r .		7		÷	an 1 1
ASSESSME	INT :	;													
	CRI	י דו דו	ICAL	ITY T	F	EDUN	IDANCY	SCF	REENS			CII TTI	L Em		
	FLIGHT HDW/FUNC A								C	2					
NASA IOA	[[3 3	/3 /3]]	[[]	[[]]	[[]]		[[]]	*	
COMPARE	[/]	[]	ľ]	[]		[]		
RECOMMEN	IDAJ	FI	ONS:	(Ii	t dif	fere	ent fr	om N	IASA)						
	[/]	[]	Ľ]	[]	(AI	[1/0/1] DELE	ETE)	
* CIL RE	TEN	IT:	ION	RATION	VALE:	(If	f appl	icak	ole)	DEOU	\ m E	r			
NRVI N 72 -									INA	DEQUA	ATE	[]		
NO DIFFE	REN	1C]	ES.		۰ <u>ــــ</u> . ۲۰۰۰ ع		ini Second			 5×12	in an				

-...=

= :

÷

REPORT DATE 2/26/88 C-474

1/29/8 FRCS-5 05-6KF	8 16 -208	4 -1			N2 1	ASA DATA BASELINE NEW	: [[] x]	
FRCS 516 RESIST	OR,	1.2K	2W						
D. HAR	TMAN	ſ							
ITY F NC	RE A	DUND	ANCY B	SCREE	INS C		CI IT	L EM	
]]	[P []]	[F []	[P []]	[[X] *
]	[]]	[N]	[N]	[N]
(If	diff	eren	t fro	om NAS	SA)				
]	[P]	[P]	[P] (A] /dd	D DEI] LETE)
RATIONA	LE:	(If	appli	icable	≥) A INA	DEQUATE DEQUATE	[[•]]
	<pre>1/29/8 FRCS-5 05-6KF FRCS 516 RESIST D. HAR ITY I I I I I I I I I I I I I I I I I I</pre>	<pre>1/29/88 FRCS-516 05-6KF-208 FRCS 516 RESISTOR, D. HARTMAN ITY RE NC A] [P] [N (If diff] [P RATIONALE:</pre>	<pre>1/29/88 FRCS-516 05-6KF-2084 -1 FRCS 516 RESISTOR, 1.2K D. HARTMAN ITY REDUND NC A] [P]] []] [N] (If differen] [P] RATIONALE: (If</pre>	<pre>1/29/88 FRCS-516 05-6KF-2084 -1 FRCS 516 RESISTOR, 1.2K 2W D. HARTMAN ITY REDUNDANCY FNC A B] [P] [F] [] [] [N] [N (If different from] [P] [P RATIONALE: (If application)</pre>	<pre>1/29/88 FRCS-516 05-6KF-2084 -1 FRCS 516 RESISTOR, 1.2K 2W D. HARTMAN ITY REDUNDANCY SCREE NC A B] [P] [F]] [] [] []] [N] [N] [I] []] [N] [N] (If different from NAS] [P] [P] RATIONALE: (If applicable)</pre>	1/29/88 N2 FRCS-516 1 05-6KF-2084 -1 1 FRCS 516 RESISTOR, 1.2K 2W D. HARTMAN D. HARTMAN ETY REDUNDANCY SCREENS C J [P] [F] NC A B C J [P] [F] [P] J [N] [N] [N] J [P] [F] [P] J [N] [N] [N] J [P] [P] [P] J [N] [N] [N] A B C C J [P] [P] [P] J [N] [N] [N] RATIONALE: (If applicable) A INA INA INA	1/29/88 NASA DATA FRCS-516 BASELINE 05-6KF-2084 -1 NEW FRCS 516 RESISTOR, 1.2K 2W D. HARTMAN D. HARTMAN C ITY REDUNDANCY SCREENS NC A B C I [P] [F] [P] I [P] [F] [P] I [P] [P] [P] I [N] [N] [N] I [P] [P] [P] I [N] [N] [N] I [P] [P] [P] I [P] [P] [P] I [P] [P] [P] I [P] [P] [P] (If different from NASA) [P] (A RATIONALE: (If applicable) ADEQUATE ADEQUATE ADEQUATE ADEQUATE	1/29/88 NASA DATA: FRCS-516 BASELINE 05-6KF-2084 -1 NEW FRCS 516 RESISTOR, 1.2K 2W D. HARTMAN D. HARTMAN CI TY REDUNDANCY SCREENS CI T A B C I [P] [F] [P] NC A B C] [P] [F] [P]] [N] [N] [N]] [N] [N] [N]] [P] [P] [P]] [P] [P] [P]] [P] [P] [P] [If different from NASA)] [P] [ADD/ RATIONALE: (If applicable) ADEQUATE [NADEQUATE	1/29/88 NASA DATA: FRCS-516 BASELINE [] 05-6KF-2084 -1 NEW [X] FRCS 516 RESISTOR, 1.2K 2W D. HARTMAN C A B C ITY REDUNDANCY SCREENS CIL ITY REDUNDANCY SCREENS CIL NC A B C I [P] [F] [P] I [P] [P] [N] I [P] [P] [N] I [N] [N] [N] I [N] [N] [N] I [P] [P] [P] I [N] [N] [N] I [P] [P] [P] I [N] [N] [N] I [P] [P] [P] I

NASA FMEA CONSIDERS MULTIPLE FAILURES. HOWEVER, LOSS OF ALL REDUNDANCY TO MONITOR VALVE POSITION MAY LEAD TO FALSELY FAILING THE VALVE CLOSED.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

: =

ASSESSI ASSESSI NASA FI	ATE: D:	1/29/ FRCS- 05-6H	84 -	2		N	ASA I BASEI	DATA: LINE NEW	: [[X] (]				
SUBSYSTEM:FRCSMDAC ID:517ITEM:RESISTOR, 1.2K														
LEAD AN	IAL	IST	:	D. H2	ARTMA	N								
ASSESS	IEN'	r :												
	CI	RIT		ITY	R	EDUN	DANCY	SCF	REENS			CII	J	
		HD	N/FU	NC	A		В		С			T T E	2141	
NASI IOI	¥	[3 [3	/3 /3]]	[[]	[[]]	[[]	-	[[]]	*
COMPARI	2	נ	/]	[]	[]	٢]		[]	
RECOMMI	END	ATIC	ons:	(11	f dif:	fere	nt fr	om N	IASA)					
	ĺ	[3	/2R]	[₽	1	[₽]	[P]	(AI	[)D/[] DELE	TE)
* CIL I	RETI	ENT	ION	RATION	NALE:	(If	appl	icat	ole) A	DEQUA	TE	[ĵ	
REMARKS	S: FERI	ENC	ES.			,			INA	DEQUA	ATE	[]	•
			·										-	

REPORT DATE 2/26/88 C-476

. . . .

i de session de la composition de la co

_

٥

- - - 12

i i

1

NASA DATA: ASSESSMENT DATE: 1/29/88 BASELINE [ASSESSMENT ID: FRCS-518 NEW [X] 05-6KF-2084 -1 NASA FMEA #: FRCS SUBSYSTEM: MDAC ID: 518 RESISTOR, 1.2K 2W ITEM: LEAD ANALYST: D. HARTMAN ASSESSMENT: REDUNDANCY SCREENS CIL CRITICALITY ITEM FLIGHT В С HDW/FUNC A [X] * NASA [3/1R][P] [F] [P] [] IOA [3/3] [] [1 COMPARE [/N] [N] [N] [N][N] RECOMMENDATIONS: (If different from NASA) [3/2R] [P] [P] [P] [D] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [INADEQUATE [1 **REMARKS:**

NASA FMEA CONSIDERS MULTIPLE FAILURES. HOWEVER, LOSS OF ALL REDUNDANCY TO MONITOR VALVE POSITION MAY LEAD TO FALSELY FAILING THE VALVE CLOSED.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

1/29/88 FRCS-519 05-6KF-20			N2 1	ASA DATA BASELINE NEW	: [X]	
FRCS 519 RESISTOR,	2W						
D. HARTMA	N				-		
ITY R	EDUNDA	NCY	SCREE	ens		CIL	
NC A		в		С		1161	1
] []]	[[]	[[]	[[] *]
] []	נ]	[]	[]
(If dif	ferent	fro	om NAS	SA)			
J []	[]	[] (A	[10/00] ELETE)
RATIONALE:	(If a	ppli	icable	e) Al INAI	DEQUATE DEQUATE	[[]]
	1/29/88 FRCS-519 05-6KF-203 FRCS 519 RESISTOR, D. HARTMAN 	<pre>1/29/88 FRCS-519 05-6KF-2084 -2 FRCS 519 RESISTOR, 1.2K D. HARTMAN .TY REDUNDA .TY REDUNDA .TT NC A] []] []] []] [] RATIONALE: (If a </pre>	1/29/88 FRCS-519 05-6KF-2084 -2 FRCS 519 RESISTOR, 1.2K 2W D. HARTMAN LITY REDUNDANCY TNC A B] [] [] [] [] [] [] [] [] [] [[] [] [] [REDUNDANCY TT NC A B] [] [] [] [] [] [] [] [REDUNDANCY TT NC A B] [] [] [] [] [] [] [] [] [] [RATIONALE: (If appli	<pre>1/29/88 FRCS-519 05-6KF-2084 -2 FRCS 519 RESISTOR, 1.2K 2W D. HARTMAN TY REDUNDANCY SCREE T NC A B] [] []] [] []] [] []] [] [</pre>	1/29/88 NA FRCS-519 1 05-6KF-2084 -2 FRCS 519 RESISTOR, 1.2K 2W D. HARTMAN HARTMAN J. HARTMAN HARTMAN J. HARTMAN B C J. HARTMAN IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	1/29/88 NASA DATA FRCS-519 BASELINE 05-6KF-2084 -2 NEW FRCS 519 RESISTOR, 1.2K 2W D. HARTMAN JITY REDUNDANCY SCREENS T A B NC A B J [] [] [] I [] [] [] J [] [] [] I [] [] [] A B C [] J [] [] [] J [] [] [] I [] [] [] A B	1/29/88 NASA DATA: FRCS-519 BASELINE [05-6KF-2084 -2 NEW [X FRCS 519 RESISTOR, 1.2K 2W D. HARTMAN J. HARTMAN ITY NC A B C] [] [] [] [] [] NC A B C C] [] [] [] [] []] [] [] [] [] []] [] [] [] [] []] [] [] [] [] []] [] [] [] [] []] [] [] [] [] []] [] [] [] [] []] [] [] [] [] []] [] [] [] [] []] [] [] [] [] [] [] []

=

.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-520 05-6KF-20	86 -1	NASA DATA: BASELINE [] 1 NEW [X]					
SUBSYSTEM: MDAC ID: ITEM:	FRCS 520 RESISTOR,	5.1K 1/4	W					
LEAD ANALYST:	D. HARTMA	N		. .				
ASSESSMENT:								
CRITICAL FLIGH	ITY R T	EDUNDANCY	SCREENS	- · ·	CIL ITEM			
HDW/FU	NC A	I	3	С				
NASA [3 /3 IOA [3 /3] [] [] [] [] [] []]	[]*			
COMPARE [/] [] [] []	[]			
RECOMMENDATIONS:	(If dif	ferent fr	om NASA)					
[3 /2R] [P] []	?) [P] (A	[] .DD/DELETE)			
* CIL RETENTION	RATIONALE:	(If app]	licable) IN	ADEQUATE IADEQUATE	[]			
REMARKS: THIS FAILURE MAY POSITION. REDUN TO FALSELY FAILI OPERATIONS.	CAUSE LOS DANCY PROV NG THE VAL	S OF ACCU IDED. LC VE CLOSEI	URATE IND DSS OF AI D, POSSIE	L REDUNDA L REDUNDA LY EFFECT	F THE VALVE NCY MAY LEAD ING MISSION			
ISSUE NOT RESOLV	ED AT MEET	ING WITH	SUBSYSTE	M MANAGER	ON 1/20/88.			

_

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-52 05-6KF-2	L 2086 -1		NASA DATA: BASELINE NEW	: [] [X]	
SUBSYSTEM: MDAC ID: ITEM:	FRCS 521 RESISTOI	R, 5.1K 1	/4W			
LEAD ANALYST:	D. HARTI	MAN				
ASSESSMENT:						
CRITICAL	JTY	REDUNDAN	CY SCREEN	S	CIL ITEM	
HDW/FU	NC	A	В	C		
NASA [3 /3 IOA [3 /3] [] [] [] [] [] []	[] []	*
COMPARE [/] [] [] []	[]	
RECOMMENDATIONS:	(If d	ifferent	from NASA)		
[/] [] [] [] (A)	[] DD/DEL	ETE)
* CIL RETENTION	RATIONAL	E: (If ap	plicable)	ADEOUATE	r 1	
	Bhaile		I	NADEQUATE	i j	
REMARKS: A SHORT ACROSS A IOA RECOMMENDS F FMEA.	A RLR TYP REMOVAL O	E RESISTC F THE "SH	OR IS NOT ORT" FAIL	A CREDIBLE URE MODE FI	FAILU ROM TH	RE. IS

ISSUE RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88 (SHORT FAILURE MODE TO BE REMOVED).

REPORT DATE 2/26/88

.

C-480

n<u>e pere</u> verte filono e

₹

ASSESSMENT DATE: 1/29/88 NASA DATA: BASELINE [ASSESSMENT ID: FRCS-522 NEW [X] NASA FMEA #: 05-6KF-2085 -1 SUBSYSTEM: FRCS MDAC ID: 522 ITEM: RESISTOR, 5.1K 1/4W LEAD ANALYST: D. HARTMAN ASSESSMENT: REDUNDANCY SCREENS CIL CRITICALITY ITEM FLIGHT B С A HDW/FUNC] NASA [3 /3] ſ] [] [[] * 1 IOA [3 /3 1 1 Г 1 COMPARE [/] [] [] ſ] ٢] **RECOMMENDATIONS:** (If different from NASA) [3/2R] [P] [P] [P] [1 (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE Ε INADEQUATE 1 Γ **REMARKS:** THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE

POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

_

-

.....

-

-

9

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-523 NASA FMEA #: 05-6KF-2085 -1									NA E	ASA DAT BASELIN NI	FA: NE [EW [X]	
SUBSYSTE MDAC ID: ITEM:	E M :			FRCS 523 RESI	STOR	, 5.1	.K 1/4	N	.d.			÷	
LEAD ANA	LY	ST	:	D. H	IARTM/	AN							n i una
ASSESSME	ENT	:											
	CR	IT		LITY	1	REDUN	IDANCY	sc	REENS		CIL TTE	м	
]		W/FU	JNC	2	A	В		С				
NASA IOA	[[3 3	/3 /3]]	[[]]	[[]]	[[]	[[]]	*
COMPARE	[/]	נ]	[]	[]	٢]	
RECOMMEN	NDA'	TI	ONS	: (]	f di:	ffere	ent fr	om	NASA)				
	נ		1	3	[]	נ]	נ]] (ADD/D] ELE	TE)
* CIL RI	ETE	NT	ION	RATIC	ONALE	: (If	f appl	ica	ble) AI INAI	DEQUAT DEQUAT	E (E (]]	
REMARKS A SHORT IOA RECO FMEA.	: AC OMM	RO EN	SS 1 DS 1	A RLR REMOVI	TYPE AL OF	RESI THE	STOR SHOR	IS T"	NOT A (FAILURI	CREDIB E MODE	LE FAI FROM	LUR THI	E. S
	;-											100	

ISSUE RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88 (SHORT FAILURE MODE TO BE REMOVED).

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-524 05-6KF-2080	6 -1	N2 I	ASA DATA: BASELINE NEW	[[X]]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 524 RESISTOR, !	5.1K 1/4W				
LEAD ANALYST:	D. HARTMAN					· ·
ASSESSMENT:						
CRITICAL	- · ·	CIL				
HDW/FU	NC A	В	с			
NASA [3 /3 IOA [3 /3] [] [] [] [] [] []	[[] *]
COMPARE [/] [] [] []	[]
RECOMMENDATIONS:	(If diff	erent fro	m NASA)			
[3 /2R] [P] [P] [P] (AI	[DD/DE] Slete)
* CIL RETENTION	RATIONALE:	(If appli	cable) Al INA)	DEQUATE DEQUATE	[]
REMARKS: THIS FAILURE MAY POSITION. REDUN TO FALSELY FAILI OPERATIONS.	CAUSE LOSS DANCY PROVI NG THE VALV	OF ACCUR DED. LOS E CLOSED,	ATE INDI S OF ALL POSSIBL	CATION OI REDUNDAI Y EFFECT:	F THE NCY M ING M	VALVE AY LEAD ISSION
ISSUE NOT RESOLV	ED AT MEETI	NG WITH S	UBSYSTEM	MANAGER	ON 1	/20/88.

REPORT DATE 2/26/88

: =---

-

-

-

-

ASSESSMI ASSESSMI NASA FMI	ent Ent Ea #	D/ II #:	ATE: D:	: 1/2 FRC 05-	9/88 S-525 6KF-20	86 -	-1		NZ E	ISA I BASEI	DATA LINE NEW	: []] x]	-
SUBSYSTI MDAC ID: ITEM:	em : :			FRC 525 RES	S SISTOR,	5.1	LK 1/4	W	5a.	. · ·				- 14 ⁻ 14 - -,
LEAD ANA	ALYS	ST	:	D.	HARTMA	N								
ASSESSMI	ent :	;												
	CRI	T) דו		LITY	R	EDUN	NDANCY	sc	REENS			CI TT	L	
	H	ID	W/FU	JNC	A	•	В		С					
NASA IOA	[[3 3	/3 /3]]	[[]]_	[[]	ן נ]		[[]	*
COMPARE	[/]	[]	נ]	C]		[]	
RECOMMEN	IADN	CI (ONS	: (If dif	fere	ent fr	om	NASA)					
	[/]	, L]	. []	[]	(A] DD/] DEL	ETE)
* CIL RI	ETEN	IT:	ION	RATI	ONALE:	(11	f appl	ica	ble) AI INAI	EQU	ATE	[]	
REMARKS A SHORT IOA RECO FMEA.	: ACI OMMI	ROS	SS Z DS 1	A RLF REMOV	R TYPE VAL OF	RES] THE	ISTOR "SHOR	IS F"	NOT A C FAILURE	RED	IBLE DE F	FA Róm	ILU. TH	RE. IS
														·

ISSUE RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88 (SHORT FAILURE MODE TO BE REMOVED).

....

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-526 05-6KF-20	85 -1	NASA DATA: BASELINE [] NEW [X]					
SUBSYSTEM: MDAC ID: ITEM:	FRCS 526 RESISTOR,	5.1K 1/4	W		ш			
LEAD ANALYST:	D. HARTMA	N		. u .				
ASSESSMENT:								
CRITICAL	ITY R	EDUNDANCY	SCREENS		CIL			
HDW/FU	NC A	В		с	TICH			
NASA [3 /3 IOA [3 /3] [] [] [] []	[]*			
COMPARE [/] [] [] []	[]			
RECOMMENDATIONS:	(If dif	ferent fr	om NASA)					
[3 /2R] [P	·] [₽] [P] (A	[] DD/DELET	E)		
* CIL RETENTION	RATIONÁLE:	(If appl	icable)					
	н Настания в да 115 г.		IN	ADEQUATE ADEQUATE		11 V.L		
REMARKS: THIS FAILURE MAY POSITION. REDUN TO FALSELY FAILIN OPERATIONS.	CAUSE LOS DANCY PROV NG THE VAL	S OF ACCU IDED. LO VE CLOSED	RATE IND SS OF AL , POSSIB	ICATION O L REDUNDA LY EFFECT	F THE VA NCY MAY ING MISS	LVE LEAD ION		
ISSUE NOT RESOLV	ED AT MEET	ING WITH	SUBSYSTE	M MANAGER	ON 1/20	/88.		

REPORT DATE 2/26/88

. . . .

: =

-

: -

-

=

=

ASSESSMI ASSESSMI NASA FMI	SSESSMENT DATE: 1/29/88 SSESSMENT ID: FRCS-527 ASA FMEA #: 05-6KF-2085 -1								NAS BA	A DATA: SELINE [NEW [x]	··
SUBSYSTI MDAC ID: ITEM:	em : :			FRCS 527 RESI	STOR,	5.3	1K 1/4	W	· · · ·			
LEAD AND	ALY	ST	:	D. H	IARTMA	N						
ASSESSMI	ENT	:										
	CR	IT F	ICA LIG	LITY	F	EDUI	NDANCY	S	CREENS	C I	IL Tem	
	1	HD	W/F	UNC	A	L	В		С			
NASA IOA	[[3 3	/3 /3]	[[]]	[[]]	[] []	[[]	*
COMPARE	[/]	[]	[]	[]	ſ]	
RECOMMEN	NDA'	TI(ons	: (]	f dif	fer	ent fr	om	NASA)			
	[/]	[]	[]	[]] (ADD] /DELI	ETE)
* CIL R	ETEI	NT	ION	RATIC	NALE:	(I:	f appl	ica	able)		_	
									ADE INADE	QUATE [QUATE []	
REMARKS A SHORT	AC	RO	SS	A RLR	TYPE	RES	ISTOR	IS	NOT A CR	EDIBLE F	AILUI	RE.
TOA RECO	UMM	EN	DS	REMOVA		THE .a .:	"SHOR	- T	FAILUKE	MODE FROM	<u></u>	19
				3		1.7 * (**)			TW WANAC	ED ON 1/		·

ISSUE RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88 (SHORT FAILURE MODE TO BE REMOVED).

NASA DATA: ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-528 BASELINE [NEW [X] NASA FMEA #: 05-6KF-2086 -1 SUBSYSTEM: FRCS MDAC ID: 528 RESISTOR, 5.1K 1/4W ITEM: LEAD ANALYST: D. HARTMAN ASSESSMENT: CIL REDUNDANCY SCREENS CRITICALITY ITEM FLIGHT С В HDW/FUNC A NASA [3 /3 ן נ]]] [L IOA [3/3] ſ 1 Γ] 1 ſ 1 [1 [] [] COMPARE [/] [] **RECOMMENDATIONS:** (If different from NASA) [3/2R] [P] [P] [P] ſ 1 (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE in the state L INADEQUATE ſ 1

REMARKS: THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

.

ASSESSMI ASSESSMI NASA FMI	ent Ent Ea #	DATE: ID: :	: 1/29 FRCS 05-6)/88 -529 KF-20)86 -	NASA DATA: BASELINE [] -1 NEW [X]							
SUBSYST MDAC ID ITEM:	EM : :		FRCS 529 RESI	STOR,	, 5.1	.K 1/4	IW						
LEAD AN	ALYS	т:	D. H	IARTM/	N								
ASSESSMI	ENT:												
	CRI	TICAI FLIGI	LITY IT	I	REDUN	DANCY	C SCR	EENS			CII ITH	- E M	
	H	DW/F	JNC	1	ł	I	3	C	2				
NASA IOA	[[3 /3 3 /3]]	[[]]	[[]]	[[]]		[[] *]	
COMPARE	[/]	C]	C]	[]		[]	
RECOMME	NDAT	IONS	: (]	f dif	ffere	nt fi	com N	ASA)					
	[/	3	[]	[]	[]	(A)	[DD/I] DELET	E)
* CIL R	eten	TION	RATIC)NALE :	: (If	app]	licab	le) / IN/	ADEQU. ADEQU.	ATE ATE	[[]]	
REMARKS A SHORT IOA REC	: ACR OMME	oss i NDS i	A <u>RLR</u> REMOVA	TYPE L OF	RESI THE	STOR	IS N RT" F	OT A AILUI	CRED RE MO	IBLE DE FI	FA] ROM	LURE THIS	•

.

FMEA.

ISSUE RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88 (SHORT FAILURE MODE TO BE REMOVED).

REPORT DATE 2/26/88

ASSESSMENT DAT ASSESSMENT ID: NASA FMEA #:	E: 1/29/8 FRCS-5 05-6KI	38 530 7-208	6 -1			N.	ASA DATA BASELINH NEV	A: 5 [∛ [X]]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 530 RESIST	ror,	5.1K	1/40	ł				
LEAD ANALYST:	D. HAI	RTMAN	ſ						
ASSESSMENT:									
CRITIC	ALITY	RE	DUND	NCY	SCRE	ens		ĊIL	v
HDW/	FUNC	A		В		С		TIE	M
NASA [3 / IOA [3 /	3] 3]	[[]]	[[]]	[[]	[[] *]
COMPARE [/]	[]	[]	[]	[]
RECOMMENDATION	5: (If	diff	erent	: fro	om NA	SA)			
	2R]	[P]	[P]	[P] (2	[ADD/D] ELETE)
* CIL RETENTIO	N RATION	ALE:	(If a	appl:	icabl	e) A INA	DEQUATE DEQUATE	[[]]
REMARKS: THIS FAILURE M	AY CAUSE	LOSS	OF	ACCUI	RATE	INDI	CATION (OF TH	E VALV

THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

.

and a construction of the second s

REPORT DATE 2/26/88

-

ASSESSMI ASSESSMI NASA FMI	ent Ent Ea ;	D) I) #:	ATE D:	2: 1/ FR 05	29/88 CS-53 -6KF-	1 2086	-1			NASA I BASEI	DATA: LINE NEW	: [[X]	
SUBSYST MDAC ID ITEM:			FR 53 RE	CS 1 SISTO	R, 5.	.1K 1/4	W							
LEAD AN	ALY:	ST	:	D.	HART	MAN								
ASSESSM	ENT	:										- · · · ·		
	CR	IT		LITY		REDU	UNDANCY	c so	CREENS	;		CIL	M	
	1	HD	W/I	TUNC		A	1	3		С			••	
NASA IOA	[[3 3	/3 /3	8] 8]	[נ]	[[]]	[[]	-	[[]	*
COMPARE	[/]	[]	[]	[]		[]	
RECOMME	NDA'	FI	ONS	5:	(If d	iffe	rent fi	com	NASA)					
	[/	1	נ]	ſ]	[]	(AI	[]]] ELE	TE)
* CIL R	ETE	NT	IOF	I RAT	IONAL	e: (]	If app:	Lica	able) IN	ADEQUI IADEQUI	ATE ATE	[]]	
REMARKS A SHORT IOA REC FMEA.	: ACI OMM	RO EN	SS DS	A RL REMO	R TYP VAL O	e res F Thi	SISTOR E "SHOI	IS RT"	NOT A FAILU	CRED	IBLE DE FI	FAI ROM	LUR THI	E. S
ISSUE R	ESO	LV	ED	AT M	EETIN	G WIT	TH SUB	SYSI	rem Ma	NAGER	ON 2	L/20	/88	

.

=

-

(SHORT FAILURE MODE TO BE REMOVED).

REPORT DATE 2/26/88

APPENDIX C ASSESSMENT WORKSHEET ASSESSMENT DATE: NASA DATA: BASELINE [ASSESSMENT ID: FRCS-532] NASA FMEA #: NEW [1 SUBSYSTEM: FRCS MDAC ID: 532 OX & FU TK ISOL VLV 1/2 SWITCH ITEM: LEAD ANALYST: ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM A HDW/FUNC В С NASA NASA [/] [IOA [3 /3] [] []] j] COMPARE [N /N] [] **RECOMMENDATIONS:** (If different from NASA) (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] and a second INADEQUATE [1 **REMARKS:** OXIDIZER AND FUEL TANK ISOLATION VALVE 1/2 SWITCH RE-ANALYZED BY IOA. SEE ASSESSMENT IDs FRCS 11085X-11089X. -----1 REPORT DATE 2/26/88 C-491

100

SUBSYSTEM: MDAC ID: ITEM:FRCS 533 OX & FU TK ISOL VLV 1/2 SWITCHLEAD ANALYST:ASSESSMENT:CRITICALITY FLIGHT HDW/FUNCREDUNDANCY SCREENS BCIL ITEMNASA IOA $[3/1R]$ $[P]$ $[P]$ $[P]$ IOA $[3/1R]$ $[P]$ $[P]$ $[P]$ $[P]$ COMPARE $[N/N]$ $[N]$ $[N]$ $[N]$ $[N]$	
LEAD ANALYST: ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL FLIGHT A B C NASA $\begin{bmatrix} / \\ 3 / 1R \end{bmatrix}$ $\begin{bmatrix} \\ P \end{bmatrix}$ $\begin{bmatrix} \\ P \end{bmatrix}$ $\begin{bmatrix} P \end{bmatrix}$ $\begin{bmatrix} \\ \end{bmatrix}^*$ COMPARE $\begin{bmatrix} N / N \end{bmatrix}$ $\begin{bmatrix} \end{bmatrix}$	
ASSESSMENT: $\begin{array}{c} CRITICALITY \\ FLIGHT \\ HDW/FUNC \end{array} \qquad REDUNDANCY SCREENS \\ A B C \end{array} \qquad \begin{array}{c} CIL \\ ITEM \end{array}$ $\begin{array}{c} ITEM \end{array}$ $\begin{array}{c} OR \\ ITEM \end{array}$ $\begin{array}{c} OR \end{array}$ $\begin{array}{c} OR \\ ITEM \end{array}$ $\begin{array}{c} OR \\ ITEM \end{array}$ $\begin{array}{c} OR \\ ITEM \end{array}$ $\begin{array}{c} OR \end{array}$ $OR \end{array}$ $\begin{array}{c} OR \end{array}$ $\begin{array}{c} OR \end{array}$ $\begin{array}{c} OR \end{array}$ $OR \end{array}$ $\begin{array}{c} OR \end{array}$ $OR \end{array}$ $\begin{array}{c} OR \end{array}$ $OR $	¥4 -
$\begin{array}{c} CRITICALITY \\ FLIGHT \\ HDW/FUNC \end{array} \qquad \begin{array}{c} REDUNDANCY SCREENS \\ A & B & C \end{array} \qquad \begin{array}{c} CIL \\ ITEM \end{array}$ $\begin{array}{c} NASA \\ IOA & \begin{bmatrix} / \\ 3 / 1R \end{bmatrix} & \begin{bmatrix} \\ P \end{bmatrix} $	
HDW/FUNC A B C NASA $\begin{bmatrix} / \\ 3 / 1R \end{bmatrix}$ $\begin{bmatrix} \\ P $	
NASA $[/]$ $[]$ $[]$ $[]$ $[]$ IOA $[3 / 1R]$ $[P]$ $[P]$ $[P]$ $[P]$ $[]$ COMPARE $[N / N]$ $[N]$	
COMPARE [N/N]. [N] [N] [N] []	
RECOMMENDATIONS: (If different from NASA)	
[/] [] [] [] [] (ADD/DELETE)	
* CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE []	
REMARKS:	
TOA. SEE ASSESSMENT IDS FRCS 11085X-11089X.	+ - <u>^</u>

REPORT DATE 2/26/88

- - - -

-

--

ASSESSME ASSESSME NASA FME	NT NT A #		ATE: D:	FR	CS-5	534	1								N7 F	ASA I BASEI	DATA: LINE NEW	: []	•]	
SUBSYSTE MDAC ID: ITEM:	M:			FR 53 OX	CS 4 & F	U	TH	K I:	SOL	V	'LV	7 1/	'2 S	W	IJ	гсн					
LEAD ANA	LYS	T:	:																		
ASSESSME	NT:																				
CRITICALITY FLIGHT								REDUNDANCY SCREEN										CIL ITEM			
	H	[DV	V/FUI	NC			A				B				С						
NASA IOA	[[3	/ /1R]		[[P]		[[P]	[Р]		[[]	*
COMPARE	ſ	N	/N]	-	[N]		[N]	(•	N]		[]	
RECOMMENDATIONS: (If different from NASA)																					
	[/]		[]		[]	(•]	(Al] DD/	DE] LF	TE)
* CIL RE	TEN	[T]	ION	RAT	IONA	L	E:	(I	fa	PI)];	cat	ole) I	[N	AI AI	DEQU DEQU	ATE ATE	[]	
REMARKS: OXIDIZER	AN E A	ID \SS	FUE: SESSI	L T MEN	ANK T II	I:)s	50] FI	LAT	ION 11	7 30	/A]	LVE (-1)	1/2 L089	2 9 X	sī	VITC	H RE-	-AN	AL	YZ	ED B

REPORT DATE 2/26/88

E.A

-

-

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	FRCS-535		NASA DATA: BASELINE NEW	[]								
SUBSYSTEM: MDAC ID: ITEM: 2	FRCS 535 OX & FU TK	ISOL VLV 1/2 S	WITCH OPEN	CONTACTS 1,								
LEAD ANALYST:												
ASSESSMENT:												
CRITICAL	ITY REI	DUNDANCY SCREEN	S	CIL								
FLIGH HDW/FU	NC A	В	С	T I CM								
NASA [/ IOA [3 /1R] []] [P]] [] [] [F] [] P]	[] * [X]								
COMPARE [N /N] [И]	ן נאן (N]	[N]								
RECOMMENDATIONS: (If different from NASA)												
[/	J (]	3 [] [] (AE	[] DD/DELETE)								
* CIL RETENTION	RATIONALE: ((If applicable) I	ADEQUATE NADEQUATE	[]								
REMARKS: OXIDIZER AND FUE	L TANK ISOL	ATION VALVE 1/2	SWITCH RE-	ANALYZED BY								
IOA. SEE ASSESSMENT IDS FRCS 11085X-11089X.												

REPORT DATE 2/26/88

and a set of the second of the second

				A	ai Ssessi	PPENI IENT	DIX C WORKS	SHEET	2				
ASSESSMEI ASSESSMEI NASA FMEI	NT NT A #		ATE: D:	FRC	5-536				1	NASA BASE	DATA: LINE NEW	[[]
SUBSYSTE MDAC ID: ITEM: 2	M:			FRC: 536 OX	S & FU 1	K IS	SOL VI	IV 1/	2 SW	ІТСН (OPEN	CO	NTACTS
LEAD ANA	LYS	T	:										
ASSESSME	NT:												
(CRI	T F	ICAL LIGH	JITY T	F	EDU	IDANCY	SCF	EENS	-		CI IT	L EM
	n	וטו	<i>"/</i> FU	NC	F	1	ľ	•	,	.			
NASA IOA	[[3	/ /3]	[[]]	[[]]	[[]		[[] *]
COMPARE	[N	/N]	[]	[]	٦]		[]
RECOMMENI	DAI	'IC	ONS:	(:	If dif	fere	ent fr	om N	iasa)				
	[7	ן ני	C]	נ]	Ľ]	(AD	[D/1] DELETE
* CIL RE	FEN	Ţ	ION	RATIO	ONALE:	(11	app]	icab	ole)	ADEQU	ATE	[j

IOA. SEE ASSESSMENT IDS FRCS 11085X-11089X.

REPORT DATE 2/26/88

u 2

<u>в та</u>

-

.

ها

ASSESSMI ASSESSMI NASA FMI	ent Ent Ea	D2 II #:	ATE: D:	FRCS	-537		NASA DATA: BASELINE [] NEW []									
SUBSYSTI MDAC ID ITEM:	EM: :			FRCS 537 OX &	FU I	K IS	OL VI	N 1/	2 SW]	TCH (GPC C	e: ONTA	CTS	3,4		
LEAD AND	ALY	ST	:													
ASSESSM	ENT	:											-			
	CR	IT	ICAI	LITY	F	REDUN	DANCY		CIL							
		F. HDI	W/FU	IT INC	7	A	E	3	C	2						
NASA IOA	[[3	/ /3]	[[]]	[[]]	[[]		[] *			
COMPARE	נ	N	/N	1	[]	[]	ן]		[]			
RECOMME	NDA	TI	ONS	: (1	fdi	fere	ent fi	com N	IASA)							
	נ		/]	[]	[]	[]	(AD	[D/DE] LETE)		
* CIL R	ETE	NT:	ION	RATIC	NALE	: (If	app]	licab	ole) IN	ADEQU. ADEQU.	ATE ATE	[]]	-		
REMARKS OXIDIZE IOA. S	: R A EE	ND AS	FUI SESS	el tan Sment	IK ISO IDs 1	DLATI FRCS	ON VI 11089	ALVE 5X-13	1/2 1089X	SWITC:	H RE-	ANAL	YZED	BY		

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	FRCS-538		NASA BASI	DATA: LINE [] NEW []							
SUBSYSTEM: MDAC ID: ITEM:	FRCS 538 OX & FU TK	ISOL VLV	1/2 SWITCH	GPC CONTACTS	3,4						
LEAD ANALYST:											
ASSESSMENT:											
CRITICAL	ITY RE	DUNDANCY S	CREENS	CIL							
HDW/FUI	NC A	В	С								
NASA [/ IOA [3 /3] [] [] []	[] []	[]*							
COMPARE [N /N] [3 []	[]	[]							
RECOMMENDATIONS: (If different from NASA)											
[/] [] []	[]	[] (ADD/DELETE))						
* CIL RETENTION 1	RATIONALE:	(If applic	able) ADEQU INADEQU	IATE [] IATE []							
REMARKS: OXIDIZER AND FUE IOA. SEE ASSESSI	L TANK ISOL MENT IDS FR	ATION VALV CS 11085X-	E 1/2 SWITC 11089X.	H RE-ANALYZED	BY						

- -

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	ENT ENT EA ‡	D7 II #:	ATE: D:	FRCS-	•539				1	IASA D BASEL	ATA: INE [NEW []	1.4	
SUBSYSTE MDAC ID: ITEM: 6	EM :			FRCS 539 OX &	FU 7	rk Is	OL VI	LV 1/	2 SW]	[ТСН С	LOSE CO	NTACTS	5,	
LEAD ANA	LYS	ST :	:											
ASSESSME	ENT	:												
	CRI	IT	ICAL	ITY	1	REDUN	DANCY	SCR	EENS		CIL	CIL TTEM		
	H	HDV	V/FU	NC	1	A	P	3	C	2	TID	F1		
NASA IOA	[[3	/ /3]	[[]]	[[]	[[]	[[] *]		
COMPARE	[N	/N]	[]	[]	[]	[]		
RECOMMEN	NDA:	FI (ONS:	(11	di:	ffere	nt fi	com N	ASA)					
	[/]	[]	נ]	[3	[(ADD/D] ELETE)		
* CIL RI	ETEI	NT:	ION	RATION	JALE	: (If	app]	licab	ole) / IN/	ADEQUA ADEQUA	TE [TE []]		
REMARKS	: R_AI	ND	FUE	L TANI	K IS	DLATI	ON VI	ALVE	1/2 9	SWITCH	RE-ANA	LYZED	ВҮ	

لننا

IOA. SEE ASSESSMENT IDS FRCS 11085X-11089X.

REPORT DATE 2/26/88
ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	FRCS-540	NASA DATA BASELINI NEV	A: 5 [] 7 []
SUBSYSTEM: MDAC ID: ITEM: 6	FRCS 540 OX & FU TK ISOI	L VLV 1/2 SWITCH CLOS	SE CONTACTS 5,
LEAD ANALYST:			
ASSESSMENT:			a
CRITICAL FLIGH HDW/FU	ITY REDUNDA T NC A	ANCY SCREENS B C	CIL ITEM
NASA [/ IOA [3 /1R] []] [P]	[] [] [F] [P]	[] * [x]
COMPARE [N /N] [N]	[N] [N]	[N]
RECOMMENDATIONS:	(If different	t from NASA)	
[/.] []	[]][]	[] ADD/DELETE)
* CIL RETENTION	RATIONALE: (If a	applicable) ADEQUATE INADEQUATE	[]
REMARKS: OXIDIZER AND FUE	I. TANK ISOLATIO	N VALVE 1/2 SWITCH R	E-ANALYZED BY

IOA. SEE ASSESSMENT IDS FRCS 11085X-11089X.

REPORT DATE 2/26/88

=

: 1 :

_

C-499

c-8

ASSESSMI ASSESSMI NASA FMI	ENT ENT EA i	D2 II #:	ATE: D:	FRCS	-541			N	IASA D. BASEL	ATA: INE NEW	: [[]		
SUBSYSTI MDAC ID: ITEM: 8	EM : :			FRCS 541 OX &	FU T	K IS	OL VI	V 1/	2 SWI	тсн о	PEN	CON	TACTS	7,
LEAD AND	ALYS	ST	:											
ASSESSMI	ENT	:										-	· ···-	
CRITICALITY REDUNDANCY SCREENS CIL												M		
	1	HDV	N/FU	NC	A		B	5	C	2				
NASA IOA	[[3	/ /3]	[[]]	[[]	[[]		[[] *]	
COMPARE	ן	N	/N]	[]	C	1	[]		[]	
RECOMMEN	NDA!	FI (ons:	(1	f dif	fere	nt fr	om N	ASA)					
	[/]	ĩ]	[]	[1	(AI	[DD/D] ELETE))
* CIL R	ETE	NT:	ION	RATIO	NALE:	(If	appl	icab	le) J INZ	ADEQUA ADEQUA	TE TE	[[]	
REMARKS OXIDIZE IOA. SI	EMARKS: XIDIZER AND FUEL TANK ISOLATION VALVE 1/2 SWITCH RE-ANALYZED BY OA. SEE ASSESSMENT IDS FRCS 11085X-11089X.													

REPORT DATE 2/26/88

÷

.

- -

.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	FRCS-542		NASA DATA BASELINE NEW	
SUBSYSTEM: MDAC ID: ITEM: 8	FRCS 542 OX & FU TH	(ISOL VLV	1/2 SWITCH OPEN	CONTACTS 7,
LEAD ANALYST:				
ASSESSMENT:				
CRITICAL FLIGH	ITY RE T	EDUNDANCY S	SCREENS	CIL ITEM
HDW/FU	NC A	В	С	
NASA [/ IOA [3 /3] [] [] []] []] []] []	[] * []
COMPARE [N /N] [J [] []	[]
RECOMMENDATIONS:	(If dif	ferent from	m NASA)	
[/) _. [] []	[] [] (A	[] .DD/DELETE)
* CIL RETENTION REMARKS:	RATIONALE:	(If applic	cable) ADEQUATE INADEQUATE	

OXIDIZER AND FUEL TANK ISOLATION VALVE 1/2 SWITCH RE-ANALYZED BY IOA. SEE ASSESSMENT IDS FRCS 11085X-11089X.

REPORT DATE 2/26/88

an t blint

-

=

-

-

· ___

.

-

ASSESSME ASSESSME NASA FME	NT NT A #	DA II :	ATE: D:	FRCS	-543				1	NASA D BASEL	ATA: INE NEW	[[]
SUBSYSTE MDAC ID: ITEM: 10	M:			FRCS 543 OX &	FU 1	rk is	OL VI	.V 1/	2 SW:	ІТСН G	PC C	CONT	ACTS 9,
LEAD ANA	LYS	ST :	:										
ASSESSME	NT:												
	CRI	T]	CAL	ITY	1	REDUN	DANCY	SCR	EENS			CIL	ur .
	H	F I IDV	V/FUI	NC	1	A	E	3	(2		110	-1
NASA IOA	[[3	/ /3]]	[[]]	[[]]	[[]]		[[] *]
COMPARE	[N	/N]	C]	[]	[]		[]
RECOMMEN	DAI	IC	ons:	(I	f di	ffere	nt fr	om N	ASA)				
	נ	•	/]	[]	[]	ſ]	(AI	[מ/ס] Elete)
* CIL RE	TEN	[T]	ION 1	RATIO	NALE	: (If	appl	icab	le) INZ	ADEQUA ADEQUA	TE TE	[[]
REMARKS: OXIDIZER IOA. SE	AN E A	id Ass	FUE SESSI	L TAN MENT	K IS IDs 1	OLATI FRCS	ON VA 11085	LVE X-11	1/2 S 089X	SWITCH	RE-	-ANAI	LYZED BY

REPORT DATE 2/26/88 C-502

್ ಎಂದು ಸಂಪ್ರದ ಸಂಪ್ರ

ASSESSME ASSESSME NASA FME	ENT ENT EA ;	D/ II #:	ATE: D:	FRCS	5-544					NASA D BASEL	ATA: INE [NEW []]
SUBSYSTE MDAC ID: ITEM: 10	E M :			FRCS 544 OX 8	5 6 FU 1	rk is	SOL VI	LV 1,	/2 51	ИТСН G	PC CO	NTACTS 9
LEAD ANA	LY	ST	:									
ASSESSME	ENT	:										
	CR	IT F	ICAI LIGI	LITY IT	1	REDUN	IDANCY	K SCI	REENS	5	CI	IL TEM
]	HD	W/Ft	JNC	1	A	E	3		с		
NASA IOA	[[3	/ /3]]	[[]]	[[]	ן נ]	[[] *]
COMPARE	٦	N	/N]	[]	[]	٢]	[]
RECOMMEN	IDA!	TI	ONS	: (]	f di:	ffere	ent fi	com 1	NASA)		
	[/]	[]	[]	[]] (ADD] /delete)
* CIL RE	ETE)	NT	ION	RATIO	ONALE	: (I1	f app]	Lical	ble) I	ADEQUA NADEQUA	.TE (.TE (]]
REMARKS	RA	ND	FU	EL TAI	NK IS	DLAT		ALVE	1/2	SWITCH	RE-A	NALYZED

IOA. SEE ASSESSMENT IDS FRCS 11085X-11089X.

and and a set of the
REPORT DATE 2/26/88

: =

2

- -

C-503

.

i i

- - -.

-

ASSESSMENT DATE: ASSESSMENT ID: FRCS-545 NASA FMEA #:										N	IASA DA' BASELII NI	FA: Ne (Ew (]]	
SUBSYSTE MDAC ID: ITEM: 11, 12	M:			FRC 545 OX	s & FU	TK	ISOL	VLV	1/2	SWI	TCH CLA	DSE CO	ONTAC	CTS
LEAD ANA	LYS	ST :	:											
ASSESSME	NT :	:										-	t vie	e di tera
	CRI	T]	CAL	ITY		REI	OUNDAN	ICY	SCRE	ENS		CI	L 7 M	
	F	IDV	V/FU	NC		A		B		C	:		311	
NASA IOA	[[3	/ /3]	[[]]	[[]	[[] *	
COMPARE	[N	/N]	ſ]		[]	נ]	[]	
RECOMMEN	IDAJ	ric	ons:	(If di	.ffe	erent	fro	m NAS	SA)				
	[/]	[]]	[]	[(ADD/1] DELEI	'E)
* CIL RE	TEN	1T]	ION 1	RATI	ONALE	:: _(lf ap	opli	cabl	e) A INA	DEQUATI DEQUATI	2 [2 []]	. ·
REMARKS: OXIDIZER	R AN E A	ND ASS	FUE:	L TA MENT	NK IS ' IDs		TION S 110	VAI 85X	VE 1, -110	/2 S 39X.	WITCH 1	RE-ANZ	LYZE	D BY

REPORT DATE 2/26/88 C-504

s i ne e

 $*_{\beta}$

tang ang sa

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	FRCS-546	NASA DATA: BASELINE NEW	
SUBSYSTEM: MDAC ID: ITEM: 11, 12	FRCS 546 OX & FU TK ISOL VLV	1/2 SWITCH CLOSE	E CONTACTS
LEAD ANALYST:			
ASSESSMENT:			• • • • •
CRITICAL FLIGH	ITY REDUNDANCY	SCREENS	CIL ITEM
HDW/FU	NC A B	С	
NASA [/ IOA [3 /1R] [] [] [P] [F] []] [P]	[] * [X]
COMPARE [N /N] [И] [И	ן א ן	[א]
RECOMMENDATIONS:	(If different fro	m NASA)	
[/] [] [] [] (AI	[] DD/DELETE)
* CIL RETENTION	RATIONALE: (If appli	cable) ADEQUATE INADEQUATE	
REMARKS: OXIDIZER AND FUE IOA. SEE ASSESS	L TANK ISOLATION VAL MENT IDs FRCS 11085X	VE 1/2 SWITCH RE- -11089X.	-ANALYZED BY

REPORT DATE 2/26/88

: :=

.

C-505

-

ASSESSME ASSESSME NASA FME	NT DA NT II A #:	ATE:):	FRCS-	NZ I	ASA DATA BASELINE NEW	: [[]				
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 547 OX &	FU TI	K ISOI	. VLV	7 3/4/	'5 SV	VITCH		
LEAD ANA	LYST:										
ASSESSME	NT:										
	CRITI	CAL	ETY P	RI	EDUNDA	NCY	SCREE	INS		CIL	A
	HDW	I/FUI	NC	A		В		С		T T Dt	•
NASA IOA	[3	/ /3]	[[]	[[]	[[]	[[] *
COMPARE	[]	/N]	[]	[]	[]	[]
RECOMMEN	DATIC)NS:	(If	dif	ferent	fre	om NAS	SA)			
	[/	1	[]	נ]	[] (A)	[DD/DI] Elete)
* CIL RE	TENTI	I NO	RATION	ALE:	(If a	ppl:	icable	e) Ai INAI	DEQUATE DEQUATE	[[]
REMARKS: OXIDIZER BY IOA.	AND SEE	FUE ASSI	l tank Essmen	ISOI T ID:	LATION 5 FRCS	VA 5 11	LVE 3/ 090X-1	/4/5 1094	SWITCH	RE-AN	NALYZED

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	FRCS-548			NASA DATI BASELINI NEW	A: E [] W []
SUBSYSTEM: MDAC ID: ITEM:	FRCS 548 OX & FU	TK ISOI	L VLV 3/4,	/5 SWITCH	
LEAD ANALYST:					
ASSESSMENT:					
CRITICAL FLIGH	ITY T	REDUNDA	NCY SCREI	ENS	CIL ITEM
HDW/FU	NC	A	В	С	
NASA [/ IOA [3 /1R] [] [] P]	[] [P]	[] [P]	[] * []
COMPARE [N /N	J [N]	[N]	[N]	· []
RECOMMENDATIONS:	(If di	fferent	from NAS	SA)	
[/] []	[]	[]	[] ADD/DELETE)
* CIL RETENTION	RATIONALE	: (If a	applicable	2)	
				ADEQUATE INADEQUATE	
REMARKS: OXIDIZER AND FUE BY IOA. SEE ASS	L TANK IS ESSMENT I	OLATION Ds FRCS	VALVE 3/ 5 11090X-1	/4/5 SWITCH L1094X.	RE-ANALYZED

REPORT DATE 2/26/88 C-507

ieros Vigili

1 ة. يُرْ أسا

= :

.

£ 13

e 1

=

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	FRCS-549		NASA DATA: BASELINE NEW	; [] []	
SUBSYSTEM: MDAC ID: ITEM:	FRCS 549 OX & FU TK ISO	L VLV 3/4/5	SWITCH		
LEAD ANALYST:					
ASSESSMENT:					
CRITICAL	TTY REDUND.	ANCY SCREEN	S	CIL TTEM	
HDW/FU	NC A	В	С	± 1 211	
NASA [/ IOA [3 /1F] []] [P]	[] [[P] [] P]] *]
COMPARE [N /N] [N]	[N][N]	[]
RECOMMENDATIONS:	(If differen	t from NASA	.)		
[/] []	ניז נ] (Al] LETE)
* CIL RETENTION	RATIONALE: (If	applicable) I	ADEQUATE NADEQUATE	[]
REMARKS: OXIDIZER AND FUE BY IOA. SEE ASS	L TANK ISOLATIO ESSMENT IDs FRC	N VALVE 3/4 S 11090X-11	/5 SWITCH 1 094X.	RE-AN	ALYZED

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	NT NT A	D2 I1 #:	ATE: D:	FRC	S-5	50)								NA E	SA DA BASEL	ATA INË NEW	: [[]]		
SUBSYSTE MDAC ID: ITEM: 1, 2	M:			FRC 550 OX	:S & F	۳IJ	TF	(I	SOI	5 7	γLζ	73/	4/	5	SW	ИТСН	OP	EN	cc)NT	AC.	rs
LEAD ANA	LYS	5 T :	:																			
ASSESSME	NT	:																				
	CR:	IT: F] HD	ICAL LIGH W/FU	ETY F IC			RI A	EDU	NDA	NO	CY B	SCF	REE	NS	С			C3 I3	[L PEN	1		
NASA IOA	[[3	/ /1R]		[[P]]		[[F]		[[P]		[[x]]	*	
COMPARE	נ	N	/N]		[N]		[N]		נ	N]		[N]		
RECOMMEN	'DA'	rI(ons:	(If	d:	if	fer	ent	: :	fro	om 1	NAS	A)								
	נ		/]		[]		[]		[]	(A] DD,	/DI] SLE	TE)
* CIL RE	TE)	NT	ION 3	RATI	ONZ	ALI	E:	(1	fa	apj	p1 :	Lcal	ole) IN	AI IAI	DEQUA DEQUA	TE TE	[[]]		
REMARKS: OXIDIZER	A	ND	FUE	L TA	NK	I	501	LAT	101	, I	VA]	LVE	3/	4/	'5	SWIT	СН	RE	-A1	IAI	YZ	ED

BY IOA. SEE ASSESSMENT IDS FRCS 11090X-11094X.

REPORT DATE 2/26/88

C-509

л 1997-гайс I. В -

ASSESSMEN ASSESSMEN NASA FMEA	551			ł	VASA DA BASELI N	TA: NE [EW []]				
SUBSYSTEM MDAC ID: ITEM: 1, 2	[:		FRCS 551 OX & I	T TF	K ISOI	. VII	3/4/	/5 5	БWITCH	OPEN C	ONTACTS
LEAD ANAI	YST:										
ASSESSMEN	IT:										
c	RITI	CAL	TY	RE	DUNDA	NCY	SCREE	ens		CIL	i INF
	HDŴ	/FUN	1C	A		В		C	3	TIE	-4-1
NASA IOA	[[3	/ /3]	[[]]	[[]	[[]	[[] *]
COMPARE	[N	/N]	[]	[]	[]	Γ]
RECOMMEND	DATIC	NS:	(If	diff	erent	fro	om NAS	SA)			
	נ	/]	נ]	C]	[3	[(ADD/D] DELETE)
* CIL RET	TENTI	ON P	RATION	LE:	(If a	ppli	cable	≥) 2 IN2	ADEQUAT ADEQUAT	Ë [E [."]]
REMARKS: OXIDIZER	AND	FUEI	L TANK	ISOI	ATION	I VAI	.VE 3/	/4/5	5 SWITC	H RE-A	NALYZED
BY IOA.	SEE	ASSI	ESSMEN	C IDs	FRCS	: 110	90X-1	109	94X.		

REPORT DATE 2/26/88

.

---- :

Ē

ASSESSMENT ASSESSMENT NASA FMEA	DATE: ID: #:	FRCS-55	2			NZ E	ASA DA BASELI N	TA: NE [EW []]				
SUBSYSTEM: MDAC ID: ITEM: 4		FRCS 552 OX & FU	TK ISO	L VL	7 3/4	/5 SV	VITCH	GPC CO	NTACTS	3,			
LEAD ANALYS	ST:												
ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL													
ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM HDW (FUNC A P C													
I	HDW/FUI	NC	Α	В		С							
NASA [IOA [/ 3 /3] [] []]	[[]	[[]	[[] *]				
COMPARE [N /N] []	[]	נ]	ľ]				
RECOMMENDA	TIONS:	(If d	ifferen	t fr	om NA	SA)							
Ľ	/] []	[]	[]	[(ADD/D] ELETE)				
* CIL RETEN	NTION	RATIONAL	E: (If	appl	icabl	e) AI INAI	DEQUAT DEQUAT	E [E []				
OXIDIZER AL BY IOA. SI	ND FUE EE ASSI	L TANK I ESSMENT	SOLATIC IDs FRC	N VA	LVE 3 090X-	/4/5 11094	SWITC	H RE-A	NALYZE	D			

REPORT DATE 2/26/88

ASSES ASSES NASA	smen Smen Fme <i>l</i>	TV TV A ‡	DZ II \$:	ATE: D:	FRCS	-553				1	IASA BASE	DATA: LINE NEW	: [[]]	
SUBSY MDAC ITEM: 4	STEN ID:	M:			FRCS 553 OX &	FU 1	rk Is	OL VI	LV 3/	4/5 5	SWITC	H GPO	c cc	NTACT	S 3,
LEAD	ANAI	L¥S	ST:	:											
ASSES	SME	NT:	:										-		
	(CRI	T] F]	ICAL LIGH	ITY T	I	REDUN	DANCY	SCR	EENS			CII ITE	M	
		F	IDV	V/FU	NC	1	A	E	3	C	2				
NA I	ISA IOA	[[3	/ /3]]	[[]	[[]]	[[]]		[[] *]	
COMPA	RE	[N	/N]	[]	נ]	C]		[]	
RECOM	MENI	DAI		ONS:	(1	f di	ffere	nt fi	com N	iasa)					
		נ		/]	[1	נ]	C]	· (Al	[)D/I] DELETE)
* CII	L RE	rei	NT:	ION	RATIO	NALE	: (If	app]	licab	ole) / IN/	ADEQU. ADEQU	ATE ATE	[[]]	· _
REMAN OXIDI BY IC	RKS: IZER DA.	Al Si	ND EE	FUE ASS	L TAN ESSME	K ISO NT II	DLATI Ds FR	ON VA	LVE L090X	3/4/5	5 SWI 94X.	TCH I	RE-A	NALYZ	ED

Ì

-

REPORT DATE 2/26/88 C-512

ASSESSME ASSESSME NASA FME	NT NT A	D2 I1 #:	ATE: D:	FR	CS-5	554]	NASA DA BASELI I	ATA: INE [NEW []]	
SUBSYSTE MDAC ID: ITEM: 5, 6	M:			FR 55 OX	CS 4 7 & 1	T UT	K IS	OL VI	V 3/	4/5	SWITCH	CLOSE	CON	TACTS
LEAD ANA	LYS	ST	:											
ASSESSME	NT	:												
	CR:	IT: F: HDI	ICAL LIGH	ITY T NC		R	EDUN	DANCY	SCF	REENS	c	C] []	L EM	
	-		, 10			,	, 	-	, ,		- ,	F		±
NASA IOA	L [3	/3]		[[]	L [j	נ]	Ĺ]	~
COMPARE	[N	/N]		[]	[]	נ]	C]	
RECOMMEN	DA'	rI(ons:		(If	dif	fere	nt fr	om N	IASA)				
	[/]		נ]	[]	Γ]	[(ADD/] 'DELE	TE)
* CIL RE	TE	NT	ION	RAI	ION	ALE:	(If	appl	icat	ole) IN	ADEQUA' ADEQUA'	re (re (]]	· · · · · · · ·
ALMARKS:	2011	ŃΠ	ना एव	т. т	ANK	TSC	T.ATT	ON VA	IVE	3/4/	5 SWIT	CH RE-	ANAT	YZED

OXIDIZER AND FUEL TANK ISOLATION VALVE 3/4/5 SWITCH R BY IOA. SEE ASSESSMENT IDS FRCS 11090X-11094X.

REPORT DATE 2/26/88 C-513

ASSESSMENT ASSESSMENT NASA FMEA #	DATE: ID: :	FRCS-5	55				N	ASA DA BASELI N	TA: NE [IEW []	
SUBSYSTEM: MDAC ID: ITEM: 5, 6		FRCS 555 OX & F	U TF	(ISOI	VLV	3/4/	'5 S	WITCH	CLOS	E (CONT	TACTS
LEAD ANALYS	F :											
ASSESSMENT:												
CRI	FICALI FLIGHI DW/FUN	[TY [1C	RE A	DUNDA	NCY B	SCREE	NS C	!	C I	IL TE	м	
NASA [IOA [/ 3 /1R]	[[P]	[[F]]	[[F]	[[x	; []	*
COMPARE []	N /N]	[N]	ת]]	[N	[]	[N]	
RECOMMENDAT	IONS:	(If	diff	erent	fro	om NAS	A)					
C	/]	[]	[]	[]] (ADD	/D] ELEI	ſE)
* CIL RETEN	TION I	RATIONA	LE:	(If a	ppli	cable	e) A INA	DEQUAT	YE (YE (]]	77FD
BY IOA. SE	E ASSI	L TANK ESSMENI		FRCS	110	עב זען 90X-1	4/9 .109	4X.	n KE	A.	INAL)	1260

7

REPORT DATE 2/26/88 C-514

.

27 ÷ *

ASSESSME ASSESSME NASA FME	NT NT A #	DÆ II :	ATE: D:	FRC	5-556	5			ł	NASA D BASEL	ATA: INE NEW	[]	
SUBSYSTE MDAC ID: ITEM: 7, 8	:M:			FRC 556 OX	S & FU	TK IS	SOL VI	JV 3/	'4/5 S	WITCH	OPE	NC	CONTAC	rs
LEAD ANA	LYS	T:	:											
ASSESSME	NT:													
	CRI	T] FI	CAL	ITY T		REDUN	IDANCY	SCR	REENS		(CII ITH	3 M	
	н	DV	V/FU	NC		A	E	3	C	2	·			
NASA IOA	[[3	/ /3]]] []	[[]]	[[]		[[] *]	
COMPARE	נ	N	/N]	۵]	[]	[]		[]	
RECOMMEN	DAT	'IC	ons:	(If di	ffere	ent fr	om N	iasa)					
	[/]	ן נ]	[]	٢]	(AD	[D/I] DELETE)
* CIL RE	TEN	T	ION	RATI	ONALE	C: (I1	appl	icat	ole) /	ADEOUA	TE	Г	1	
REMARKS:									INZ	DEQUA	TE	Ì	j	
OXIDIZER BY IOA.	AN SE	D E	FUE ASS	L TAN	NK IS ENT I	OLATI	CON VA	LVE 10903	3/4/5 (-1109	5 SWIT 94X.	CH R	E-7	ANALYZI	ED

REPORT DATE 2/26/88

-

-

ASSESSMEN ASSESSMEN NASA FMEN	VT D2 VT 11 A #:	ATE: D:	FRCS-	557				N	IASA DA BASELI M	ATA: INE [NEW [].]			
SUBSYSTEM MDAC ID: ITEM: 7, 8	1:		FRCS 557 OX & 1	FU TI	K ISOI	, ALZ	1 3/4/	′5 S	WITCH	OPEN	CONT	ACTS		
LEAD ANAI	LYST	:												
ASSESSMEN	ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL													
CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM														
	HD	W/FU	NC	A		В		C	:					
NASA IOA	[[3	/ /3]	[[]	[[]]	[[]]	[[];	*		
COMPARE	[N	/N]	[]	[]	נ]	[]			
RECOMMENI	DATI	ons:	(If	dif	ferent	: fro	om NAS	SA)						
	[/]	נ]	[]	[1	[(ADD,] /DELE	FE)		
* CIL RET	rent:	ION	RATION	ALE:	(If a	ppl:	icable	e) A INA	DEQUAT	TE [TE []]			
REMARKS: OXIDIZER BY IOA.	AND SEE	FUE ASS	L TANK ESSMEN	ISOI F ID:	LATION S FRCS	V VAJ 5 110	LVE 3/)90X-1	/4/5 L109	SWITC 4X.	CH RE-	-ANAL	YZED		

REPORT DATE 2/26/88

. .

-

.

ASSESSMENT ASSESSMENT NASA FMEA	DATE ID: #:	FRCS-	558				N	ASA DA BASELI 1	ATA: INE NEW	: [[]]		
SUBSYSTEM: MDAC ID: ITEM: 10		FRCS 558 OX &	FU TI	K ISO	L VL	V 3/4,	/5 S	WITCH	GP	c co	NTACTS	9,	
LEAD ANALY	ST:												
ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL													
ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM HDW/FUNC A B C													
			А		5		Ŭ						
NASA [IOA [/ 3 /3]]	[[]	[[]]	[[]]		[[] *]		
COMPARE [N /N	3	[]	[]	[]		[]		
RECOMMENDA	TIONS	: (If	dif	feren	t fr	om NAS	SA)						
tila di C	/ 41.012	3	[3	[3	[]	(Al	ן ס/סס] ELETE)		
					- - -		- 1						
* CIL RETE	INTION	RATION	ALE:	(11 3	appı	lCable	е) Ъ	DEOUA	rт	r	1		
		n Alarahan at an at					INA	DEQUA!	ΓE	ľ]		
REMARKS:	-							-		-	-		
OXIDIZER A BY IOA. S	ND FU SEE AS	EL TANK SESSMEN	ISO TID	LATIO S FRC	N VA 5 11	LVE 3, 090X-:	/4/5 1109	SWIT(4X.	CH 1	RE-A	NALYZE	D	

REPORT DATE 2/26/88

i_ <u>I</u>

: •

: <u>-</u>....

=

-

ŝ

_

;

.

= :

ASSESSMEN ASSESSMEN NASA FMEA	NT D. NT I: A #:	ATE: D:	FRCS-S	559				N 2 1	ASA DATA BASELINE NEW	L: 5 [7 []
SUBSYSTEN MDAC ID: ITEM: 10	1:		FRCS 559 OX & I	TU TH	(ISOI	VL	7 3/4/	'5 ST	WITCH GE	PC CO1	NTACTS 9,
LEAD ANAI	lyst	:									
ASSESSMEN	1T :										
C	CRIT F	ICALI LIGHT	LTY P	RE	DUNDA	NCY	SCREE	ENS		CIL ITEI	4
	HD	W/FUI	NC	Α		В		С			
NASA IOA	[[3	/ /3]]	[[]	[[]	[[]]	[[] *]
COMPARE	[11	/N]	[]	נ]	[]	[]
RECOMMENI	DATI	ons:	(If	diff	erent	: fro	om NAS	SA)			
	[/]	נ]	[]	[] (2	[נס/ססי] Elete)
* CIL RET	TENT	ION I	RATION	ALE:	(If a	ppli	icable	e) Ai Inai	DEQUATE DEQUATE	[[]]
OXIDIZER BY IOA.	AND SEE	FUEI ASSI	l tank Essment	ISOI IDs	ATION FRCS	I VAI 5 110	LVE 3/)90X-1	4/5 1094	SWITCH	RE-Al	VALYZED

÷.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	FRCS-560			NASA DA BASELI I	ATA: INE [] NEW []
SUBSYSTEM: MDAC ID: ITEM: 11, 12	FRCS 560 OX & FU T	K ISOL VI	.V 3/4/!	5 SWITCH	CLOSE CONTACTS
LEAD ANALYST:					
ASSESSMENT:					
CRITICAL FLIGH	LITY R	EDUNDANCY	SCREEN	15	CIL ITEM
HDW/FU	INC A			C	
NASA [/ IOA [3 /3] [] [] [] []	[] []	[] * []
COMPARE [N /N] [] []	[]	[]
RECOMMENDATIONS:	(If dif	ferent fi	com NASI	A)	
[/	ຸ] [ן נ]	[]	[] (ADD/DELETE)
* CIL RETENTION	RATIONALE:	(If app]	licable) ADEQUA' INADEQUA'	TE [] TE []
REMARKS: OXIDIZER AND FUE	L TANK ISO	LATION V	ALVE 3/	4/5 SWIT	CH RE-ANALYZED

BY IOA. SEE ASSESSMENT IDs FRCS 11090X-11094X.

REPORT DATE 2/26/88

:

: L.

. . .

- ----

1 44

2

-

_

ه

;

-

•

na∰enti∯ og tellerig<u>en</u> skola en stationen som som stationen. Nationen

ASSESSMEN ASSESSMEN NASA FMEA	IT IT A #		ATE: D:	FRCS-5	561							N <i>P</i> E	ASA DA BASELI N	TA: NE IEW	[[]	
SUBSYSTEN MDAC ID: ITEM: 11, 12	[:			FRCS 561 OX & H	TU	TK	ISOL	. 7	/LV	3/4,	/5	SV	ИТСН	CLO	SE	С	ON	TACTS
LEAD ANAI	JYS	ST:	:															
ASSESSMEN	IT:																	
c	RI	T]	[CAL]	TY		RE	DUNDA	NC	CY	SCRE	ENS	5				L Dv		
	H	IDV	/FUN	IC		A			B			С		· · -	ττ,	014 014		
NASA IOA	[[3	/ /1R]	[[P]]	[[F]]	[[P]		[x]]	*
COMPARE	[N	/N]	[N]	[N]	[N]		[]	N]	
RECOMMENI	TAC	IC	ONS:	(If	di	ff	erent	: 1	fro	m NAS	SA))						
	נ		/]	[]	[]	[]	(AD	[D/1	DE] LE	TE)
* CIL REI	'EN	IT]	ION F	ATION	LE	:	(If a	pŗ	oli	cable	e) IN	AI JAI)EQUAT)EQUAT	'E 'E	[r]	
REMARKS: OXIDIZER BY IOA.	AN SF	ID EE	FUEI ASSI	L TANK SSMENT	IS F I	OL. Ds	ATION FRCS	I V	7AI	VE 3, 90X-1	/4/ 110	/5)94	SWITC	HR.	E-2	AN	AĹ	YZED

REPORT DATE 2/26/88

1.

ASSESSMI ASSESSMI NASA FMI	ent ent ea	D2 I) #:	ATE: D:	FRCS-	562	2						NA E	SA DA BASEL	ATA: INE NEW	[]]	
SUBSYSTI MDAC ID ITEM:	EM: :			FRCS 562 CONTR	OLI	LEI	R, R	EMC	TE	P	OWER						
LEAD AND	ALY	ST	:														
ASSESSM	ENT	:															
	CR	IT F	ICAL	ITY F		RI	EDUN	DAN	Y SICY	S	CREENS	5			CIL ITEN	1	
]	HD	W/FUI	NC		A			в			C					
NASA IOA	[[3	/ /2R]]	[[Р]]	[P]	[[P]		[[] *]	
COMPARE	[N	/N]	נ	N]	[N]	٢	N]		[]	
RECOMME	NDA	TI	ons:	(If	đ	if	fere	nt	fr	om	NASA)						
	[/]	נ]	l]	[]	(AI	[00/01] ELET	E)
* CIL R	ete:	NT	ION	RATION	AL	E :	(If	ar	pl	ic	able) IN	AI IAI)EQUA')EQUA'	TE TE	[[]	
													-		-	-	

REMARKS: FORWARD MANIFOLD ISOLATION VALVE #5 RE-ANALYZED BY IOA DUE TO CHANGE TO CIRCUITRY. SEE ASSESSMENT IDS FRCS 11001X-11079X.

REPORT DATE 2/26/88

ASSESSM ASSESSM NASA FM	ENT ENT EA	D/ I) #:	ATE: D:	FRCS-	563				:	NASA DA BASELI N	ATA: INE IEW	[[]
SUBSYST MDAC ID ITEM:	EM: :			FRCS 563 CONTR	OLLE	R, RE	MOTE	POWEI					
LEAD AN	ALY	ST	:										
ASSESSM	ENT	:											
	CR	IT:	ICAL	ITY	R	EDUND	ANCY	SCREE	ens			CIL	M
]	HD	W/FU	NC	Α		В			с			
NASA IOA	[[3	/ /3]	[[]]	[[]	[[]		[[] *]
COMPARE	[N	/N]	[3	٢	1	[]		[]
RECOMME	NDA	TI	ons:	(If	dif	feren	t fro	om NAS	SA)				
	[/]	נ]	[]	[]	(AI	[0/0] Elete)
* CIL R	ETE	NT	ION	RATION	ALE:	(If	appl:	icable	∍) IN	ADEQUAT ADEQUAT	re Te	[[]
REMARKS FORWARD CHANGE	: TO	NI	FOLD RCUI	ISOLA	TION SEE	VALV	E #5	RE-AN I IDs	IAL FR	YZED BY CS 1100	7 IC)1X-	DA D	UE TO 79X.

REPORT DATE 2/26/88 C-522

A second s

-

_

≣

_

≣

= : -

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA # :	FRCS-564			N	ASA DAT BASELIN NH	CA: NE [Ew []]		
SUBSYSTEM: MDAC ID: ITEM:	FRCS 564 CONTROLLEI	R, REM	IOTE	POWER	Ł					
LEAD ANALYST:										
ASSESSMENT:										
CRITICAL	ITY RI	EDUNDA	NCY	SCREE	INS		(1	CIL TTEM	ſ	
HDW/FU	NC A		В		C		-			
NASA [/ IOA [3 /3] [] []	[[]	[[]]] *]	;
COMPARE [N /N] []	[]	[]	([]	
RECOMMENDATIONS:	(If dif:	ferent	: fro	om NAS	SA)					
, , , , , , , , , , , , , , , , , , ,] [3	נ]	נ]	(ADI	[D/DE] :LEI	PE)
* CIL RETENTION	RATIONALE:	(If a	appli	icable	≥) A INA	DEQUATI	E E	[[]	
REMARKS: FORWARD MANIFOLD CHANGE TO CIRCUI	ISOLATION TRY. SEE	VALVI ASSESS	e #5 Sment	RE-AN I IDS	VALY FRC	ZED BY S 1100	10/ 1X-3	A DU 1107	IE] 9X.	ro ,

REPORT DATE 2/26/88

;

| 143 | 253 | **25**3

-

-

-

-

. :

. 7

-.

ASSESSM ASSESSM NASA FM	ent Ent Ea	D2 I1 #:	ATE: D:	FRCS-	56!	5						NZ I	ASA DATA: BASELINE NEW	: [[]
SUBSYST MDAC ID ITEM:	EM : :			FRCS 565 CONTRO	OL	LEI	R, I	REMOI	'E	POWI	ER				
LEAD AN	ALY	ST	:												
ASSESSM	ENT	:													
	CR	IT:	[CAL]	CTY		RI	EDUI	NDANC	Y	SCRI	EENS	;		CIL	
]	HD	V/FUN	10 10		A			В			С		TIEL	1
NASA IOA	[[3	/ /2R]	[[P]]	[[P]]	[[P]	[[] *]
COMPARE	נ	N	/N]	[N]	[N]	[N]	[]
RECOMME	NDA'	TIC	ons:	(If	đ	if	ere	ent f	r	om N2	ASA)				
	[/]	[]	[]	[] (AI	[)D/DI] ELETE)
* CIL R	ETE	NT:	ION P	RATION	ALI	E :	(11	f app	1 1	lcab]	le)	AI	DEQUATE	٢	1
REMARKS	:										IN	IAI	DEQUATE	Č	j
FORWARD	MA	NII	FOLD	ISOLA	<u><u>r</u>i(</u>	ON	VAI	LVE #	5	RE-A	ANAI	JY Z	ED BY IC	DA DU	JE TO
CHANGE '	TO (CII	RCUIT	TRY. S	SEI	E 2	SSI	ESSME	N	l IDa	s FF	CS	5 11001X-	-1107	9X.

REPORT DATE 2/26/88 C-524

ASSESSME ASSESSME NASA FME	NT DATE: NT ID: A #:	FRCS-56	56				:	NASA DAT. BASELIN NE	A: E [W []
SUBSYSTE MDAC ID: ITEM:	M:	FRCS 566 CONTROI	LEH	R, REI	MOTE	POWER	2			
LEAD ANA	LYST:								,	
ASSESSME	NT:									
	CRITICAI FLIGH	JTY T	RI	EDUNDA	ANCY	SCREE	ns		CII ITE	M
	HDW/FU	NC	A		В		1	С		
NASA IOA	[/ [3 /2F) [;] [P]	[[P]]	[[] P]	[[] *]
COMPARE	[N /N] [N]	[]]	[И]	C]
RECOMMEN	DATIONS:	(If d	lifi	ferent	t fro	om NAS	A)			
	[/] [•]	נ]	נ]	[ADD/I] DELETE)
* CIL RE	TENTION	RATIONAI	E:	(If a	appl:	icable	:)		_	_
		. <u></u> .					IN	ADEQUATE ADEQUATE	[[]
FORWARD CHANGE T	MANIFOLD O CIRCUI	ISOLATI	ON CE 2	VALV	E #5 SMEN'	RE-AN I IDs	AL FR	YZED BY CS 11001	IOA [X-110	OUE TO 079X.

REPORT DATE 2/26/88

.

o kona nom kona kona

ASSE <u>SSM</u> ASSESSM NASA FM	ent Ent Ea ‡	D2 II #:	ATE: D:	FRCS-5	567]	NASA DATA BASELINE NEW	: [[]
SUBSYST MDAC ID ITEM:	EM : :			FRCS 567 CONTRO	LLEF	R, REI	IOTE	POWER	٤			
LEAD AN	ALYS	5T	:							-		
ASSESSM	ENT	:										
	CRJ	IT:		ITY	RE	EDUNDA	ANCY	SCREE	ens		CIL	w
	F	F1 HD1	W/FUI	NC	A		В		(C .		
NASA IOA	[[3	/ /3]	[[]]	[[]]	[[]]	[[] *]
COMPARE	[N	/N	1	[]	[]	[3	[]
RECOMME	NDA'	FI (ons:	(If	diff	ferent	t fro	om NAS	SA)			
	[/]	נ]	[]	[] (A] .DD/D] ELETE)
* CIL R	etei	NT:	ION	RATION	ALE:	(If a	appli	icable	≥) IN	ADEQUATE ADEQUATE]]
REMARKS FORWARD CHANGE	: MAI TO (NI	FOLD RCUI	ISOLAT	TION SEE P	VALV	e #5 Sment	RE-AN F IDs	IAL FR	YZED BY I CS 11001X	OA D	UE TO 79X.

REPORT DATE 2/26/88

.

internet and the second subscript

, *ž*

=

-

=

÷.

ASSESSMENT DATE: 1/29/88 NASA DATA: BASELINE [ASSESSMENT ID: FRCS-568 NEW [X] NASA FMEA #: 05-6KF-2255F-1 SUBSYSTEM: FRCS MDAC ID: 568 ITEM: DIODE LEAD ANALYST: D. HARTMAN ASSESSMENT: REDUNDANCY SCREENS CIL CRITICALITY ITEM FLIGHT В C HDW/FUNC A [P] [X]* NASA [3/1R][F] [P] IOA [3/3] [] ſ] **r** 1 COMPARE [/N] [N] [N] **RECOMMENDATIONS:** (If different from NASA) [3/3] [] [] [] [D] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE Ľ INADEQUATE [٦ **REMARKS:** NASA FMEA CONSIDERS MULTIPLE FAILURES. THIS FAILURE ALONE HAS NO EFFECT.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

C-527

.

ASSESSMI ASSESSMI NASA FMI	ENT ENT EA #		ATE:):	1/ FR 05	29/8 CS-5 -6KH	88 569 7-2) 225	55F-	2					N2 I	ASA BAS	DATA: ELINE NEW	[x]]	
SUBSYSTI MDAC ID: ITEM:	E M :			FR 56 DI	CS 9 ODE															
LEAD ANA	LYS	ST:	:	D.	HAF	S.L.I	IAN	1												
ASSESSMI	ENT:																			
	CRI	T] FI	CALI LIGH	CTY C			RI	EDUN	DAI	٩C	Y	SCF	REENS	5			C] I]	IL TEN	1	
	H	۱D۳	V/FUI	NC.			A				в			C						
NASA IOA	[[3 3	/1R /3]]		[[P]]		[[F]]	[[P]]		[[X]	*
COMPARE	[/N]		[N]		[N]	ſ	N]		[N]	
RECOMMEN	1DAI	'IC	ONS:		(If	d:	if	fere	nt	f	rc	om N	iasa))						
	Γ	2	/1R]		[P]	1	[F]	[P]	(AI] /00	A /DI	511]	ETE)
* CTL RI	TEN	רידי	ION 1	RAT	TONA	L	E:	(If	a	מס	lj	cab	ole)							

ADEQUATE [] INADEQUATE []

272

REMARKS:

NASA FMEA CONSIDERS MULTIPLE FAILURES. THIS FAILED SHORT DIODE CAUSES EXCESSIVE MOTOR OPERATION (CONTINUOUS POWER THAT OPENS THE VALVE SLIGHTLY THEN CLOSES IT, CONSTANTLY REPEATING ITSELF). MOTOR DAMAGE WOULD LIKELY CAUSE THE VALVE TO CLOSE, CAUSING LOSS OF JETS ON ASSOCIATED MANIFOLD, REDUNDANCY PROVIDED BY JETS ON ANOTHER MANIFOLD. LOSS OF REDUNDANCY CAUSES THE INABILITY TO EXPEL PROPELLANTS TO MEET CG CONSTRAINTS.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

ereal a

ASSESSME ASSESSME NASA FME	NT NT A		ATE: D:	1/ FR 05	29/8 CS-9 -6KI	29/88 25-570 •6KF-2255C-1								N	ASA BAS	DATA ELINE NEW	: [[[] X]	
SUBSYSTE MDAC ID: ITEM:	M:			FR 57 DI	CS 0 ODE														
LEAD ANA	LYS	ST	:	D.	HAI	RTI	MAI	N											
ASSESSME	NT	:																	
	CR	IT: F	ICAL	ITY T			RI	EDU	NDA	NC	CY	sc	REEN	S			CI TT	L EM	
	J	HD	W/FU	NC			A				В			С			**		
NASA IOA	[[3 3	/1R /1R]]		[[P P]		[[P P]	[[P P]]		[[]	*
COMPARE	נ		/]		נ]		[]	[]		נ]	
RECOMMEN	'DA'	rI(ons:		(If	đ	if	fer	ent	: 1	fr	m	NASA	.)					
1	<u>[</u>		/]		[]		[]	[]	A)] DD/] DEI	LETE)
* CIL RE	TE	NT	ION	RAT	ION	AL	E:	(1	fa	p)]:	lca	ble) I	A NA	DEQ	UATE UATE	[[]	
NO DIFFE	RE	NC	ES.																

REPORT DATE 2/26/88

• _-

-

- - -

-

-

-

ASSESSMENT ASSESSMENT NASA FMEA	F DATI F ID: #:	E: 1/29 FRC: 05-0	9/88 5-571 6KF-225	55C-	·2		N.	ASA DATA BASELINE NEW	: [[X].
SUBSYSTEM: MDAC ID: ITEM:	:	FRC: 571 DIO	s De							
LEAD ANALY	YST:	D. 1	HARTMAN	1						
ASSESSMENT	г:									
CI	RITICA FLIC	ALITY GHT	RI	EDUN	DANCY	SCR	EENS		CIL ITE	M
	HDW/1	FUNC	A		В		С	· ····		
NASA IOA	[3 /: [3 /:	3] LR]	[[F]]	[[P]]	[[P]	[[x] *]
COMPARE	[/]	4]	[N]	[И]	[N]	[N]
RECOMMENDA	ATIONS	5: ()	If diff	fere	nt fro	om N	iasa)			
ł	c /]	C]	ſ]	ſ] (A	[DD/D] ELETE)
* CIL RET	ENTIO	N RATIO	ONALE:	(If	appl:	icab	ole) A INA	DEQUATE DEQUATE	[[]]
IOA AGREES	S WITH	H NASA	FMEA.							

REPORT DATE 2/26/88 C-530

Ξ

Ħ

NASA DATA: ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-572 BASELINE [1 NEW [X] NASA FMEA #: 05-6KF-2255 -1 SUBSYSTEM: FRCS MDAC ID: 572 ITEM: DIODE LEAD ANALYST: D. HARTMAN ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM С HDW/FUNC В Α [F] [1] [P] [1 NASA [2 /1R] [P] [X] * ī IOA [3/3] 1 COMPARE [N /N] [N] [N] [N] [N] **RECOMMENDATIONS:** (If different from NASA) [3/3] [] [] [D] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE Γ INADEQUATE [1 **REMARKS:** NASA FMEA CONSIDERS MULTIPLE FAILURES. THIS FAILURE ALONE HAS NO EFFECT. AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

er - 1

C-531

· · · ·

ASSESSM ASSESSM NASA FM	SSESSMENT DATE: 1/29/88 SSESSMENT ID: FRCS-573 ASA FMEA #: 05-6KF-2255 -2									NASA DATA: BASELINE [] NEW [X]						
SUBSYST MDAC ID ITEM:	em : :			FRCS 573 DIODE						1.1 T		eren e en				
LEAD AN	ALY	ST	:	D. HA	RTMA	N										
ASSESSM	ENT	:														
	CR	IT:		ITY	R	EDUND	ANCY	SCREE	ens		CIL	ĸ				
	1	HD	W/FU	NC	A		В		С		1101	•				
NASA IOA	[[3 3	/3 /3]	[[]	[[]	[[]	[[] *]				
COMPARE	נ		/]	[]	נ]	[]	[]				
RECOMME	NDA'	TI(ons:	(If	dif	feren	t fro	om NAS	SA)							
	ľ	3	/2R	3	[₽]	[P]	[P] (AI	ן וס/סכ] ELETE)				
* CIL R	ETE	NT)	ION	RATION	ALE:	(If	appli	icable	≥) AI INAI	DEQUATE DEQUATE	[[]				
REMARKS THIS FA	: ILU	RE	МАУ	CAUSE	LOS	S OF	ACCUI	RATE I		CATION OF	THI	E VALVE				
POSITIO TO FALS OPERATI	N. Ely Ons	RI F/	EDUN	DANCY NG THE	PROV VAL	IDED. VE CL	LOS OSED	ss of , poss	ALL SIBLY	REDUNDAN (EFFECT)	NCY N ENG N	AY LEAD				
						1. S.	11 11 11 11 11 11 11 11 11 11 11 11 11	<u></u>			÷	· · · · · · · · · · · · · · · · · · ·				

_

Ξ

_

=

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

÷ .

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-57 05-6KF-2	4 2255B	-1		NASA BAS	DATA ELINE NEW	:: ; [; [X]]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 574 DIODE							
LEAD ANALYST:	D. HART	MAN						
ASSESSMENT:								
CRITICAL FLIGH	ITY T	REDU	NDANCY	SCREEN	IS		CIL ITEN	4
HDW/FU	NC	A	В		С			
NASA [3 /2R IOA [3 /1R] [] [P] P]	[P [P] [P] P]		[[] *]
COMPARE [/N	J []	ľ] []		C]
RECOMMENDATIONS:	(If d	iffer	ent fro	om NASA	.)			
[3 /1R] [P]	[12	A] [P]	(2	[נס/סם] ELETE)
* CIL RETENTION	RATIONAL	E: (I	f appl:	icable) I	ADEQ NADEQ	UATE UATE	[[]]
REMARKS: THIS DIODE FAILE	D OPEN C	AUSES	INABI	LITY TO	OPEN	THE	VALVI	E WITH

THIS DIODE FAILED OPEN CAUSES INABILITY TO OPEN THE VALVE WITH THE GPC. MANUAL REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY CAUSES LOSS OF JETS REQUIRED TO EXPEL PROPELLANTS TO MEET CG LIMITS.

ISSUE NOT RESOLVED AT THE MEETING WITH THE SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-575 05-6KF-22	55B-2			N 2	ASA DAT BASELIN NE	'A: IE [IW [] x]	
SUBSYSTEM: MDAC ID: ITEM:	FRCS 575 DIODE				7 . se				
LEAD ANALYST:	D. HARTMAN	N							
ASSESSMENT:									
CRITICAL FLIGH HDW/FU	ITY RI F NG A	EDUNDA	NCY	SCREE	NS C		CI IT	L EM	
NACA (2 /2	, , , , , , , , , , , , , , , , , , ,	,	- r	1	r	1	r	٦	*
IOA [3 / 3 IOA [3 / 1R] [F]	[₽]	[P]	נ	x]	
COMPARE [/N] [И	1	נ א]	[ท	1	נ	ן א	
RECOMMENDATIONS:	(If dif:	ferent	: fro	om NASI	A)				
[/] []	[]	[]	[ADD/] DEL	ETE)
* CIL RETENTION H	RATIONALE:	(If a	appli	cable) Al INA	DEQUATE DEQUATE	[[]]	
IOA AGREES WITH N	NASA FMEA.	-		2 7.211					

=;

REPORT DATE 2/26/88 C-534
NASA DATA: ASSESSMENT DATE: 1/29/88 BASELINE [ASSESSMENT ID: FRCS-576 NEW [X] NASA FMEA #: 05-6KF-2255E-1 SUBSYSTEM: FRCS MDAC ID: 576 DIODE ITEM: LEAD ANALYST: D. HARTMAN **ASSESSMENT:** REDUNDANCY SCREENS CIL CRITICALITY ITEM FLIGHT В С HDW/FUNC Α [P] [] NASA [3 /1R] IOA [3 /3] [F] [] [P] [] [X] * 1 COMPARE [/N] [N] [N] [N] **RECOMMENDATIONS:** (If different from NASA) [D] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE Ι 1 INADEQUATE [1 **REMARKS:** NASA FMEA CONSIDERS MULTIPLE FAILURES. THIS FAILURE ALONE HAS NO EFFECT.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-577 05-6KF-2255E-2	NASA DATA: BASELINE NEW	[]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 577 DIODE		
LEAD ANALYST:	D. HARTMAN		
ASSESSMENT:			
CRITICAL	TY REDUNDAN	CY SCREENS	CIL
HDW/FUN	NC A	B C	
NASA [3 /1R IOA [3 /3] [P] [] [] [F] [P]] []	[X]* []
COMPARE [/N] [N] [и] [И]	[N]
RECOMMENDATIONS:	(If different	from NASA)	
[2 /1R] [P]] [F] [P] (AD	[A] DD/DELETE)
* CIL RETENTION H	RATIONALE: (If ap	plicable) ADEQUATE INADEQUATE	
NASA FMEA CONSIDI	ERS MULTIPLE FAIL	URES. THIS FAILED S	HORT DIODE
CAUSES EXCESSIVE VALVE SLIGHTLY TH	MOTOR OPERATION HEN CLOSES IT, CO	(CONTINUOUS POWER TH NSTANTLY REPEATING I	TSELF).
MOTOR DAMAGE WOUL LOSS OF JETS ON A ON ANOTHER MANIFO EXPEL PROPELLANTS	LD LIKELY CAUSE T ASSOCIATED MANIFO DLD. LOSS OF RED 5 TO MEET CG CONS	HE VALVE TO CLOSE, C LD. REDUNDANCY PROV UNDANCY CAUSES THE I TRAINTS.	AUSING IDED BY JETS NABILITY TO

444

≝ :

- ÷

.....

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-578 05-6KF-2255 -1	NASA DATA BASELINE NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 578 DIODE		
LEAD ANALYST:	D. HARTMAN		
ASSESSMENT:			
CRITICAL	ITY REDUNDAN	CY SCREENS	CIL TTEM
HDW/FU	NC A	B C	
NASA [2 /1R IOA [3 /3] [P] [] [] [F] [P]] []	[X]* []
COMPARE [N /N	ן נא ז נ	м] [М]	[N]
RECOMMENDATIONS:	(If different	from NASA)	
[3 /3] [] [] [] (A	[D] \DD/DELETE)
* CIL RETENTION	RATIONALE: (If ap	plicable) ADEQUATE	L J
		INADEQUATE	i j
NASA FMEA CONTAI EFFECT.	NS MULTIPLE FAILU	RES. THIS FAILURE	ALONE HAS NO

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

1

1

ASSESSMI ASSESSMI NASA FMI	ent Ent Ea f	D2 I1 #:	ATE: D:	1/29 FRC9 05-0	9/88 5-579 5KF-22	55 -2	2			NASA BASE	DATA: LINE NEW	[[x]	. स व र्ष
SUBSYSTI MDAC ID: ITEM:	em : :			FRCS 579 DIOI	5 DE									
LEAD AND	ALYS	ST	:	D. H	IARTMA	N			1 8 1 <u>1</u>	1				
ASSESSM	ENT	:												
	CR	IT:		ITY	R	EDUNI	DANCY	SCI	REENS			CIL	v	
	I	HD	V/FUI	NC	A		В			с		ITEM		
NASA IOA	[[3 3	/3 /3]]	[[]]	[[]]	[[]]		[[]]	*
COMPARE	[/]	נ]	[]	[]		[]	
RECOMMEN	NDA:	ric	ONS:	(]	f dif	ferer	nt fr	om N	iasa)					
	[3	/2R]	[P]	[P]	ľ	P]	(AD	[0D/D] ELE	ETE)
* CIL RI	etei	NT:	ION 1	RATIC	DNALE:	(If	appl	icak	ole) IN	ADEQU ADEQU	ATE ATE	[[]	

REMARKS:

THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

C-538 BELLION DUBLAS - EPOL

i an i an

= : .

i i

. ..

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-580 05-6KF-2268 -	-1	NASA D. BASEL	NASA DATA: BASELINE [] NEW [X]					
SUBSYSTEM: MDAC ID: ITEM:	FRCS 580 DIODE								
LEAD ANALYST:	D. HARTMAN								
ASSESSMENT:									
CRITICALI FLIGHT HDW/FUN	CIL ITEM								
NASA [3 /3 IOA [3 /3] []	[] []	[] []	[]*					
COMPARE [/] []	[]	[]]	[]					
RECOMMENDATIONS:	(If differe	nt from	NASA)	· · · · ·					
[3 /2R] [₱]	[₽]	[₽]	[] (ADD/DELETE)					
* CIL RETENTION H	RATIONALE: (If	applica	ble) ADEQUA INADEQUA	FE [] FE []					
REMARKS: THIS FAILURE MAY POSITION. REDUNI TO FALSELY FAILIN OPERATIONS.	CAUSE LOSS OF DANCY PROVIDED NG THE VALVE C	ACCURAT D. LOSS LOSED, P	E INDICATIO OF ALL REDU OSSIBLY EFF	N OF THE VALVE NDANCY MAY LEAD ECTING MISSION					
ISSUE NOT RESOLVE	ED AT MEETING	WITH SUB	SYSTEM MANA	SER ON 1/20/88.					

REPORT DATE 2/26/88 C-539

ು ಕು. ಅತ್ತುತೆಂದ್ದರೆ

17

· ____

_ _

1997 - 19

ASSESSME ASSESSME NASA FME	NT I NT I A #:	DATE:	1/29/ FRCS- 05-6K	88 581 F-22	68 -	2		NA E	SA DA' BASELI N	TA: NE [EW [x]
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 581 DIODE									
LEAD ANA	LYSI	2:	D. HA	RTMA	N							
ASSESSME	NT:											
CRITICALITY REDUNDANCY SCREENS C FLIGHT I											CIL TEM	ſ
	HI	W/FU	NC	A	÷	В		С		÷.,		
NASA IOA	[3	3 /1R 3 /3]	[F [)]	[P []	[P []	((•] *]
COMPARE	[/N]	[]	[]	[N]	[N]	[N]
RECOMMEN	IDATI	IONS:	(If	dif	fere	ent fro	om NASI	A)				
	[/]	[]	ľ]	[]] (ADE	D/DE] Elete)
* CIL RE	TENI	TION	RATION	ALE:	(If	appli	icable;) Aľ INAľ	EQUAT EQUAT	Ē (Ē (- - -]]
REMARKS: IOA AGRE	EES V	VITH :	NASA F	MEA.								

_

REPORT DATE 2/26/88

and the second second

C-540

ASSESSME ASSESSME NASA FME	NT NT A	D/ I) #:	ATE: D:	1/ FH 05	/29/8 RCS-5 5-6KI	38 582 5-220	68 - 1	L			NASA BASI	DATA ELINE NEW	:]]	1 x]		
SUBSYSTE MDAC ID: ITEM:	м:			FF 58 D]	RCS 32 LODE											
LEAD ANA	LY	ST	:	D	. HAI	RTMAI	N									
ASSESSME	NT	:														
	CR:	IT		ITY	č	R	EDUNI	DANCY	SCR	EENS	5		CI	L FM		
	1	HD!	W/FU	NC	C A E						с		ITEM			
NASA IOA	[[3 3	/3 /3]]		[[]]	[[]]	[[]		[[]	*	
COMPARE	[/]		[]	ſ]	[]	- ee	[]		
RECOMMEN	'DA'	TI	ons:		(If	dif	ferer	nt fr	om N	ASA)						
	נ	3	/2R]		[P]	[P]	[P]	(A] DD/] DEI	ETE)	
* CIL RE	TE] 	NT		RA'	TION	ALE:	(If	appl	icab	ole) IN	ADEQI NADEQI	UATE JATE	[[]		
REMARKS: THIS FAT	LU	RF	MAY	C7	AUSE	LOS	S OF	ACCU	RATE	INI	DICAT	ION O	FT	ΉE	VALVE	

THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

. .

: ____

1

I F

1

7

_

÷,

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-583 05-6KF-2	268 -2		NASA DATA BASELINI NEV	A: E [] N [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 583 DIODE				
LEAD ANALYST:	D. HARTM	AN			
ASSESSMENT:					
CRITICAL FLIGH	ITY : F	REDUND	ANCY SCRI	ENS	CIL ITEM
HDW/FUI	NC .	A	в	C	
NASA [3 /1R IOA [3 /3] []] [P]]	[P] []	[P] []	[]*
COMPARE [/N] []	N]	נ א]	[N]	[א]
RECOMMENDATIONS:	(If di	fferent	from NA	ASA)	
[/] []	[]	[]	[] ADD/DELETE)
* CIL RETENTION 1	RATIONALE	: (If a	applicabl	le) ADEQUATE INADEQUATE	[]
REMARKS: TOA AGREES WITH 1	NASA FMEA				
		-			

REPORT DATE 2/26/88

ASSESSMENT DATE: 1/29/88 NASA DATA: BASELINE [ASSESSMENT ID: FRCS-584 NEW [X] NASA FMEA #: 05-6KF-2255A-1 SUBSYSTEM: FRCS MDAC ID: 584 ITEM: DIODE LEAD ANALYST: D. HARTMAN **ASSESSMENT:** REDUNDANCY SCREENS CIL CRITICALITY ITEM FLIGHT HDW/FUNC A В С NASA [3 /3 [] []] IOA [3/3] 1 COMPARE [/] ז ניז נ r Г 1] **RECOMMENDATIONS:** (If different from NASA) (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE l INADEQUATE F 1 **REMARKS:**

LOSE 1 OF 2 GPC COMMANDS TO CLOSE THE VALVE. REDUNDANCY PROVIDED BY SECOND GPC COMMAND AND MANUAL CLOSE COMMAND. LOSS OF THIS, COUPLED WITH THE LOSS OF ALL HARDWARE REDUNDANCY, MAY PREVENT ISOLATION OF A THRUSTER LEAK.

SUBSYSTEM MANAGER STATED THAT THE GPC IS NOT USED TO ISOLATE A LEAK BECAUSE THE TIME TO EFFECT CAN BE UP TO 24 HOURS (SOFTWARE HAS TO BE MANUALLY LOADED). IOA WITHDRAWS THEIR ISSUE BASED ON THIS RATIONALE.

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	INT INT IA #	DATE: ID: :	1/29/8 FRCS-9 05-6K	88 585 F-229	2		NASA DATA BASELINE NEW	: [] [X]	
SUBSYSTE MDAC ID: ITEM:	EM:		FRCS 585 DIODE						
LEAD ANA	LYS	г:	D. HAI	RTMAI	4				
ASSESSME	ent:								
	CRI	FICAL FLIGH	ITY T	RI	EDUNI	DANCY	SCREE	NS	CIL ITEM
	H	DW/FU	NC	A		B		С	
NASA IOA	[3 /3 3 /1R]	[[F]	[[P]	[] [P]	[] * [X]
COMPARE	ľ	/N]	[]]	[N]	נ א]	[N]
RECOMMEN	IDAT:	IONS:	(If	dif	fere	nt fro	om NAS	A)	
	ľ	/]	[]	[]	[] (A	[] DD/DELETE)
* CIL RE	TEN	TION	RATION	ALE:	(If	appli	lcable) ADEQUATE INADEQUATE	[]
REMARKS: IOA AGRE	EES I	WITH	NASA FI	MEA.			2 8.± .	a mag	

REPORT DATE 2/26/88

.

na series de la companya de la compa Nome de la companya de

C-544 Rectance marked and and

_

-

_

_

2

ASSESSMEN ASSESSMEN NASA FMEA	IT D. IT I: #:	ATE: D:	1/29 FRCS 05-6)/88 -586 5KF-22	:55A-	1	NASA DATA: BASELINE [] NEW [X]							
SUBSYSTEM MDAC ID: ITEM:	[:		FRCS 586 DIOI	S DE										
LEAD ANAL	lyst	:	D. H	IARTMA	N									
ASSESSMEN	IT:													
CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM														
	i	c)			••	-							
NASA IOA	[3 [3	/3 /3]	[[]	[[]	[[]]		[[]	*	
COMPARE	[/]	[]	[]	[]		[.]		
RECOMMEND	DATI	ons:	(1	[f dif	fere	ent fr	om N	NASA)						
	[1]	נ]	C]	[]	(A	[DD/I])ELI	ETE)	
* CIL REI	CENT	ION	RATI	ONALE	: (If	f appl	icat	ole)	DEOU	1 M M W	r	٦		
								INA	DEQU	ATE	[j		
REMARKS: LOSE 1 OF BY SECONI COUPLED V ISOLATION	F 2 D GF WITH N OF	GPC PC CO I THE I A T	COMM MMANI LOS: 'HRUS'	ANDS 2 D AND S OF 2 FER LI	FO CI MANU ALL F EAK.	LOSE I JAL CI HARDWA	'HE V OSE RE I	VALVE. COMMA REDUNI	RE ND. DANCY	DUND LOS	ANCY S OF Y PF	' PI ' TI \EVI	ROVIDI HIS, ENT	ED

SUBSYSTEM MANAGER STATED THAT THE GPC IS NOT USED TO ISOLATE A LEAK BECAUSE THE TIME TO EFFECT CAN BE UP TO 24 HOURS (SOFTWARE HAS TO BE MANUALLY LOADED). IOA WITHDRAWS THEIR ISSUE BASED ON THIS RATIONALE.

REPORT DATE 2/26/88

: ·

: ---

- ----

C-545

•

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-587 NASA FMEA #: 05-6KF-2255A-2								-2			1	NAS BA	A SE	DATA LINE NEW	: []	x]	
SUBSYSTE MDAC ID: ITEM:	M:		FR 58 DI	RCS 7 CODE													-	
LEAD ANA	LYST	:	D.	HAH	RT	MAI	N											
ASSESSME	NT:																	
	CRIT: FI	ICAL	ITY F			RI	EDUI	NDAN	СҮ	SCI	REENS					LL LEN	4	
	HD	₩/FUI	NC			A			В		C	2		-				
NASA IOA	[3 [3	/3 /1R]]		[[F]	[[P]]	[[]	,]			[[x]]	*
COMPARE	[/N]		נ	N]	[N]	1	i]	•		נ	N]	
RECOMMEN	DATIC	ONS:		(If	đ	if	fer	ent	fr	om 1	NASA)			e rena é				Nord and S
	[/]		[]	[]	٢]		(AI] /0C	DE] ELE	TE)
* CIL RE	TENT	ION I	RAT	IONA	L	E:	(1:	f ap	p1 :	icak	ole) A INA	DE DE	QU/ QU/	ATE ATE	[]	
REMARKS: IOA AGRE	ES WI	ITH 1	NAS	A FM	IE2	A.							-		-		-	

_ :

;

REPORT DATE 2/26/88 C-546

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-588 NASA FMEA #: 05-6KF-2255D-1								-1				N7 H	ASA BASI	DATA ELINE NEW	: [[}] (]	
	SUBSYSTE MDAC ID: ITEM:	:M:		FRO 588 DIC	CS 3 DDE							-					
	LEAD ANA	LYSI	:	D.	HART	MAI	N										
	ASSESSME	ENT:															
		CRIT	ICAL	ITY T		R	EDU	NDAN	CY	SCF	REEN	S			CII ITH	_ EM	
		н	W/FU	NC		A			В			С					
	NASA IOA	[3 [3	/1R /3]]	[[P]]	[[P]]	[[P]]		[[]	*
	COMPARE	[/N]	[N]	[N]	[N]		[]	
	RECOMMEN	IDATI	ONS:	i	(If d	if	fer	ent	fr	om N	IASA)					
		Ţ	1]	C]	[]	[]	(2] DELE	ETE)
	* CIL RE	TENI	NOI	RAT:	IONAL	E:	(1	f ap	pl.	icab	ole) I	Al NAI	DEQ	UATE UATE	[]]	
	IOA AGRE	EES V	ITH	NAS	A FME	A.							-				

REPORT DATE 2/26/88

=

.

.

6-1

ASSESSMI ASSESSMI NASA FMI SUBSYSTI	5D-	2				N7 1	ASA DATA BASELINI NEW	A: 5 [7 [x]							
MDAC ID: ITEM:	2		589 DI	9 ODE													
LEAD AND	LYST	:	D.	HAR	TM	AN	ſ										
ASSESSMI	en t :																
	CRIT F	ICALI LIGHI	CTY C			RE	DUN	DAN	CY	sc	REENS	5		CI IT	IL TEN	ſ	
	HD	W/FUI	1C			A			в			С					
NASA IOA	[3 [3	/3 /1R]]] [F]	[[P]	ך נ	P]	[[X]	*
COMPARE	C	/N]		[N]	۵	N]	[N]	[N]	
RECOMMEN	IDATI	ons:		(If	di	ff	ere	nt	fro	om	NASA)					
	[/]		[]	[]	[] (2	[ADD/	DE] ELE	TE)
* CIL RI	ETENT	ION P	RAT	IONA	LE	:	(If	ар	pl:	ica	uble) Il	AI NAI	DEQUATE DEQUATE	[[]]	
REMARKS : IOA AGRI	: Ees W	ITH N	NAS	A FM	EA	•											

REPORT DATE 2/26/88

C-548

and the second
ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-590 05-6KF-22	55F-1		NASA DATA BASELINE NEW	: [x] [x]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 590 DIODE				
LEAD ANALYST:	D. HARTMA	N			
ASSESSMENT:					
CRITICAI	LITY R	EDUNDAN	ICY SCREE	INS	CIL ITEM
HDW/FU	INC A		В	С	1154
NASA [3 /1F IOA [3 /3	R] [P] [) [] [F]	[P] []	[X]* []
COMPARE [/N] . [N] [[N]	[N]	[N]
RECOMMENDATIONS:	(If dif	ferent	from NAS	SA)	
[3 /3] [] [[]	[] (A)	[D] DD/DELETE)
* CIL RETENTION	RATIONALE:	(If ap	oplicable	e) ADEQUATE INADEQUATE	[] []
KEMAKKS:					NTONE UNC

NASA FMEA CONTAINS MULTIPLE FAILURES. THIS FAILURE ALONE HAS NO EFFECT.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

ASSESSMI ASSESSMI NASA FMI	ENT D ENT I EA #:	ATE: D:	1/29/3 FRCS-5 05-6K	88 59: F-:	1 225	55F-2	2			-	N	ASA DATI BASELINI NEV	\: ∑ [▼ [X]	
SUBSYSTI MDAC ID: ITEM:	e m : :		FRCS 591 DIODE												
LEAD ANA	LYST	:	D. HA	RTI	MAN	1						ar.			
ASSESSMI	ent:														
	CRIT	ICAL	ITY		RI	EDUNI	DAI	1CX	SC	REEN	s		CIL) M	
	HD	W/FUN	NC NC		A			в			С		TIF	M	
NASA IOA	[3 [3	/1R /3]	[[P]		[F]]	[[P]	[X []	*
COMPARE	[·/N]	נ	N]		[N]	[N]	[N]	
RECOMMEN	IDATI	ons:	(If	đ	ifi	ferei	nt	fr	om i	NASA)				
	[2	/1R]	[P]		[F]	ָר נ	P]()	[A ADD/D) ELI	ETE)
* CIL RI	ETENT	ION I	RATION	AL	E:	(If	ar	ppl	ica	ble) I	A NA	DEQUATE DEQUATE	[[]	

REMARKS:

NASA FMEA CONSIDERS MULTIPLE FAILURES. THIS FAILED SHORT DIODE CAUSES EXCESSIVE MOTOR OPERATION (CONTINUOUS POWER THAT OPENS THE VALVE SLIGHTLY THEN CLOSES IT, CONSTANTLY REPEATING ITSELF). MOTOR DAMAGE WOULD LIKELY CAUSE THE VALVE TO CLOSE, CAUSING LOSS OF JETS ON ASSOCIATED MANIFOLD. REDUNDANCY PROVIDED BY JETS ON ANOTHER MANIFOLD. LOSS OF REDUNDANCY CAUSES THE INABILITY TO EXPEL PROPELLANTS TO MEET CG CONSTRAINTS.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

C-550

2.X. ____

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-592 05-6KF-22	55C-1		NASA BASE	DATA: LINE NEW	[[X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 592 DIODE						
LEAD ANALYST:	D. HARTMA	N					
ASSESSMENT:							
CRITICAL	JITY R IT	EDUNDANC	Y SCREE	INS		CIL ITEM	ſ
HDW/FU	INC A		В	с			
NASA [3 /1R IOA [3 /1R	t] [P t] [P		P] P]	[P] [P]		[[] *]
COMPARE [/] [] []	[]]		[]
RECOMMENDATIONS:	(If dif	ferent f	rom NAS	SA)			
I /] [] []	[]	(AI	[DD/DF] CLETE)
* CIL RETENTION	RATIONALE:	(If app	licable	e) ADEQU INADEQU	IATE IATE	[[]]
REMARKS: NO DIFFERENCES.			. *z ;				··· :*

REPORT DATE 2/26/88

5 E. 5 **G**

- -

ASSESSME ASSESSME NASA FME	NT DATE: NT ID: A #:	1/29/88 FRCS-593 05-6KF-2	255C-2		NASA DATA BASELINE NEW	: [] [X]					
SUBSYSTE MDAC ID: ITEM:	M:	FRCS 593 DIODE				<u></u>					
LEAD ANA	LYST:	D. HARTM	AN								
ASSESSME	NT:					<u></u>					
CRITICALITY REDUNDANCY SCREENS C											
	HDW/FU	NC 2	A	В	С	TIEM					
NASA IOA	[3 /3 [3 /1R] [:] [F] [] P]	[] [P]	[] * [X]					
COMPARE	[/N] []	и] [и	ן א ן	[N]	[N]					
RECOMMEN	DATIONS:	(If di	fferent	from NAS	5A)						
	<u>[</u> /] [] []	[] (A)	[] DD/DELETE)					
* CIL RE	TENTION	RATIONALE	: (If ap	oplicable	e) ADEQUATE INADEQUATE	[]					
IOA AGRE	ES WITH	NASA FMEA									

REPORT DATE 2/26/88 C-552

ASSESSMENT DATE: 1/29/88 NASA DATA: BASELINE [] NEW [X] ASSESSMENT ID: FRCS-594 NASA FMEA #: 05-6KF-2255 -1 SUBSYSTEM: FRCS MDAC ID: 594 ITEM: DIODE LEAD ANALYST: D. HARTMAN ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM HDW/FUNC В С A [F] [P] [2/1R]NASA [P] [X]* IOA [3 /3] r 1 r 1 1 COMPARE [N/N] [N] [N] [N] **RECOMMENDATIONS:** (If different from NASA) [D] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE [] **REMARKS:** NASA FMEA CONTAINS MULTIPLE FAILURES. THIS FAILURE ALONE HAS NO EFFECT.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

1

.

C-553

. . . .

ASSESSMENT DATH ASSESSMENT ID: NASA FMEA #:	: 1/29/8 FRCS-5 05-6KF	8 95 '-225!		NAS BA	SA DATA: ASELINE (NEW (] x]					
SUBSYSTEM: MDAC ID: ITEM:	FRCS 595 DIODE										
LEAD ANALYST:	D. HAR	TMAN									
ASSESSMENT:											
CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM											
HDW/1	UNC	A		В	С	-	LILM				
NASA [3 /3 IOA [3 /3]] []	[] []			*			
COMPARE [/]	[] [1	[]]	[]				
RECOMMENDATIONS	: (If	diff	erent f	from N	ASA)						
[3 /2	R]	[P] [P]	[P]	[(ADI] D/DELE	TE)			
* CIL RETENTION	RATIONA	LE:	(If app	olicab	le) ADI INADI	EQUATE (EQUATE (]				
INADEQUATE [] REMARKS: THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.											
ISSUE NOT RESOL	NED AT M	(EETI)	NG WITH	I SUBS	YSTEM N	ANAGER C	ON 1/2	0/88.			

=

٥

۲

ļ

Ī

REPORT DATE 2/26/88

· 'ŧ

u u utilitati uniti interrettati

- - - - -

ASSESSME ASSESSME NASA FME	NT NT A	D/ I) #:	ATE: D:	E: 1/29/88 FRCS-596 05-6KF-2255B-1										N2]	ASA BAS	DA ELI N	TA NE IEW	: [[X]	
SUBSYSTE MDAC ID: ITEM:	M:			FR(59) DI(CS 5 DDE															
LEAD ANA	LYS	ST	:	D.	HAF	(T	AN	T												
ASSESSME	NT	:																		
	CR:	TI דו	ICAL	[TY r			RF	DU	NDA	N	CY	SCF	REENS	5				CIL ITE	M	
	1	HD	W/FUI	1C			A				B			С						
NASA IOA	[[3 3	/2R /1R]		[[P P]]		[[P P]]	[[P P]]			[[]]	*
COMPARE	[/N]		נ]		[]	[]			[]	
RECOMMEN	DA!	FI (ons:	;	(If	đ	ſ	er	ent	: :	fro	om N	IASA))			÷ - ·			.
	[3	/1R]		[P]		[NZ	\]	[P]		(A] D/DD] ELI	ETE)
* CIL RE	TE	NT:	ION I	RAT	IONA	LI	2:	(1	fa	ıp]	91 1	lcab	ole) Il	a NA	DEQ DEQ	UAT UAT	'E	[]	
REMARKS: THIS DIO THE GPC.	DE I	F) MAJ	AILEI NUAL	D OI REI	PEN DUNE	C/ Al	IUS ICY	SES (P	IN ROV	[A] 71]	BII DEI	LITY D.	TO LOS	0] 5 (PEN DF	TH ALL	E R	- VALV EDUN	E V DAN	VITH VCY

CAUSES LOSS OF JETS REQUIRED TO EXPEL PROPELLANTS TO MEET CG LIMITS.

ISSUE NOT RESOLVED AT THE MEETING WITH THE SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

÷ .

1

-

•

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-597 NASA FMEA #: 05-6KF-2255B-2													N2 1	ASA BASI	DATA ELINE NEW	:: ; [/ [x]]		
SUBSYSTE MDAC ID: ITEM:	M:			FH 59 D]	RCS 97 LODE															
LEAD ANA	LYS	ST	:	D.	. HAI	۲T	MAN	N												
ASSESSME	NT	:																		
	CRI	IT: F]	ICAL LIGH	ITY T	Ľ		RI	EDU	NDA	NC	CY	SC	REENS	5			C: I:	IL Fen	1	
	F	ID	W/FU	NC			A				в			С						
NASA IOA	[[3 3	/3 /1R]		[[F]]		[[P]]	[[P]]		[[x]]	*
COMPARE	[/N]		[N]		נ	N]	נ	N]		[N]	
RECOMMEN	'DA'	FI (ONS:		(If	đ	if	fer	ent	. 1	fro	om 1	NASA))						
	[/]		[]		[]	[]	(A] DD,	/DI] SLF	ETE)
* CIL RE	TEI	T	ION	RAI	CION?	L	E:	(I	fa	p	91	lcal	ble) Il	IA IAI	DEQI DEQI	UATE UATE	[[]]	
REMARKS: IOA AGRE	ES	W	ITH	NAS	SA FN	Æ.	Α.													· -

REPORT DATE 2/26/88 C-556

and a second
=

=

 \equiv

= -

ASSESSMENT DATE: 1/29/88 NASA DATA: BASELINE [ASSESSMENT ID: FRCS-598 NEW [X] NASA FMEA #: 05-6KF-2255E-1 SUBSYSTEM: FRCS MDAC ID: 598 ITEM: DIODE D. HARTMAN LEAD ANALYST: ASSESSMENT: CRITICALITY CIL REDUNDANCY SCREENS ITEM FLIGHT С HDW/FUNC A В [F] [P] [] [X] * [3 /1R] [P] NASA] î î IOA [3/3] ٦ [N] COMPARE [/N] **RECOMMENDATIONS:** (If different from NASA) [D] [3/3] [] [] [] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE INADEQUATE Γ 1 **REMARKS:**

NASA FMEA CONSIDERS MULTIPLE FAILURES. THIS FAILURE ALONE HAS NO EFFECT.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

C-557

NASA DATA: BASELINE [] NEW [X] ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-599 05-6KF-2255E-2 NASA FMEA #: FRCS SUBSYSTEM: MDAC ID: 599 ITEM: DIODE LEAD ANALYST: D. HARTMAN ASSESSMENT: REDUNDANCY SCREENS CIL CRITICALITY ITEM FLIGHT Α В C HDW/FUNC NAŠA [3/1R] [P] [F] [P] IOA [3/3] [] [] [] [X]* 1 COMPARE [/N] [N] [N] [N] **RECOMMENDATIONS:** (If different from NASA) [2/1R] [P] [F] [P] [A] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [INADEQUATE [1 **REMARKS:** NASA FMEA CONSIDERS MULTIPLE FAILURES. THIS FAILED SHORT DIODE

CAUSES EXCESSIVE MOTOR OPERATION (CONTINUOUS POWER THAT OPENS THE VALVE SLIGHTLY THEN CLOSES IT, CONSTANTLY REPEATING ITSELF). MOTOR DAMAGE WOULD LIKELY CAUSE THE VALVE TO CLOSE, CAUSING LOSS OF JETS ON ASSOCIATED MANIFOLD. REDUNDANCY PROVIDED BY JETS ON ANOTHER MANIFOLD. LOSS OF REDUNDANCY CAUSES THE INABILITY TO EXPEL PROPELLANTS TO MEET CG CONSTRAINTS.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

ೆಗೆ ಲ್ಲಾ ಕ್ಲಿ ಎಂಬ ಸ್ಥಾನ ಕ್ಲೇ ಸ್ಥಾನ

ASSESSMENT ASSESSMENT NASA FMEA #	DATE: ID: :	1/29/8 FRCS-6 05-6KF	8 500 7-225	55 -1			NASA BASI	DATA: ELINE NEW	[[X]]
SUBSYSTEM: MDAC ID: ITEM:		FRCS 600 DIODE								-
LEAD ANALYS	ST:	D. HAF	TMAN	1						
ASSESSMENT:										
CRI	TICAL FLIGH IDW/FU	ITY F NC	RI A	DUND	ANCY B	SCREI	ENS C		CIL ITEN	1
NASA [IOA [2 /1R 3 /3]]	[P []]	[F []]	[P] []		[X [] *]
COMPARE [N /N]	[N]	[N]	[N]		[N]
RECOMMENDAI	TIONS:	(If	diff	feren	t fro	om NAS	SA)			
ſ	3 /3]	[]	[]	[]	(AI	[D [D/D]] ELETE)
* CIL RETEN REMARKS:	NOLTI	RATION	ALE:	(If	appl:	icable	e) ADEQI INADEQI	JATE JATE	[[]]

NASA FMEA CONTAINS MULTIPLE FAILURES. THIS FAILURE ALONE HAS NO EFFECT.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

÷ .

. . .

- -

. . .

area

- -

• <u>•</u>

1 **b**--i

5 <u>813</u>

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-601 NASA FMEA #: 05-6KF-2255 -2										1	NASA I BASEI	DATA LINE NEW	: [[X]		
SUBSYST MDAC ID ITEM:	EM: :			FR 60 DI	CS 1 ODE											
LEAD AN	ALY	ST	:	D.	HAR	FMA	N									
ASSESSM	ENT	:														
	CR	IT F	ICAL LIGH	ITY F		R	EDUN	DANC	Y S	CREE	NS	-		CII ITE	M	
	1	ועח	W/ E UI	NC.		A			D		,	-				
NASA IOA] [3 3	/3 /3]]		[[]	[[]		[[]		[[]	*
COMPARE	[/]	1	[]	[]		[]		[]	
RECOMME	NDA	ri(ons:		(If c	lif	fere	nt f	rom	NAS	A)					
	[3	/2R]	l	[₽]	[P]		[1	?]	(AI] ס/סכ] ELE	TE)
* CIL R	etei	NT:	ION I	RAT:	IONAJ	LE:	(If	app	lic	able) 7	ADEQUA	ATE	[]	
REMARKS THIS FA POSITIO TO FALS OPERATIO	: ILU N. ELY ONS	RE RI FZ	MAY EDUNI AILII	CAI DAN(NG 2	USE I CY PI THE V	LOS: ROV 7AL	S_OF IDED VE C:	ACC L LOSE	URA OSS D,	TE I OF POSS	ND] ALI IBI	ICATIC L REDU LY EFI	ON OI JNDAN FECTI	l F TH NCY ING	J E V MAY MIS	ALVE LEAD SION
ISSUE NO	OT 1	RE	SOLVI		AT MI	eet:	ING N	WITH	SU	BSYS	TEN	MAN2	AGER	ON	1/2	0/88.

= : ■ ;

,

-

REPORT DATE 2/26/88

ASSESSMI ASSESŠMI NASA FMI	ENT ENT EA	D2 II #:	ATE: D:	1/2 FRC 05-	29/88 CS-60 -6KF-	2 226	8 -	1				NZ I	ASA BASI	DATA ELINE NEW	: [[]] (]	е 4 с
SUBSYSTI MDAC ID: ITEM:	EM: :			FRO 602 DIC	CS 2 DDE												
LEAD ANA	ALY:	ST	:	D.	HART	MAN				· ·	·		-				и
ASSESSMI	ENT	:															
	CR	IT: F] HDI	ICAL LIGH W/FU	ITY T NC		RE A	DUN	DAN	CY B	SC	REEN	s c			CII ITH	EM	
NASA IOA	[[3 3	/3 /3]]	[נ]	. [[]]	[[]]		[[]]	*
COMPARE	٢		/]	נ]	[]	ſ]		[]	
RECOMMEN	NDA	TI¢	ONS:	ł	(If d	iff	ere	nt	fro	om (NASA)					
	[3	/2R]	[P]	[P]	[P]	(A)	[DD/I] DELI	ETE)
* CIL R	etei	NT:	ION	RATI	IONAL	E:	(If	ap	pli	lca	ble) I	AI NAI	DEQI DEQI	JATE JATE	[]	

REMARKS: THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	NT D NT I A #:	ATE: D:	1/29 FRC 05-0	9/88 5-603 6KF-2	3 226	58 -	-2				NZ I	SA DATA BASELINI NEV	A: 5 [7 [X]	2
SUBSYSTE MDAC ID: ITEM:	M:		FRC: 603 DIO	S DE						_					
LEAD ANA	LYST	•	D. 1	HARTI	IAN	T									
ASSESSME	NT:														
	CRIT	ICAL	[TY r		RI	DUN	IDAN	CY	sc	REENS	5		CII TTE	M	
	HD	W/FUI	NC		A			в			С		4 1 1	1.1	
NASA IOA	[3 [3	/1R /3]]	ן נ	P]]	[[Ρ]	[[P]	[[]],	*
COMPARE	[/N]	נ	N]	[N]	۵	N]	[N]	
RECOMMEN	DATI	ons:	(If di	iff	ere	ent	fr	om	NASA))				
	[/]	[]	[]	[] (2] ELE	ETE)
* CIL RE REMARKS: IOA AGRE	TENT Es W	ION I	RATI(NASA	onali Fmei	E:	(11	E ap	pl	ica	ble) Iì	AI NAI	DEQUATE DEQUATE	[[]	

REPORT DATE 2/26/88 C-562 Server and Lot Contractions

. & .

Sector States and States

s

Ξ

= ;

3

e 1

1

-

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-604 05-6KF-22	68 -1		NASA DATA BASELINE NEW	: [] 7 [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 604 DIODE				•••
LEAD ANALYST:	D. HARTMAN	N			
ASSESSMENT:					
CRITICAL	ITY R	EDUNDANCY	SCREEN	5	CIL
HDW/FU	NC A	E	3	C	
NASA [3 /3 IOA [3 /3] [] [] [] [] []]	[]*
COMPARE [/] [] [] []	[]
RECOMMENDATIONS:	(If dif	ferent fr	om NASA)	
[3 /2R] [P] []	P] [P] (A	[] .DD/DELETE)
* CIL RETENTION	RATIONALE:	(If appl	icable) I	ADEQUATE NADEQUATE	[]
THIS FAILURE MAY	CAUSE LOS	S OF ACCU	RATE IN	DICATION C	F THE VALV

THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

.....

ASSESSM ASSESSM NASA FM	1/2 FRC 05-	29/8 25-6 -6KF	26	8 -2	2		NASA DATA: BASELINE [] NEW [X]												
SUBSYST MDAC ID ITEM:	SUBSYSTEM: FRCS MDAC ID: 605 ITEM: DIODE																		
LEAD AN	ALYS	ST:		D.	HAR	TM	AN												
ASSESSM	ENT:																		
	ITY REDUNDAN F)AN	CY	A	CIL ITEM										
	17	104	7 . 0				n			D			C						
NASA IOA	[[3 3	/1R /3]		[[Ρ]]] [P]	[[P]]		[[]	*
COMPARE	[/N	1		[N]	[N]	[N]		[N]	
RECOMME	NDAI	IC	NS:		(If	di	ff	erer	nt	fr	om NÁ	SA))						
	ſ		/]		[]	נ]	נ		1	(AI])D/	′DF] ELE	TE)
* CIL R	ETEN	ITI	ON	RATI	IONA	LE	:	(If	ap	pl:	icabl	e) Il	ia Iai	DEQUAT	TE TE	[]]	
IOA AGR	EES	WI	TH	NASI	A FM	EA	•												

۰.

.

-

REPORT DATE 2/26/88

C-564

ASSESSME ASSESSME NASA FME	NT I NT] A #:	DATE: [D: ;	1/29/ FRCS- 05-6K	88 606 F-22	55A-	1		И	IASA DAT BASELIN NE	'A: IE [IW [X]]
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 606 DIODE							-	
LEAD ANA	LYSI	C:	D. HA	RTMA	N						
ASSESSME	NT:										
-	CRIT	FICAL	ITY	F	EDUN	DANCY	SCR	EENS		CIL	
	HI	SLIGH SW/FU	NC	A		E	3	c	2	TIE	1
NASA IOA	[3]	3 /3 3 /3]	[[]]	[[]	[[]	[[] *]
COMPARE	[/]	[]	Γ]	Ţ]	Γ]
RECOMMEN	DAT	cons:	(If	dif	fere	nt fr	on N	iasa)			
	[1]	נ]	[]	[]] ELETE)
* CIL RE	TENI	rion	RATION	ALE :	(If	app]	licab	ole) / IN/	ADEQUATE ADEQUATE	E [E []]
REMARKS:	.	CPC	COMMAN	י פת		പടമ പ	THE V	ALVE	REDIN	IDANCY	PROVT

LOSE 1 OF 2 GPC COMMANDS TO CLOSE THE VALVE. REDUNDANCY PROVIDED BY SECOND GPC COMMAND AND MANUAL CLOSE COMMAND. LOSS OF THIS, COUPLED WITH THE LOSS OF ALL HARDWARE REDUNDANCY, MAY PREVENT ISOLATION OF A THRUSTER LEAK.

SUBSYSTEM MANAGER STATED THAT THE GPC IS NOT USED TO ISOLATE A LEAK BECAUSE THE TIME TO EFFECT CAN BE UP TO 24 HOURS (SOFTWARE HAS TO BE MANUALLY LOADED). IOA WITHDRAWS THEIR ISSUE BASED ON THIS RATIONALE.

REPORT DATE 2/26/88

C-565

ASSESSME ASSESSME NASA FME	SSESSMENT DATE: SSESSMENT ID: ASA FMEA #:				1/29/88 FRCS-607 05-6KF-2255A-2								DATA ELINE NEW	: [[[] x]				
SUBSYSTE MDAC ID: ITEM:	M:			FR 60 DI	RCS)7 CODE									<u> </u>					- 4 - 4
LEAD ANA	LYS	ST:	:	D.	HA	RTI	MAI	N											
ASSESSME	NT:	:																	
-	CRI	TI	CAL	ITY			R	EDU	NDA	NC	Y	SCF	REEN	S				L PM	
	H	IDW	/FU	NC			A		:		в			С			111	514I	
NASA IOA	[[3 3	/3 /1R]]		[[F]]		[[P]]	[[P]		[]	x]	*
COMPARE	[/N]		[N]			N]	נ	N]		[]	4]	
RECOMMEN	DAI	IC	ONS:		(If	d:	if	fer	ent	f	r	om N	IASA)		· ·.			=
	[/]		נ]		[]	[]	(A] DD/I] DEL	ETE)
* CIL RE	TEN	ITI		RAT	ION	ALI	E:	(I	fa]	pp	11	.cab	ole)	77		· ····································	: <u>.</u>		. ± .
													I	ia IAN	DEQ	UATE	[]	
REMARKS:	FC	ωт	ו זבותרי	N A C	יזד א		•												

_

= :

REPORT DATE 2/26/88

_

ASSESSME ASSESSME NASA FME	ENT I ENT I EA #:	DATE:	1/29, FRCS- 05-61	/88 -608 KF-22	255A-	IASA DAT BASELIN NI	TA: IE [TW [X]				
SUBSYSTE MDAC ID: ITEM:	EM : :		FRCS 608 DIODI	Ξ							• -	
LEAD ANA	ALYSI	::	D.H	ARTM	AN						-	
ASSESSME	ENT:											
	CRIT	ICAL	ITY	I	REDUN	DANCY	SCR	REENS		CIL TTE	M	
	HI	W/FU	NC	1	A	В		c	2			
NASA IOA	[3 [3	/3 /3]]	[[]]	[[]	[[]]	[[] *]	
COMPARE	נ	/]	[]	[]	[]	[]	
RECOMMEN	IDAT]	ons:	(I:	E dif	fere	nt fr	om N	iasa)				
	[/]	[]	[]	[]	[ADD/D] ELETE)	
* CIL RE	STENI	TION I	RATIO	NALE :	: (If	appl	icab	ole) A INA	DEQUATE	[[]	
LOSE 1 C BY SECON COUPLED ISOLATIC	OF 2 ND GI WITH ON OF	GPC PC CO I THE F A T	Commai MMAND LOSS HRUSTI	NDS 7 AND OF 2 ER LI	TO CL MANU ALL H EAK.	OSE T AL CL ARDWA	HE V OSE RE R	ALVE. COMMA EDUNI	REDUN ND. LO DANCY, M	IDANCY)SS OF IAY PR	PROVII THIS, EVENT	DED
SUBSYSTI LEAK BEC HAS TO I THIS RAT	em Ma Cause Be Ma Fiona	NAGE THE NUAL LE.	R STAT TIME LY LOI	TED 1 TO P ADED)	THAT EFFEC	THE G T CAN OA WI	PC I BE THDR	S NOT UP TO AWS T	USED 1 24 HOU HEIR IS	O ISO RS (S SUE B	LATE A OFTWARI ASED OI	Ë N

- .

-

- -

ASSESSME ASSESSME NASA FME	1/29/8 FRCS-6 05-6KF	8 09 '-22	255	5A-2			NASA DATA BASELINE NEW]			
SUBSYSTE MDAC ID: ITEM:	E M :		FRCS 609 DIODE													
LEAD ANA	LYST	:	D. HAF								-					
ASSESSME	en t :															
	CRIT	TY	REDUNDANCY SCRP							5			CIL	i Nar		
	HD	N/FUN	iC IC	2	A			В			С			LTEM		
NASA IOA	[3 [3	/3 /1R]	[]	F]	[[P]	[[P]]		[[X]	*
COMPARE	ſ	/N]	[]	1]	נ	N]	[N]		[N]	
RECOMMEN	DATI	ONS:	(If	di	ff€	eren	t	fro	om NAS	SA))					
	[/]	[•]	ן]	[]	(AD	[D/D] ELE	TE)
* CIL RI	TENT:	ION P	RATIONA	LE	: ((If a	apj	pl:	icable	e) Il	IA IAI	DEQUAT	E	[r]	
REMARKS : IOA AGRI	EMARKS: OA AGREES WITH NASA FMEA.															

-

ī

_

-

≣

REPORT DATE 2/26/88

C-568

ASSESSMENT DATE ASSESSMENT ID: NASA FMEA #:	: 1/29/88 FRCS-61 05-6KF-	3 LO -225	55 D-1]	DATA LINE NEW	: [[X]]				
SUBSYSTEM: MDAC ID: ITEM:	FRCS 610 DIODE	FRCS 610 DIODE											
LEAD ANALYST:	D. HART	D. HARTMAN											
ASSESSMENT:													
CRITICA	LITY HT	RI	EDUND	ANCY	SCREI		CIL ITEM						
HDW/F	UNC	A				С							
NASA [3 /1] IOA [3 /3	R] [] [[P []]	[P []	[P]]		[[] *]			
COMPARE [/N	ן נ	[N]	[N]	נ	N]		[]			
RECOMMENDATIONS	: (If ċ	lifi	ferent	t fr	om NAS	SA)							
[/] [[]	[]	[]	(A)] DD/DD] ELETI	E)		
* CIL RETENTION REMARKS:	RATIONAI	LE:	(If a	appl	icable	∍) IN	ADEQU ADEQU	VATE VATE	[[]]			
IUA AGREES WITH	IMT AGAN	ъ м .											

. .

.

1 e----

.

-

ASSESSMEI ASSESSMEI NASA FMEI	ATE: D:	38 511 7-2:	25	5D-2					N <i>P</i> E	ASA DATA BASELINE NEW	: [[x]]			
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 611 DIODE													
LEAD ANA	lyst	:	D. HAI). HARTMAN												
ASSESSME	NT:															
(CRIT F	CTY C	DUND	/N(CY	SCRE	ENS	5	CIL ITEM							
	W/FUI	1C	2	A			B			С						
NASA IOA	[3 [3	/3 /1R]]	[]	F]	[[P]]	[[P]	[[x] *]	
COMPARE	[/N]	[]	N]	[N]	[N]	[N]	
RECOMMEN	DATI	ons:	(If	di:	ff	erent	: 1	Erc	om NA	SA)	l					
	[/]	[]	[]	[] (A] DD/	DE] LETE)
* CIL RET	rent	ION I	RATION?	LE	:	(If a	p	oli	cabl	e) IN	AI JAI)EQUATE)EQUATE	[[]	-
TAN URVE	uo m	**** *	wor tt		•											

i di

REPORT DATE 2/26/88

C-570

- - ---
ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-612 05-6KF-2	2 2255F-1		NA E	SA DATA: BASELINE NEW	[[X]]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 612 DIODE						
LEAD ANALYST:	D. HARTI	MAN		- ·			
ASSESSMENT:							
CRITICAL	ITY	REDUND	ANCY S	CREENS		CIL TTEI	ч
HDW/FU	NC	A	В	С			-
NASA [3 /1R IOA [3 /3] [P]]	[F] []	[P []]	[X [] *]
COMPARE [/N] [ן א	[N]	[N]	[N]
RECOMMENDATIONS:	(If d	ifferen	t from	NASA)			
[3 /3] []	[]	[] (AI	[D D/D] Elete)
* CIL RETENTION	RATIONAL	E: (If	applic	able) AI INAD)EQUATE)EQUATE	[[]]
REMARKS: NASA FMEA CONTAI EFFECT.	NS MULTI	PLE FAI	LURES.	THIS F	AILURE	LON	E HAS

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

NO

REPORT DATE 2/26/88

. . .

.

-

_;

-1214 2 2 2 2 2

a start a

ASSESSMEN ASSESSMEN NASA FMEZ	NT DATE: NT ID: A #:	1/29/88 FRCS-61 05-6KF-	3 225	5 5 F-2					NZ E	ASA DATA BASELINE NEW	: []	x]]	
SUBSYSTEN MDAC ID: ITEM:	1:	FRCS 613 DIODE											:	:
LEAD ANAI	LYST:	D. HART	MAN	ſ										
ASSESSMEN	IT:													
Ċ	RITICAL	TY	RE	DUNDA	NC	CY	SCREE	ENS	3		C:	L		
	HDW/FUN	4C	A			В			С		д.	1 61	1	
NASA IOA	[3 /1R [3 /3] [P]	[[F]	[[P]	[[X]	*
COMPARE	[/N] [N]	[N]	[N]	[N]	
RECOMMENI	DATIONS:	(If d	iff	erent	: f	irc	om NAS	SA)						
	[2 /1R] [P]	[F]	[P] (Al] ,00	A /DE] SLE	TE)
* CIL REI	TENTION F	RATIONAL	E:	(If a	pr) li	cable	2)	A	EQUATE	[]	
REMARKS:								IN	IAI	DEQUATE	[]	

NASA FMEA CONSIDERS MULTIPLE FAILURES. THIS FAILED SHORT DIODE CAUSES EXCESSIVE MOTOR OPERATION (CONTINUOUS POWER THAT OPENS THE VALVE SLIGHTLY THEN CLOSES IT, CONSTANTLY REPEATING ITSELF). MOTOR DAMAGE WOULD LIKELY CAUSE THE VALVE TO CLOSE, CAUSING LOSS OF JETS ON ASSOCIATED MANIFOLD. REDUNDANCY PROVIDED BY JETS ON ANOTHER MANIFOLD. LOSS OF REDUNDANCY CAUSES THE INABILITY TO EXPEL PROPELLANTS TO MEET CG CONSTRAINTS.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

ing and the second s

C-572

i **i na**-

ASSESSME ASSESSME NASA FME	NT NT A	DZ II #:	ATE: D:	1/2 FRC 05-	9/8 S-6 6KF	8 14 1-2	4 22!	55C	-1					NZ F	ASA BAS	DATA ELINE NEV	.: 5 [7 [x]	
SUBSYSTE MDAC ID: ITEM:	M:			FRO 614 DIC	S DE													- 10		
LEAD ANA	LYS	5T:	:	D.	HAF	TI	MAI	N												
ASSESSME	NT	:																		
	CRI	IT: FI	ICAL	ITY F			R	EDU	NDA	N	CY	SC	REENS	5			CI II	IL 'EN	1	
	I	HDI	W/FUI	S			A				В			С						
NASA IOA	[[3 3	/1R /1R]		[[P P]]		[[P P]]	[[P P]]		[[]]	*
COMPARE	[/]		[]		נ]	٢]		[]	
RECOMMEN	IDA'	FI	ons:	((If	đ	if:	fer	ent	: 1	fro	л	NASA)						
-	[2	/]		[]		[]	[]	(1] ADD/	'DI] 5L1	ETE)
* CIL RE	TEI	T	ION	RATI	[ON#	L	Е:	(1	fa	ıpı)]:	ica	ble) I	IA IAN	DEQ	UATE UATE	[[-]	
REMARKS: NO DIFFE	REI	NC	ES.												~		-		-	

REPORT DATE 2/26/88

-

· •

;

.

.

ASSESSME ASSESSME NASA FME	NT I NT J A #:	DATE: [D:	1/29 FRCS 05-6	9/88 5-615 5KF-2:	255C·	-2		NASA DA BASELI 1	ATA: [NE [] JEW [X]
SUBSYSTE MDAC ID: ITEM:	М:		FRCS 615 DIOI	S DE					
LEAD ANA	LYSI	C:	D. F	IARTM	AN				
ASSESSME	NT:								
	CRI7	TICAL	ITY	1	REDUI	NDANCY	sc	REENS	CIL ITEM
	н	W/FU	NC	i	A	В		с	
NASA IOA	[3	3 /3 3 /1R]	[[]] F]	[[P]]	[] [P]	[] * [X]
COMPARE	[/N]	[]	ן א	[N]	[и]	[N]
RECOMMEN	DATI	IONS:	(1	f di	ffere	ent fro	om	NASA)	
	[/]	נ]	. []	[]	[] (ADD/DELETE)
* CIL RE REMARKS:	TENI		RATIC	NALE	: (I:	f appl:	ica	ble) ADEQUAN INADEQUAN	TE [] TE []
IOA AGRE	ES W	VITH 1	NASA	FMEA	•				

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-616 05-6KF-2255 -1	NASA DATA: BASELINE [] NEW [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 616 DIODE	
LEAD ANALYST:	D. HARTMAN	
ASSESSMENT:		
CRITICAL FLIGH	ITY REDUNDANCY T	SCREENS CIL ITEM
HDW/FU	NC A B	c
NASA [2 /1R IOA [3 /3] [P] [F] [] [] [P] [X]*] [] []
COMPARE [N /N] [N] [N] [N] [N]
RECOMMENDATIONS:	(If different fro	om NASA)
[3 /3] [] ·[] [] [D] (ADD/DELETE)
* CIL RETENTION	RATIONALE: (If appl:	icable) ADEQUATE [] INADEQUATE []
REMARKS: NASA FMEA CONTAI EFFECT.	NS MULTIPLE FAILURE	S. THIS FAILURE ALONE HAS NO

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

C-575

. - -

,

ASSESS ASSESS NASA I	SSESSMENT DATE: 1/29/88 SSESSMENT ID: FRCS-617 ASA FMEA #: 05-6KF-2255 -2 UBSYSTEM: FRCS									-2				N	iasa Base	DATA: LINE NEW	: [[]] x]		
SUBSYS MDAC I ITEM:	STE [D:	M:				FR 61 DI	ĊS 7 ODE													
LEAD A	NA	LYS	ST	:		D.	HAI	RTN	1AN	I										
ASSESS	SME	NT	:															۰.		
		CR	IT:	IC.	ALI CH'	CTY r			RE	DUN	IDAN	СХ	SC	REE	NS				L EM	
]	HD	W/	FUI	1C			A			В			C					
NAS IC	SA DA	[[3 3	1	3 3]]		[[]]	ן ב]]		[[]]		ן נ]	*
COMPAR	₹E	[/]		[]	[]		[]		[]	
RECOM	IEN	DA!	FI (ON	s:		(If	đ	Ĺff	ere	ent	fro	מכ	NAS.	A)					
		נ	3	1	2R]		[P]	, , [P]		[1)	(AI	[/dc/1] DEL	ETE)
* CIL	RE	TEI	NT:	10	NI	RAT	IONZ	₹TI	:2	(If	ap:	pli	ica	ble) A INA	DEQU DEQU	ATE ATE	[[]]	
REMARI THIS I POSITI TO FAI OPERAT	KS: FAI LON LSE FIO	LUI LY NS	RE RI FZ	M ED AI	AY UNI LII	CA DAN NG	USE CY I THE	LC PRC VI	DSS DVI ALV	GOP DED VE C	F AC). CLOS	CUI LOS ED,	RAT 55 (, P	E I OF OSS	NDI ALI IBI	CATI RED LY EF	ON OI UNDAN FECTI	F TI ICY ING	HE MA MI	VALVE Y LEAD SSION
ISSUE	NO	T]	RE	SO	LVI	ED 2	AT N	1EI	ETI	NG	WIT	H S	SUB	SYS	TEM	I MAN	AGER	ON	1/	20/88.

REPORT DATE 2/26/88

- - - - -

C-576

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/8 FRCS-6 05-6KF	8 18 -2255	5B-1		N	IASA DATA BASELINE NEW	: [x]							
SUBSYSTEM: MDAC ID: ITEM:	FRCS 618 DIODE														
LEAD ANALYST:	D. HAR	TMAN													
ASSESSMENT:															
CRITICA FLIG	CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM HDW/FUNC A B C														
HDW/FU	INC	A		В	c			-							
NASA [3 /2] IOA [3 /1]	2] 2]	[P] [P]] [] [P] P]	(F	>]	[[] *]							
COMPARE [/N]	[]	ן נ]	[]	[]							
RECOMMENDATIONS	(If	diffe	erent f	rom NAS	5A)										
	8]	[P]] [NA]	[]	?) (A	[.DD/D] ELETE)							
* CIL RETENTION		LE: ((If app	licable	€) A INA	DEQUATE DEQUATE	[[]]							
REMARKS: THIS DIODE FAIL THE GPC. MANUA CAUSES LOSS OF C LIMITS.	ED OPEN L REDUND JETS REQ	CAUSI ANCY UIREI	ES INAB PROVID D TO EX	ELITY (ED. LA PEL PRO	TO C DSS DPEI	OPEN THE OF ALL R LLANTS TO	VALV EDUN MEE	E WITH DANCY T CG							

ISSUE NOT RESOLVED AT THE MEETING WITH THE SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

-

•••••••

10.00

ь...... **Р**

• •

C-577

·····

ASSESSME ASSESSME NASA FME	ENT ENT EA #	DATE: ID: :	1/: FR 05	29/8 CS-6 -6KF	8 19 -22	55B-	·2				NAS. BA	A DATA SELINE NEW	.: [[x]	
SUBSYSTE MDAC ID: ITEM:	EM:		FR 61 DI	CS 9 ODE												
LEAD ANA	LYS	Ť:	D.	HAR	гма	N										
ASSESSME	ENT:															
	CRI	TICAI FLIGH	ITY T		R	EDUN	IDANC	CY	SCR	EENS	5			[L [EN	1	
	H	DW/FU	NC		A	•		в			С	•				
NASA IOA	[]	3 /3 3 /1R]		((F]	[[P]	· []] P]		[[x]]	*
COMPARE	נ	/N]		[N]	[N]	[N]		נ	N]	
RECOMMEN	IDAT	IONS:		(If d	lif	fere	ent i	Erc	om N	iasa)	I					
	[/]		[]	. [].	[]	(A] .DD/	/DI] SLE	TE)
* CIL RE	TEN	TION	RAT		LE:	(If	app	91	icab	le) IN	ADE(QUATE QUATE	[נ]	
REMARKS: IOA AGRE	EES	WITH	NAS	a FM	EA.								•		•	

.

= •

REPORT DATE 2/26/88

•

. . .

C-578

ASSESSMENT DATE: 1/29/88 NASA DATA: ASSESSMENT ID: FRCS-620 BASELINE [NEW [X] NASA FMEA #: 05-6KF-2255E-1 FRCS SUBSYSTEM: MDAC ID: 620 ITEM: DIODE LEAD ANALYST: D. HARTMAN ASSESSMENT: REDUNDANCY SCREENS CIL CRITICALITY FLIGHT ITEM HDW/FUNC Α В С [P] [] [F] [] [X] * [P] [] [3 /1R] NASA IOA [3/3] COMPARE [/N] [N] [N] **RECOMMENDATIONS:** (If different from NASA) [3/3] [] [] [] [D] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [INADEQUATE [1 **REMARKS:** NASA FMEA CONSIDERS MULTIPLE FAILURES. THIS FAILURE ALONE HAS NO EFFECT. AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN. - estit - k - - - - - - - -

REPORT DATE 2/26/88

0.7%)

C-579

- -

ASSESSMENT DATE ASSESSMENT ID: NASA FMEA #:	: 1/29/88 FRCS-62 05-6KF-	1 2255E-2	NASA D BASEL	ATA: INE [] NEW [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 621 DIODE		<u> </u>	
LEAD ANALYST:	D. HART	MAN		
ASSESSMENT:				
CRITICA	LITY	REDUNDANC	Y SCREENS	CIL
HDW/F	UNC	A	вс	11EM
NASA [3 /1 IOA [3 /3	R] [] [P] [3	F] [P]] []	[X]* []
COMPARE [/N] [и) [1	и] [И]	[N]
RECOMMENDATIONS	: (If d	ifferent f	rom NASA)	
[2 /1	R] [P] [3	F] [P]	[A] (ADD/DELETE)
* CIL RETENTION	RATIONAL	E: (If app	licable) ADEQUA	
REMARKS: NASA FMEA CONSI CAUSES EXCESSIV VALVE SLIGHTLY	DERS MULT E MOTOR O THEN CLOS	IPLE FAILU PERATION (ES IT, CON	RES. THIS FAIL CONTINUOUS POWE STANTLY REPEATIN	ED SHORT DIODE R THAT OPENS THE NG ITSELF).

VALVE SLIGHTLY THEN CLOSES IT, CONSTANTLY REPEATING ITSELF). MOTOR DAMAGE WOULD LIKELY CAUSE THE VALVE TO CLOSE, CAUSING LOSS OF JETS ON ASSOCIATED MANIFOLD. REDUNDANCY PROVIDED BY JETS ON ANOTHER MANIFOLD. LOSS OF REDUNDANCY CAUSES THE INABILITY TO EXPEL PROPELLANTS TO MEET CG CONSTRAINTS.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

C-580

instances and when a set

NASA DATA: ASSESSMENT DATE: 1/29/88 BASELINE [ASSESSMENT ID: FRCS-622 NEW [X] 05-6KF-2255 -1 NASA FMEA #: SUBSYSTEM: FRCS MDAC ID: 622 DIODE ITEM: LEAD ANALYST: D. HARTMAN ASSESSMENT: REDUNDANCY SCREENS CIL CRITICALITY ITEM FLIGHT В С HDW/FUNC Α [P] [] [2 /1R] [P] [F] [X]* NASA 1 IOA [3/3] [1 [N] [N] [N] [N] COMPARE [N /N] **RECOMMENDATIONS:** (If different from NASA) [D]] [3/3] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE [1 **REMARKS:** NASA FMEA CONTAINS MULTIPLE FAILURES. THIS FAILURE ALONE HAS NO

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

EFFECT.

5 **#**12.2

ASSESSMI ASSESSMI NASA FMI	ent Ent Ea	D/ I) #:	ATE: D:	1/ FR 05	29/8 CS-6 -6KI	38 523 7-2	255	-2			NA B	SA DAT ASELIN NE	A: E [W [] X]	
SUBSYSTI MDAC ID: ITEM:	em: :			FR 62 DI	CS 3 ODE										
LEAD AND	ALY	ST	:	D.	HAI	RTM	AN								
ASSESSMI	ENT	:													
	CR	IT:	ICAL	ITY			REDU	NDANC	Y SC	REENS	S		CI	L	
	1	HD	W/FU	NC			A		В		С		11.	СM	
NASA IOA	[[3 3	/3 /3]		[[]]	[[]	- [[]	[[]	*
COMPARE	[/]		נ]	[]	٢]	[]	
RECOMMEN	NDA'	FI (ons:		(If	di	ffer	ent f	rom	NASA)				
	[3	/2R	3		נ	P]	ſ	P]	[P] ([ADD/1] DEL	ETE)
* CIL RI	ETE	NT:	ION	RAT	IONZ	LE	: (I	f app	lica	ble) Il	AD NAD	EQUATE EQUATE	[]]	
REMARKS	: • • • • •	50	MAV	03	TICE	ŤŌ	<u></u>	R 300	TTD X M	T TNI				י יסט	(7) T 17 C
POSITION TO FALSI OPERATION	N. ELY DNS	RE RI FZ	MAI EDUN AILI	DAN NG	CY I THE	PRO	VIDE LVE	F ACC D. L CLOSE	OSS D, P	OF AL	LL 1 BLY	REDUND EFFEC	ANCY TING	MA MA MI	Y LEAD SSION
• •			5 · · ·	. 2 .				P2 4 .12		.s.			taal s		

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

دی. مراجعہ والاسوس ور C-582

4. 7 S.

ASSESSME	NT	D. I	ATE: D:	1, Fl	/29/8 RCS-0	88 62	4	co				N	ASA BAS	DA ELI	TA : NE	: []		
NASA FME SUBSYSTE MDAC ID: ITEM:	А М:	₩₹		F1 62 D2	RCS 24 IODE	r —	229	58 - .	L					N	C.W	L	х ј		
LEAD ANA	LY	ST	:	D	. HAI	RT	MAI	N		50 gr	क्षारः ःः,ल	· · .			4 .700 j		n yn f		
ASSESSME	NT	:																	
	CR	IT F	ICAL	IT? F	Y		RI	EDUN	DANCY	so	CREE	NS				CI IT	L Em		
]	HD	W/FUI	NC			A		В			C							
NASA IOA	[[3 3	/3 /3]]		[[]]	[[]		[[]]		-	[[]]	*	
COMPARE	[/]		נ]	[]		נ]			[]		
RECOMMEN	'DA'	TI	ons:		(If	đ	if	fere	nt fr	om	NAS	A)							
	[3	/2R]		[P]	[P]		[P]		(AI] /00/] DEL	ETE)
* CIL RE	TE	NT	ION	RAI	FION	AL	Е:	(If	appl	ica	able	:) A	DEQ	UAT	E	[]		
REMARKS:												INA	DEQ	UAT	£	[]		
THIS FAI POSITION TO FALSE OPERATIO	LU LY NS	RE RI F	MAY EDUNI AILII	CI DAI NG	AUSE NCY I THE	LA PR(V)	OSS OV] ALV	S OF IDED VE CI	ACCU LOSED	RAI SS , I	re I Of Poss	NDI ALL IBL	CAT RE Y E	ION DUN FFE	OI DAN CTI	F T NCY ING	HE MA MI	VAL Y L SSI	VE EAD ON
ISSUE NO	T	RE	SOLVI	ED	AT I	ME	ETI	ING I	VITH :	SUE	BSYS	TEM	MA	NAG	ER	ON	1/:	20/	88.

REPORT DATE 2/26/88

in the second se

C-583

Ē

-

۵

_

_

ASSESSME ASSESSME NASA FME	NT D. NT I A #:	ATE: D:	1/29 FRC8 05-0	9/8 5-6 5KF	8 25 -2	5 226	58 -	-2					N2 J	ASA BASI	DAT ELIN NI	ra: Ne Ew	[[x]]	
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 625 DIOI	5 DE									-	* = -						
LEAD ANA	LYST	:	D. 1	HAR	TN	(A)	T													
ASSESSME	NT:																			
	CRIT F	ICAL LIGH	ITY F			RI	EDUI	NDA	NC	CY	SCI	REENS	3				CI IJ	IL TEN	1	
	HD	W/FU	NC			A				В			С							
NASA IOA	[3 [3	/1R /3]]		[[P]		[[P]]	[[P]]			[[]]	*
COMPARE	[/N]		[N]		[N]	[N]			נ	N]	
RECOMMEN	DATI	ons:	C	If	d	Ĺf	fere	ent	: 1	Êro	m]	NASA)							
	[/]		[]		[]	[]		(AI] DD/	/DI) SLE	ETE)
* CIL RE	TENT	ION	RATI	ona	.LJ	::	(I:	fa	p	91	ica	ble) Il	A NA	DEQ DEQ	UAT UAT	E	[[]	
REMARKS: IOA AGRE	ES W	ITH	NASA	FM	Œ/	A .	- 5									- 8 - 7. 11 - 24				+ 1

REPORT DATE 2/26/88

C-584

X

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/8 FRCS-6 05-6KF	8 26 '-226	58 -1			N	ASA DATA BASELINE NEW	: [[X]]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 626 DIODE								
LEAD ANALYST:	D. HAR	TMAN	ł						
ASSESSMENT:									
CRITICAL	JITY	SCRE	ENS		CIL	v			
HDW/FU	INC	A		В		с		116	М
NASA [3 /3 IOA [3 /3]]	[[]]	[[]]	[[]]	[[] *
COMPARE [/]	[]	[]	[]	[]
RECOMMENDATIONS	(If	difi	feren	t fr	om NA	SA)	- <u> </u>	1 s.	
[3 /2]	8]	[P]	(P]	[P	'] (A	[\DD/D] ELETE)
* CIL RETENTION	RATIONA	LE:	(If	appl	icabl	.e) A INA	.DEQUATE .DEQUATE	[[]]
REMARKS: THIS FAILURE MAY	CAUSE	LOSS	S OF	ACCII	RATE	INDI	CATION C)F TH	E VALVE

THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

2 C

: ===

.

-

.

1

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-627 NASA FMEA #: 05-6KF-2268 -2											N2 I	ASA DATZ BASELINI NEV	1: 5 [7 [x]•.]	-	
SUBSYSTE MDAC ID: ITEM:	E M :		FRCS 627 DIODE	:													
LEAD ANA	LYST	:	D. HA	RT	1A)	1			·						2		
ASSESSME	ent:																
	CRIT	ICAL	ITY		RI	EDUNI	DAN	CY	SCR	EENS	3		C	L	r		
	HD	W/FUI	NC		A			в			с		Т .	L'EL	1		
NASA IOA	[3 [3	/1R /3]	[[P]	[[P]	[[P]	[[]]	*	
COMPARE	ľ	/N]	[N]	נ	N]	[N]	[N]		
RECOMMEN	IDATI	ons:	(If	đi	fi	fere	nti	fro	om N	ASA)	l						
	[/	J .	[]	[]	[]	DD,	/DE] :LE	TE)	
* CIL RE	TENT	ION I	RATION	ALE	2:	(If	app	pl i	lcab	le)			_		_		
-										IN	IA IAI	DEQUATE DEQUATE	[[]		
REMARKS: IOA AGRE	EES W	ITH 1	NASA F	MEA	١.		_										
	-	· · · · ·															

ی می معمد در او در می است. او دو می از در این است. این میشند در است. از وهر است. از میشند است. است. است. است. است. است.

ASSESSME ASSESSME NASA FME	ATE: D:	1/ FR 05	29/88 CS-62 -6KF-			N	ASA DAT BASELIN NI	TA: IE [EW []	() ()					
SUBSYSTE MDAC ID: ITEM:	M:			FR 62 DI	CS 8 ODE							-		ی . موجد معرف
LEAD ANA	LYS	ST	:	D.	HART	MAN								
ASSESSME	NT :	:												
	CRI	CT:		'ITY		RED	UNDAN	ICY S	SCREE	ens		ĊĹĬ	- M	
	F	HD	W/FU	NC		A		В		С		111	214	
NASA IOA	[[3 3	/3 /3]]	[[]	[[ļ I	[[]]	[[]	*
COMPARE	[/]	[]	[]	l	[]	[]	
RECOMMEN	'DA'I	rI(ons :		(If d	iffe	rent	from	a NAS	SA)				
	ľ		/]	[]	[I	נ]] (ADD/I] DEL	ETE)
* CIL RE	TEI	NT:	ION	RAT	IONAL	E: (If ap	plic	cable	e) A INA	DEQUATI DEQUATI	C [C []	
REMARKS:	े ज	,	GPC	COM	MANDS	то	CLOSE	י ייאד	TAV 5	IVE -	REDID	IDANC	Z P	ROVID

LOSE 1 OF 2 GPC COMMANDS TO CLOSE THE VALVE. REDUNDANCY PROVIDED BY SECOND GPC COMMAND AND MANUAL CLOSE COMMAND. LOSS OF THIS, COUPLED WITH THE LOSS OF ALL HARDWARE REDUNDANCY, MAY PREVENT ISOLATION OF A THRUSTER LEAK.

SUBSYSTEM MANAGER STATED THAT THE GPC IS NOT USED TO ISOLATE A LEAK BECAUSE THE TIME TO EFFECT CAN BE UP TO 24 HOURS (SOFTWARE HAS TO BE MANUALLY LOADED). IOA WITHDRAWS THEIR ISSUE BASED ON THIS RATIONALE.

REPORT DATE 2/26/88

Z

1.85

 $\cdots = \cdots$

 $\gamma_{2} < \gamma_{2}$

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-629 NASA FMEA #: 05-6KF-2255A-2]	NASA BAS	DATA: ELINE NEW	: []	x]		
SUBSYSTEM:FRCSMDAC ID:629ITEM:DIODELEAD ANALYST:D. HARTMAN																	<u>.</u>	
LEAD ANALY	(ST:		D.	HARTI	1 A1	N												
ASSESSMENT	::																	
CF	CRITICALITY FLIGHT HDW/FUNC NASA [3 /3]				RI A	EDU	JNDAN	CY B	SC	REEN	is (2		C] []	IL TEM	ſ		
NASA (IOA (3 3	/3 /1R]	[[F]	[נ	P]]			9]]		[[x]]	*	
COMPARE (•	/N]	[N]	[N]	I	<u> </u>	1]		[N]		
RECOMMENDA	TIC	NS:		(If d	Lf:	fei	rent	fr	om	NASA	4)							
t		1]	[]	(]	(•]	(AI] /D/	/DE] ELE	TE)	
* CIL RETE REMARKS:	ENTI	ON 1	RAT	IONALI	3:	()	[f ap	pl.	iça	ble)) [N]	ADEQ ADEQ	UATE UATE	[[:]		
IOA AGREES	5 WI	TH 1	NAS:	A FME2	<u>.</u>				•		÷	ao 11 m 14 Mga 1845		ž n.	· · ·			
				. · · ·	-				12 - 1 - 12					ar ar -	ŧ.,			

REPORT DATE 2/26/88

ASSESSMENT DATE: 1/29/88 NASA DATA: BASELINE [] NEW [X] ASSESSMENT ID: FRCS-630 NASA FMEA #: 05-6KF-2255A-1 SUBSYSTEM: FRCS 630 MDAC ID: ITEM: DIODE LEAD ANALYST: D. HARTMAN ASSESSMENT: CIL REDUNDANCY SCREENS CRITICALITY ITEM FLIGHT B с HDW/FUNC A [3 /3 [NASA] I [[1 []] i 1 IOA [3 /3]] Γ COMPARE [/] ſ] [] [1 1 **RECOMMENDATIONS:** (If different from NASA) [(ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [INADEQUATE [**REMARKS:**

LOSE 1 OF 2 GPC COMMANDS TO CLOSE THE VALVE. REDUNDANCY PROVIDED BY SECOND GPC COMMAND AND MANUAL CLOSE COMMAND. LOSS OF THIS, COUPLED WITH THE LOSS OF ALL HARDWARE REDUNDANCY, MAY PREVENT ISOLATION OF A THRUSTER LEAK.

SUBSYSTEM MANAGER STATED THAT THE GPC IS NOT USED TO ISOLATE A LEAK BECAUSE THE TIME TO EFFECT CAN BE UP TO 24 HOURS (SOFTWARE HAS TO BE MANUALLY LOADED). IOA WITHDRAWS THEIR ISSUE BASED ON THIS RATIONALE.

REPORT DATE 2/26/88

1.1

ASSESSME ASSESSME NASA FME	NT NT A	D. I #:	ATE: D:	1/: FR(05	29/8 CS-6 -6KF	9/88 NA S-631 E 6KF-2255A-2							ASA BAS	DA ELI N	TA: NE IEW	: [[x]				
SUBSYSTE MDAC ID: ITEM:	M:			FR(63) DI(CS 1 DDE																	
LEAD ANA	LY	ST	:	D.	HAR	T	an A	1				. :								2 3		
ASSESSME	NT	:																				
	CRITICALITY REDUN FLIGHT HDW/FUNC A NASA [3/3] []								INDAN	IC	Y B	sc	REE	NS	с С				C] I]	il Pen	ſ	
NASA IOA	[[3 3	/3 /1R]]		[[F]	[[P]]		[[P]]			[[x]]	*
COMPARE	[/N]		[N]	[N]		C	N]			[N]	
RECOMMEN	DA	FI (ons:		(If	đi	iff	[e1	rent	f	rc	m	NAS	A)								
	נ		/]		[]	[]		[]		(AI] DD/	′DF] ELE	TE)
* CIL RE	TEI	NT	ION F	RAT	IONA	LI	2:	()	f ap	p	1 1	lca	ble) Il	AI IAI	DEQ DEQ	UAT UAT	'E 'E	[[]	
IOA AGRE	ES	W	ITH N	IAS/	A FM	EZ	}.		in an	¥ 1 -	п. т. т		, s. <u>si</u> n Siste	. 5 - 5 - 4 - 5		- 11g 		- ". - T F1.	14.2 - 1	:. · -		
				-				ii									2.2					

=

12

REPORT DATE 2/26/88 C-590

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-632 05-6KF-2255D-1	NASA DATZ Baselini Nev	A: E [] N [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 632 DIODE		
LEAD ANALYST:	D. HARTMAN		
ASSESSMENT:			
CRITICAL FLIGH	ITY REDUND	ANCY SCREENS	CIL ITEM
HDW/FU	INC A	ВС	
NASA [3 /1R IOA [3 /3	E] [P]] []	[P] [P] [] []	[]*
COMPARE [/N] [N]		[]
RECOMMENDATIONS:	(If differen	t from NASA)	
[/] []	[] [] (2	[] ADD/DELETE)
* CIL RETENTION	RATIONALE: (If	applicable) ADEQUATE INADEQUATE	[]
REMARKS: IOA AGREES WITH	NASA FMEA.		

REPORT DATE 2/26/88

2-3 1-1

= ;

<u>.</u>....

. .

-

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #: SUBSYSTEM: MDAC ID: ITEM:	1/29/88 FRCS-633 05-6KF-22 FRCS 633 DIODE		NASA DATA BASELINE NEW	[] · · · · · · · · · · · · · · · · · ·							
LEAD ANALIST:	D. HARIMA	714									
ASSESSMENT:											
CRITICALITY REDUNDANCY SCREENS C FLIGHT I											
HDW/FUI	1C 2	A .	В	C							
NASA [3/3 IOA [3/1R] [1] 7]	[] [P]	[] [P]	[] * [X]						
COMPARE [/N] []	4]	נ א]	[и]	ן א ן						
RECOMMENDATIONS:	(If di	fferent	from NA	SA)							
[/] [].	[]]	[] (AI	[] DD/DELETE)						
* CIL RETENTION P REMARKS:	RATIONALE:	: (If aj	pplicabl	e) ADEQUATE INADEQUATE	[] []						
TON NOREES WITH I	non rrien										

=

_

=

ē

1.46.44

REPORT DATE 2/26/88 C-592

n ne meteric est

and a desired to the second se

ASSESSME ASSESSME NASA FME	NT DAT NT ID: A # :	E: 1/29 FRCS 05-6	9/88 5-634 5KF-2255F-	NASA DATA: BASELINE [] -1 NEW [X]							
SUBSYSTE MDAC ID: ITEM:	M:	FRCS 634 DIOI	5 DE								
LEAD ANA	LYST:	D. H	IARTMAN								
ASSESSME	NT:										
	CRITIC	ALITY	REDUN	DANCY SCH	REENS	CIL					
	HDW/	FUNC	A	В	С	± ± 1914					
NASA IOA	[3/ [3/	1R] 3]	[P] []	[F] []	[P] []	[X]* []					
COMPARE	[/	N]	[N]	[N]	[א]	[N]					
RECOMMEN	DATION	s: (1	f differe	nt from 1	NASA)	an a					
1990 - 1 9 90 - 19	[3/	3]	[]	[]	[]]	[D] (ADD/DELETE)					
* CIL RE	TENTIO	N RATIC	NALE: (If	applical	Dle) ADEQUAT INADEQUAT	E [] E []					
REMARKS: NASA FME EFFECT.	A CONT	AINS MU	ULTIPLE FA	ILURES.	THIS FAILUR	E ALONE HAS NO					
AT MEETI DISCUSSE DUE TO D ISSUE RE	NG WIT D. IT IFFERE MAINS	H SUBSY WAS AG NT INTH OPEN.	STEM MANA SREED UPON CRPRETATIO	GER ON 1/ THAT THI NS OF NST	20/88, NSTS ISSUE RAIS IS 22206. T	22206 WAS ED ABOVE WAS HEREFORE, THE					

a a series de la composition de la comp a composition de la co a composition de la co

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA # :	1/29/88 FRCS-635 05-6KF-22551	r-2	NASA DATA: BASELINE NEW	[] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 635 DIODE			- ····
LEAD ANALYST:	D. HARTMAN			
ASSESSMENT:				
CRITICAL FLIGH	ITY REDU r	INDANCY SCREENS	3	CIL ITEM
HDW/FUI		В	C	
NASA [3 /1R IOA [3 /3] [P]] []	[F] [[] [P]]	[X]* []
COMPARE [/N	ן [א]	[М] [N]	[N]
RECOMMENDATIONS:	(If differ	cent from NASA)	-
[2 /1R] [P]	[F] [P] (AI	[A] DD/DELETE)
* CIL RETENTION 1	RATIONALE: (1	[f applicable) II	ADEQUATE NADEQUATE	[] []

REMARKS: NASA FMEA CONSIDERS MULTIPLE FAILURES. THIS FAILED SHORT DIODE CAUSES EXCESSIVE MOTOR OPERATION (CONTINUOUS POWER THAT OPENS THE VALVE SLIGHTLY THEN CLOSES IT, CONSTANTLY REPEATING ITSELF). MOTOR DAMAGE WOULD LIKELY CAUSE THE VALVE TO CLOSE, CAUSING LOSS OF JETS ON ASSOCIATED MANIFOLD. REDUNDANCY PROVIDED BY JETS ON ANOTHER MANIFOLD. LOSS OF REDUNDANCY CAUSES THE INABILITY TO EXPEL PROPELLANTS TO MEET CG CONSTRAINTS.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

. Taki wa k

REPORT DATE 2/26/88

C-594

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-636 NASA FMEA #: 05-6KF-2255C-1											NA E	ASA E Basei	DATA LINE NEW	: [x]]	
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 636 DIODE													
LEAD ANA	LYST		D. HAI	RTM	[A]	4										
ASSESSME	NT:															
	CRITI FI	ICALI LIGHI	LTY P		RI	EDUND	AN	ICY	SCREI	ENS	3			CIL ITE	м	
	HDV	V/FUI	NC		A			В			С					
NASA IOA	[3 [3	/1R /1R]]	[[P P]	[[P P]]	[[P P]]		[[]]	*
COMPARE	ľ	/]	נ]	[]	[]	-	[]	
RECOMMEN	DATI	ONS:	(If	di	f	feren	it	fr	om NAS	5A))				,.	
	[/]	[]	[]	[]	(A	[DD/D] ELF	ETE)
* CIL RE	TENT:	ION]	RATION	ALE	5:	(If	aŗ	pl	icable	∍) Il	AI NAI	DEQUA DEQUA	ATE ATE	[נ]	
NO DIFFE	RENC	ES.												·····		

REPORT DATE 2/26/88

•

- -----

Ξ. .

- **e** - 1

i 🖬

C-595

, ere

. ...

• . .

ASSESSMENT DATE ASSESSMENT ID: NASA FMEA #:	: 1/29/88 FRCS-63 05-6KF-	2	NASA DATA BASELINI NEV	A: E [] V [X]								
SUBSYSTEM: MDAC ID: ITEM:	FRCS 637 DIODE				• . 							
LEAD ANALYST:	D. HART	MAN										
ASSESSMENT:												
CRITICALITY REDUNDANCY SCREENS CI FLIGHT IT												
FLIG HDW/F	UNC	A	В	с	LTEM							
NASA [3 /3 IOA [3 /1] [R] [] F]	[] [P]	[] [P]	[] * [X]							
COMPARE [/N	3 [И]	[N]	[N]	[N]							
RECOMMENDATIONS	: (If d	ifferer	nt from NAS	SA)								
[/] []	[]	[]	[] ADD/DELETE)							
* CIL RETENTION	RATIONAL	E: (If	applicable	e) ADEQUATE INADEOUATE								
REMARKS: IOA AGREES WITH	NASA FME	А.		_	L J							

-

. æ C-596

C - 9

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-638 NASA DATA: BASELINE [] NEW [X] NASA FMEA #: 05-6KF-2255 -1 SUBSYSTEM: FRCS MDAC ID: 638 ITEM: DIODE LEAD ANALYST: D. HARTMAN ASSESSMENT: REDUNDANCY SCREENS CRITICALITY CIL FLIGHT ITEM HDW/FUNC Α В С NASA [2 /1R] IOA [3 /3] [P] [] [F] [P] [] [] [X] * COMPARE [N/N] [N] [N] [N] [N]**RECOMMENDATIONS:** (If different from NASA) [3/3] [] [] [] [D] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE Ι INADEQUATE [1 **REMARKS:** NASA FMEA CONTAINS MULTIPLE FAILURES. THIS FAILURE ALONE HAS NO EFFECT. AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

C-597

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-639 NASA FMEA #: 05-6KF-2255 -2									NZ P	ASA DATA: BASELINE NEW	[[X]	
SUBSYSTE MDAC ID: ITEM:	E M :			FRCS 639 DIODE									
LEAD ANA	LY	ST	:	D. HAI	RTMAN	1							
ASSESSME	ENT	:											
CRITICALITY REDUNDANCY SCREENS											CIL	ſ	
	1	HD	W/FUI	NC	A		В		С			•	
NASA IOA	[[3 3	/3 /3]	[[]	[[]	[[]	[[]	*
COMPARE	[/]	[]	[]	[]	[]	
RECOMMEN	IDA!	TI (ONS:	(If	dif	feren	t fro	om NAS	SA)				
	[3	/2R	1	[P]	[P]	[₽]	ן זס/סכ] Elf	TE)
* CIL RI	ETE	NT	ION	RATION	ALE:	(If a	appli	cable	€) AI INAI	DEQUATE DEQUATE	[]]	
REMARKS THIS FAT POSITION TO FALSI OPERATION	INADEQUATE [] THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE OSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.												

=

=

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

ASSESSMENT DATE: 1/29/88 NASA DATA: BASELINE [] NEW [X] ASSESSMENT ID: FRCS-640 NASA FMEA #: 05-6KF-2255B-1 SUBSYSTEM: FRCS MDAC ID: 640 ITEM: DIODE LEAD ANALYST: D. HARTMAN ASSESSMENT: REDUNDANCY SCREENS CIL CRITICALITY FLIGHT ITEM HDW/FUNC A В С NASA [3/2R][P] [P] [P] IOA [3/1R][P] ΪΨĴ [P] COMPARE [/N] Г 1 RECOMMENDATIONS: (If different from NASA) [3/1R] [P] [NA] [P] Γ (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE Ξ INADEQUATE [1

REMARKS: THIS DIODE FAILED OPEN CAUSES INABILITY TO OPEN THE VALVE WITH THE GPC. MANUAL REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY CAUSES LOSS OF JETS REQUIRED TO EXPEL PROPELLANTS TO MEET CG LIMITS.

ISSUE NOT RESOLVED AT THE MEETING WITH THE SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

C-599

=

8

ASSESSMEN ASSESSMEN NASA FMEZ	SSMENT DATE: 1/29/88 SSMENT ID: FRCS-641 FMEA #: 05-6KF-2255B-2										: []	x]		
SUBSYSTEM MDAC ID: ITEM:	1:		FRCS 641 DIODE									-			
LEAD ANAL	LYST	:	D. HAF	TM	AN	I									
ASSESSMEN	NT:												= :		-
C	CRIT	ICALI	CTY r		RE	DUND	ANC	CY	SCREI	ENS	5		CIL ITEM		
	HD	W/FUN	10		λ			B			С				
NASA IÓA	[3 [3	/3 /1R]]	[[F]]	[[P]]	[[P]	[[x] *]
COMPARE	[/N]	[N]	[N]	[N]	[N]
RECOMMENDATIONS: (If different from NASA)															
	[/]	[]	נ]	[] (A)] DD/	DF] Elete)
* CIL RE	rent:	ION P	RATIONA	LE	:	(If a	apj	91 3	icable	(≤ 1	IA IAI	DEQUATE DEQUATE	[]
REMARKS: IOA AGREI	ES. W	ITH 1	NASA FM	IEA											

REPORT DATE 2/26/88

÷

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-642 NASA FMEA #: 05-6KF-2255E-						-1	NASA DATA: BASELINE [] NEW [X]												
SUBSYSTE MDAC ID: ITEM:	E M :		FR(642 DI(CS 2 ODE									-					1	
LEAD AND	LYST	:	D.	HART	MA	N													
ASSESSME	ENT:																		
	CRIT F HD	ICAL LIGH	ITY F NC		R	EDUI	NDAN	CY B	SC	REE	NS	s c		*. <u>-</u>	.	C] I'	C L Cen	1	
NASA IOA	[3 [3	/1R /3]]	[[P]]	[[F]		[[P]]			[[x]	*
COMPARE	[/N]	[N]	[N]		[N]			[N]	
RECOMMEN	NDATI	ons:		(If d	if	fer	ent	fr	om	NAS	A))			-1-1-1	-, -	·	÷	
	[3	/3]	[]	[]		[]		(AI] ,00	D / D1] ELI	ETE)
* CIL R	ETENI	NOI (RAT	IONAL	.Е :	(I	f ap	pl.	ica	able	:) II	A NA	DEQ DEQ	UAT UAT	E E	[[]	
REMARKS NASA FM CAUSES VALVE S MOTOR D	EA CO EXCES LIGHI AMAGE	NSID SIVE LY T WOU	ÉRS MO HEN LD	MULI TOR C CLOS LIKEI	IP PE ES	LE RAT IT CAU	FAIL ION , CO SE T	UR (C NS' HE	ES ONT TAN VI	T TINU ITLY ALVE	H: IOI	IS US RE TO	FA PO PEA CL	ILE WER TIN OSE	D S TI G C	SH HA IT CA	OR T SE US	r i Opi LF IN(DIODE ENS THE). G
AT MEET DISCUSS DUE TO ISSUE R	ING W ED. DIFFI EMAIN	VITH IT W ERENT IS OP	SUB AS IN EN.	SYSTE AGREE TERPF	M D ET	MAN UPO ATI	AGER N TH ONS	O AT OF	N TH NS	L/20 HE I STS	2 2	88 SU 22	, N E R 06.	STS AIS T	22 ED HEI	22 A RE	06 BO FO	W/ VE RE	AS WAS , THE
				. 									199 -	******					·

REPORT DATE 2/26/88

- -

- .

. 23

: 103 : 103

C-601

ASSESSME ASSESSME NASA FME	NT DA NT II A #:	ATE: D:	1/2 FRC 05-	29/88 CS-64 -6KF-	3 13 -22	55E	-2				NASA BAS	DATA: ELINE NEW	[[x]]	
SUBSYSTE MDAC ID: ITEM:	:M :		FRC 643 DIC	CS 3 DDE												
LEAD ANA	LYST:	:	D.	HAR!	MA	N										
ASSESSME	NT:															
	CRITI FI HDV	ICALI LIGHI V/FUN	ITY IC		R A	EDUI	NDAN	CY B	SCR	REENS	с		CI II	L Em	[
NASA IOA	[3 [3	/1R /3]]		P]	[[F]]	[[P]]		[[x]	*
COMPARE	[/N]	(N]	ſ	N]	[М]		[N]	
RECOMMEN	DATIC	ONS:	(lf d	lif	fere	ent	fro	om N	IASA)						
	[2	/1R]	[P]	[F]	[P]	(AD	[D/	A DE] LE	TE)
* CIL RE	TENTI	ON F	LTAS	ONAI	æ:	(11	f app	91 1	lcab	ole) IN	ADEQ ADEQ	UATE	[]	

REMARKS:

NASA FMEA CONSIDERS MULTIPLE FAILURES. THIS FAILED SHORT DIODE CAUSES EXCESSIVE MOTOR OPERATION (CONTINUOUS POWER THAT OPENS THE VALVE SLIGHTLY THEN CLOSES IT, CONSTANTLY REPEATING ITSELF). MOTOR DAMAGE WOULD LIKELY CAUSE THE VALVE TO CLOSE, CAUSING LOSS OF JETS ON ASSOCIATED MANIFOLD. REDUNDANCY PROVIDED BY JETS ON ANOTHER MANIFOLD. LOSS OF REDUNDANCY CAUSES THE INABILITY TO EXPEL PROPELLANTS TO MEET CG CONSTRAINTS.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-644 05-6KF-2255 -1	NASA DATA BASELINE NEW	: [] 7 [X]					
SUBSYSTEM: MDAC ID: ITEM:	FRCS 644 DIODE							
LEAD ANALYST:	D. HARTMAN							
ASSESSMENT:								
CRITICAL FLIGH	CRITICALITY REDUNDANCY SCREENS							
HDW/FU	NC A	B C						
NASA [2 /1R IOA [3 /3	[P] [] [] [F] [P]] []	[X]* []					
COMPARE [N /N] [N] [N] [N]	[N]					
RECOMMENDATIONS:	(If different	from NASA)						
[3 /3] [] [) [] (A	[D] DD/DELETE)					
* CIL RETENTION	RATIONALE: (If ap	plicable) ADEQUATE INADEQUATE						
REMARKS: NASA FMEA CONTAI EFFECT.	NS MULTIPLE FAILU	RÉS. THIS FAILURE	ALONE HAS NO					

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

.....

Ξ

ASSESSMENT DATE: 1/29/88 NASA DATA: ASSESSMENT ID: FRCS-645 BASELINE [1 NEW [X] NASA FMEA #: 05-6KF-2255 -2 SUBSYSTEM: FRCS MDAC ID: 645 ITEM: DIODE LEAD ANALYST: D. HARTMAN ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL ITEM FLIGHT A B C HDW/FUNC NASA [3/3] [IOA [3/3] Г COMPARE [/] ٢ RECOMMENDATIONS: (If different from NASA) [3/2R] [P] [P] [P] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE ſ ٦ INADEQUATE Г 1 **REMARKS:** THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	NT DATH NT ID: A #:	5: 1/29 FRCS 05-6	68 -	1		N	ASA BASE	DATA LINE NEW	: [[]	x]					
SUBSYSTE MDAC ID: ITEM:	:M:	FRCS 646 DIOD	E									-			
LEAD ANA	LYST:	D. H	ARTMA	N											
ASSESSME	NT:														
	CRITIC	LITY	R	EDUN	DANCY	SCI	REENS			CIL					
	HDW/FUNC			L	B		С	с			T T CM				
NASA IOA	[3 /3 [3 /3	3] 3]	[[]]	[[]]	[[]]		[[]	*			
COMPARE	[/]	[]	[.]	Γ]		[]				
RECOMMEN	DATIONS	5: (I	f dif	fere	nt fr	om 1	NASA)					. .			
•	[3/2	2R]	[F	']	[P	Ĵ	[P	<u>ן</u>	(A)] DD/1] DELI	ETE)			
* CIL RE	TENTION	RATIO	NALE:	(If	appl	icab	ole)			r					
							A INA	DEQU	ATE	[]				
REMARKS: THIS FAI POSITION TO FALSE OPERATIO	LURE MA . REDU LY FAII	AY CAUS JNDANCY LING TH	E LOS PROV E VAI	S OF IDED LVE C	ACCU LO LOSED	RATI SS (, PC	E INDI DF ALL DSSIBL	CATI RED Y EF	ON O UNDA FECT	F TI NCY ING	HE N MAY MIS	VALVE V LEAD SSION			

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

-

· _ ·

5 **6**223

· · · ·

_

-

_

1/29/88 FRCS-647 05-6KF-226	NA B	SA DATA: ASELINE [] NEW [X]									
FRCS 647 DIODE											
D. HARTMAN	T										
ASSESSMENT:											
CRITICALITY REDUNDANCY SCREENS FLIGHT											
NC A	В	C									
] [P] [] [P]] [] [P]]] []*								
) [N] [N] [N	ן א]								
(If diff	erent fro	om NASA)									
] [] [].[] [] (ADD/DELETE)								
RATIONALE: NASA FMEA.	(If appli	icable) ADI INADI	EQUATE [] EQUATE []								
	1/29/88 FRCS-647 05-6KF-226 FRCS 647 DIODE D. HARTMAN ITY RE NC A] [P] [N (If diff] [RATIONALE: NASA FMEA.	1/29/88 FRCS-647 05-6KF-2268 -2 FRCS 647 DIODE D. HARTMAN ITY REDUNDANCY NC A B] [P] [P] [P] [P] [N] [N (If different from] [] [] [RATIONALE: (If applity NASA FMEA.	1/29/88 NA: FRCS-647 Bi 05-6KF-2268 -2 FRCS 647 DIODE D. HARTMAN EDUNDANCY SCREENS ITY REDUNDANCY SCREENS MC A B C] [P] [P]] [P] [P] [P]] [N] [N] [N] [RATIONALE: (If applicable) AD] [NASA FMEA. AD] [N]								

REPORT DATE 2/26/88
ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-648 05-6KF-2	8 2268 -1		NAS. BA	A DATA: SELINE [NEW [] X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 648 DIODE			·		
LEAD ANALYST:	D. HARTI	MAN				
ASSESSMENT:						
CRITICAL FLIGH	ITY T	REDUND	ANCY SCI	REENS	CI IT	L EM
HDW/FU	NC	A	В	С		
NASA [3 /3 IOA [3 /3] [] []]	[·] []	[] []	[[] *]
COMPARE [/] []	[]	[]	٢]
RECOMMENDATIONS:	(If d	ifferen	: from 1	IASA)		
[3 /2R] [P]	[P]	[P]	[(ADD/] DELETE)
* CIL RETENTION	RATIONAL	E: (If a	applical	ole) ADE INADE	QUATE [QUATE []]
THIS FAILURE MAY	CAUSE LO	OSS OF 2	ACCURATI	E INDICA	TION OF T	HE VALV

THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	ENT I ENT I EA #:	DATE: ED: :	1/29/3 FRCS- 05-6K	88 649 F-220	68 -	-2				N2 I	ASA DA BASELI N	TA: NE IEW	[[x]	1. A. 2010 (A.
SUBSYSTE MDAC ID: ITEM:	EM :		FRCS 649 DIODE													
LEAD ANA	LYSI	C:	D. HA	RTMAI	N											
ASSESSME	ENT:															
	CRIT	CICAL	ITY	R	EDUI	NDAN	CY	SCRE	EENS	5			C]	L	r	
	HI	W/FU	NC	A			В			с			11	LEP	L	
NASA ·IOA	[]	3 /1R 3 /3]	[P []	[[Ρ]].	[נ	Ρ]		[[]]	*
COMPARE	ľ	/N]	[N]	[N]	[N]		[N]	
RECOMMEN	IDATI	cons:	(If	dif	fere	ent :	fro	om NA	ASA)							
	[1]	[]	[]	Γ]	(AD] D/	DE] :LE	TE)
* CIL RE	TENT	TION 1	RATION	ALE:	(I)	f ap	pl :	[cab]	le)						_	
									IN	AI IAI	DEQUAT DEQUAT	'E	[[]]	
REMARKS: IOA AGRE	ES I	VITH 1	NASA FI	MEA.	.	4 - A - A										

-

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-650 05-6KF-2255A-1		NASA DATA: BASELINE [] NEW [X]							
SUBSYSTEM: MDAC ID: ITEM:	FRCS 650 DIODE									
LEAD ANALYST:	D. HARTMAN	D. HARTMAN								
ASSESSMENT:										
CRITICAL	ITY REDUND	ANCY SCREE	ENS	CIL						
HDW/FU	NC A	В	C	<u> </u>						
NASA [3 /3 IOA [3 /3] []	[] []	[] []	[]*						
COMPARE [/] []	[]	[]	[]						
RECOMMENDATIONS:	(If differen	t from NAS	SA)	м						
] []	[]	[] (A	[] DD/DELETE)						
* CIL RETENTION	RATIONALE: (If	applicable	ADEQUATE							
REMARKS: LOSE 1 OF 2 GPC COMMANDS TO CLOSE THE VALVE. REDUNDANCY PROVIDED BY SECOND GPC COMMAND AND MANUAL CLOSE COMMAND. LOSS OF THIS, COUPLED WITH THE LOSS OF ALL HARDWARE REDUNDANCY, MAY PREVENT ISOLATION OF A THRUSTER LEAK.										

SUBSYSTEM MANAGER STATED THAT THE GPC IS NOT USED TO ISOLATE A LEAK BECAUSE THE TIME TO EFFECT CAN BE UP TO 24 HOURS (SOFTWARE HAS TO BE MANUALLY LOADED). IOA WITHDRAWS THEIR ISSUE BASED ON THIS RATIONALE.

REPORT DATE 2/26/88

.

-

.....

NASA DATA: ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-651 BASELINE [] NEW [X] NASA FMEA #: 05-6KF-2255A-2 SUBSYSTEM: FRCS MDAC ID: 651 ITEM: DIODE LEAD ANALYST: D. HARTMAN . ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL ITEM FLIGHT ВС HDW/FUNC Α IASA [3/3] [] [] [] IOA [3/1R] [F] [P] [P] NASA [3 /3] [] [X] COMPARE [/N] [N] [N] [N] **RECOMMENDATIONS:** (If different from NASA) [] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [INADEQUATE [ADEQUATE] 1 **REMARKS:** IOA AGREES WITH NASA FMEA.

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	NT NT A #	DATE: ID: :	1/29/88 NA FRCS-652 B 05-6KF-2255A-1						NASA DATA: BASELINE [] NEW [X]					
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 652 DIOI	S DE										
LEAD ANA	LYS	т:	D. F	IARTM2	AN									
ASSESSME	NT:													
	CRI	TICAI FLIGH	ITY T	ł	REDUN	DANC	SCR	REENS			CII ITE	M		
	н	DW/FU	NC	1	ł]	В	. (2					
NASA IOA	[[3 /3 3 /3]	[[]]	[[]]	[[]] [] *]		
COMPARE	٢	/]	[]	Γ]	Γ]		[]		
RECOMMEN	DAT	IONS:	()	f di	ffere	nt f	rom N	IASA)						
	[/]	[]	[]	[]	(A	[.DD/D] DELETE)		
* CIL RE	TEN	TION	RATIC	DNALE	: (If	app:	licat	ole) I INZ	ADEQI ADEQI	JATE JATE	[[]]		
REMARKS: LOSE 1 O BY SECON COUPLED	F 2 D G WIT	GPC PC CC	COMMA MMANI	NDS 7 NDS 7 ND AND S OF 1	TO CI MANU ALL H	JOSE 1 JAL CI LARDWA	THE V LOSE ARE F	ALVE COMMA EDUNI	. RI AND. DANCY	EDUND LOS Y, MA	ANCY S OF Y PR	PROVID THIS, EVENT		

SUBSYSTEM MANAGER STATED THAT THE GPC IS NOT USED TO ISOLATE A LEAK BECAUSE THE TIME TO EFFECT CAN BE UP TO 24 HOURS (SOFTWARE HAS TO BE MANUALLY LOADED). IOA WITHDRAWS THEIR ISSUE BASED ON THIS RATIONALE.

ISOLATION OF A THRUSTER LEAK.

-

≣

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-653 05-6KF-2255A-2	NASA DATA: BASELINE NEW	[] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 653 DIODE	· • • •	
LEAD ANALYST:	D. HARTMAN		
ASSESSMENT:			
CRITICALI FLIGHT	TY REDUNDA	NCY SCREENS	CIL ITEM
HDW/FUN	IC A	B C C	
NASA [3 /3 IOA [3 /1R] []] [F]	[] [] [P] [P]	[] * [X]
COMPARE [/N] [И]	[И] [И]	[N]
RECOMMENDATIONS:	(If different	from NASA)	
· · · [/] []	[] [] (AD)	[] D/DELETE)
* CIL RETENTION F	ATIONALE: (If a)	oplicable) ADEQUATE INADEOUATE	[] r]
REMARKS: IOA AGREES WITH N	IASA FMEA.		• •

REPORT DATE 2/26/88

.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-654 05-6KF-22	55D-1		NASA DATA: BASELINE [] NEW [X]					
SUBSYSTEM: MDAC ID: ITEM:	FRCS 654 DIODE				• • •2				
LEAD ANALYST:	D. HARTMA	N	- r /		- *				
ASSESSMENT:									
CRITICAL	ITY R	EDUNDĂI	NCY SCRE	ENS	CIL				
HDW/FU	NC A		В	С					
NASA [3 /1R IOA [3 /3	2] [P] [']]	[P] []	[P] []	[] * []				
COMPARE [/N] [N]	[N]	[N]	[]				
RECOMMENDATIONS:	(If dif	ferent	from NA	SA)					
` . [] []	[]	[] ([] ADD/DELETE)				
* CIL RETENTION REMARKS:	RATIONALE:	(If aj	pplicabl	e) ADEQUATE INADEQUATE					
IOA AGREES WITH	NASA FMEA.								

.

REPORT DATE 2/26/88

Ę

ASSESSMENT DAT ASSESSMENT ID: NASA FMEA #:	E: 1/29/ FRCS- 05-6K	88 655 F-225	55D-2			NASA D BASEL	ATA: INE [] NEW [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 655 DIODE	:					
LEAD ANALYST:	D. HA	RTMAN	T				
ASSESSMENT:							
CRITIC	LITY	RE	DUND	ANCY	SCRE	ENS	CIL ITEM
HDW/1	TUNC	A		В		C	
NASA [3 /: IOA [3 /:] .R]	[[F]]	[[P]]	[] [P]	[] * [X]
COMPARE [/1	[]	[N]	[N]	[N]	[N]
RECOMMENDATIONS	:: (If	diff	eren	t fro	om NA	SA)	
[/	3	[]	[]	נז ו	[] (ADD/DELETE)
* CIL RETENTION	RATION	ALE:	(If a	appl:	icabl	e) ADEQUAI INADEQUAI	TE [] TE []
IOA AGREES WITH	NASA F	MEA.					

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	FRCS-656	5]	NASA DAT BASELII NI	FA: NE [EW []]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 656 DIODE						
LEAD ANALYST:							
ASSESSMENT:							
CRITICAL	ITY	REDUNDA	NCY S	CREENS		CIL) 'M
HDW/FU	NC	A	В		с	<u> </u>	11
NASA [/ IOA [3 /3] [] []]	[]	[[]	[[] *]
COMPARE [N /N] []	[]	I []	[]
RECOMMENDATIONS:	(If di	fferent	from	n NASA)			
[/] []	[]	I (]	(ADD/D] DELETE)
* CIL RETENTION	RATIONALE	C: (If a	pplic	cáble)			
				IN	ADEQUATI ADEQUATI	E (E (]]
REMARKS: FORWARD MANIFOLD CHANGE IN CIRCUI	ISOLATIC TRY. SEP	N VALVE	#5 F MENT	RE-ANAL IDs FR	YZED BY CS 1100:	IOA D 1X-110	UE TO

REPORT DATE 2/26/88

. -

: .

= :

_

-

- · ·

-

- 7

ASSESSM ASSESSM NASA FM	ENT ENT EA	D 1 #:	ATE: D:	FRCS-6	557]	NASA BASE	DATA: LINE NEW	[]]	·
SUBSYST MDAC ID ITEM:	EM:			FRCS 657 DIODE						: :				
LEAD AN	ALY	ST	:											
ASSESSM	ENT	':												
	CR	IT	ICAL	ITY	RE	EDUNDA	NCY	SCREE	ens			CIL	,	
		HD	N/FUI	I' NC	A		В		(с		TIEN	1	
NASA IOA	[[3	/ /3]]	[[]]	[]]	[[]]		[[]]	*
COMPARE	[N	/N]	٢]	[]	۵]		[]	
RECOMME	NDA	TIC	ONS:	(If	diff	ferent	; fr	om NAS	SA)					
	נ		/].	[]	[]	[]	. (AD	[D/DE] CLE	TE)
* CIL R	ETE	NT	ION I	RATIONA	LE:	(If a	appl	icable	e) / IN/	ADEQU ADEQU	ATE ATE	[[]	
REMARKS	: MA	NT	FOLD	TSOLAT	אסדי	VALVE	2 #5	RE-AN	IAT	YZED	BY TO	A DI	E	то
CHANGE	IN	CI	RCUI	TRY. S	SEE A	SSESS	MEN	r IDs	FRO	CS 11	001X-	1107	9X	, -

REPORT DATE 2/26/88

C-616

. ~

ASSESSME ASSESSME NASA FME	NT NT A	D2 II #:	ATE: D:	FRO	cs-e	558				N	iasa Basi	DATA ELINE NEW	: [[]
SUBSYSTE MDAC ID: ITEM:	M:			FR(658 DI(CS B ODE									a e territo. A s
LEAD ANA	LY	ST	:										<u>⊢</u> .	
ASSESSME	NT	:												
	CR	IT F	ICAI LIGH	LITY IT]	REDUN	IDANCY B	SCF	EENS			CII	L EM
	-	יעה	, ,	, AC		-	-	-	-	,			r	
NASA IOA	[[3	/3]		[]	۲ ۲]	Ľ]		Ē]
COMPARE	[N	/N]		[]	Ē]	Γ]		[]
RECOMMEN	DA'	TI	ons:		(If	di	ffere	ent fr	om N	IASA)				
			/]	-	[]	[]	Ĩ]	(A] DELETE)
* CIL RE	TE	NT	ION	RAT	ION	ALE	: (11	f appl	icat	ole) / IN/	ADEQI ADEQI	UATE UATE	[[]
REMARKS: FORWARD CHANGE I	MA N	NI CI	FOLI RCUI) IS TRY	OLA'	rio: See	N VAI ASSI	LVE #5 ESSMEN	ŔE- T II	-ANALY Ds FRO	ZED	BY I 1001X	OA 1 (-11)	DUE TO 079X.

ASSESSME ASSESSME NASA FME	ENT ENT EA	D/ I) #:	ATE: D:	FRCS-	659				NASA DATA: BASELINE [] NEW []						
SUBSYSTE MDAC ID: ITEM:	EM:			FRCS 659 DIODE											
LEAD ANA	LY	ST	:												
ASSESSME	INT	:													
	CR	IT:	ICAL	ITY	R	EDUND	ANCY	SCRE	ENS			CIL			
	1	r 1 HDV	V/FU	NC	A B				С			TTEI	1		
NASA IOA	[[3	/ /3]	[]]	[[]]]]]		[[] *]		
COMPARE	[N	/N]	[]	[]	[]		[]		
RECOMMEN	DA'	ric	ONS:	(If	dif	ferent	t fr	om NAS	5A)						
	[/]	[]	[]	[]	(AD	[D/DI] Elete)		
* CIL RE	TEI	NT I	ION I	RATION	ALE:	(If a	appl	icable	∍) A INA	ADEQUAT ADEQUAT	'E	[[]]		
REMARKS:	MDI	נדנ	ະດາ.ກ	TSOLA	TON	VALVE	7 #5	DE-DI	JAT.V	ZED BV	· •	זרז ג	፲፰ ፹ር		

CHANGE IN CIRCUITRY. SEE ASSESSMENT IDS FRCS 11001X-11079X.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	FRCS-660	NASA DATA: BASELINE [] NEW []
SUBSYSTEM: MDAC ID: ITEM:	FRCS 660 DIODE	
LEAD ANALYST:		· · · · · · · · · · · · · · · · · · ·
ASSESSMENT:		
CRITICAL	ITY REDUNDANCY SCREENS	CIL
FLIGH HDW/FU	NC A B	C
NASA [/ IOA [3 /2R] [] [] [] [P] [P] [] []* P] []
COMPARE [N /N] [И] [И] [и] []
RECOMMENDATIONS:	(If different from NASA)	
[/] [] [] []] [] (ADD/DELETE)
* CIL RETENTION	RATIONALE: (If applicable)	ADEQUATE [] IADEQUATE []
REMARKS: FORWARD MANIFOLD CHANGE IN CIRCUI	D ISOLATION VALVE #5 RE-ANAL TRY. SEE ASSESSMENT IDs FR	YZED BY IOA DUE TO CS 11001X-11079X.

REPORT DATE 2/26/88

.

.

.

i iris Saur

= = =

- -

.

C-619

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	FRCS-661			NASA DATA: BASELINE NEW	[]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 661 DIODE				
LEAD ANALYST:					
ASSESSMENT:					
CRITICAL: FLIGH HDW/FUI	ITY R I IC A	EDUNDANCY B	SCREENS	Ċ	CIL ITEM
NASA [/ IOA [3 /2R] [] [F] [] [P] [] [] P]	[]*
COMPARE [N /N] [N] [N] [ן מ	[&a4680H]
RECOMMENDATIONS:	(If dif:	ferent fro	om NASA)		
[/ ·] [] [] [] (AD	[] D/DELETE)
* CIL RETENTION F	ATIONALE:	(If appl	icable) IN	ADEQUATE ADEQUATE	[]

FORWARD MANIFOLD ISOLATION VALVE #5 RE-ANALYZED BY IOA DUE TO CHANGE IN CIRCUITRY. SEE ASSESSMENT IDs FRCS 11001X-11079X.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	FRCS-66	2		NASA DATA BASELINI NEV	A: E [V []
SUBSYSTEM: MDAC ID: ITEM:	FRCS 662 DIODE					
LEAD ANALYST:						
ASSESSMENT:						
CRITICAL FLIGH	ITY T	REDUND	ANCY SCRE	ENS	CII ITF	M
HDW/FUI	NC	A	В	C		
NASA [/ IOA [3 /2R] [] [] P]	[] [P]	[] [P]	[[] *]
COMPARE [N /N] [N]	[N]	[N]	[]
RECOMMENDATIONS:	(If d	ifferen	t from NAS	SA)		
· · · · · · · · · · · · · · · · · · ·] [ן ז	[]]	[]	[D] ELETE)
* CIL RETENTION H	RATIONAL	E: (If	applicable	e) ADEQUATE	Г	1
REMARKS:				INADEQUATE	Ì	j
FORWARD MANIFOLD CHANGE IN CIRCUIT	ISOLATIO TRY. SEI	ON VALV E ASSES	E #5 RE-AI SMENT IDS	NALYZED BY I FRCS 11001X	OA D -110	UE TO 79X.

= +

.....

.....

·····

-

-

=

=

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	FRCS-66	3		NASA DATA BASELINE NEW	: [] []				
SUBSYSTEM: MDAC ID: ITEM:	FRCS 663 DIODE								
LEAD ANALYST:									
ASSESSMENT:									
CRITICAL	LITY	INS	CIL						
FLIG HDW/F	INC	A	В	С					
NASA [/ IOA [3 /2]] [] F]	[] [P]	[] [P]	[] * []				
COMPARE [N /N] [N]	נ א]	[N]	[]]				
RECOMMENDATIONS	: (If d	ifferen	t from NAS	SA)					
[/] []	[]	[] (A	[] DD/DELETE)				
* CIL RETENTION	RATIONAL	E: (If	applicable	2) ADEQUATE INADEUATE					
REMARKS: FORWARD MANIFOL CHANGE IN CIRCU	REMARKS: FORWARD MANIFOLD ISOLATION VALVE #5 RE-ANALYZED BY IOA DUE TO CHANGE IN CIRCUITRY. SEE ASSESSMENT IDS FRCS 11001X-11079X.								

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	NT DA NT II A #:	ATE: D:	FRCS	-664				N	ASA BASE	DATA: LINE NEW	[[]	
SUBSYSTE MDAC ID: ITEM:	М:		FRCS 664 DIOD)E								n <u>1</u> 1 <u>7</u> -	•
LEAD ANA	LYST:	:									، بد آد		
ASSESSME	NT:												
	CRITI	ICAL LIGH	ITY T	R	EDUN	IDANCY	SCR	EENS			CI II	L EM	
	HDV	V/FU	NC	А		В		c	:				
NASA IOA	[[3	/ /3]]	[[]]	[[]]	[[] .] []	*
COMPARE	[N	/N]	[]	[]	[]		[]	
RECOMMEN	DATIC	ONS:	(1	f dif	fere	ent fr	om N	ASA)			-		
	[/]	[]	. [נ	Ĩ]	(AI	[DD/] DEL	ETE)
* CIL RE	TENT	ION	RATIC	NALE:	(If	f appl	icab	ole) A INA	DEQU	ATE ATE	[[]	
REMARKS: FORWARD CHANGE I	MANII N CII	FOLD) ISOI TRY.	ATION SEE	I VAI ASSE	LVE #5 SSMEN	RE- T II	ANALY	ZED S 11	BY IC 001X-	DA -11	DUE .079	TO X.

REPORT DATE 2/26/88

· •

-

-

555 S

== : = :

ASSESSMI ASSESSMI NASA FMI	ENT ENT EA	D) I) #:	ATE: D:	FRCS-6	565				N	IASA D BASEL	ATA: INE NEW	[]]
SUBSYSTI MDAC ID: ITEM:	E M : :			FRCS 665 DIODE									
LEAD ANA	LY	ST	:										
ASSESSMI	ENT	:											
	CR	IT:	ICAL	ITY	RI	EDUNDA	NCY	SCREI	ens			CIL	,
	Ĩ	HDI	W/FUI	NC	A		В		c	2		<u>, 1 1 Cr</u>	1
NASA IOA	[[3	/ /3]]	[[]]	[[]]	[[]		[[] *] *
COMPARE	[N	/N]	[]	[]	[]		[]
RECOMMEN	IDA:	FIC	ONS:	(If	dif	ferent	: fro	om NAS	SA)				
	[/]	[]	[]	[]	(AD	[DD/DE] ELETE)
* CIL RE	ETEI	NT:	ION H	RATION	LE:	(If a	ppli	icable	≥) A INA	DEQUA'	re re	[[]
REMARKS: FORWARD CHANGE 1	MAN N (FOLD RCUII	ISOLAT	TION SEE 2	VALVE	2 #5_ MEN]	RE-AN IDs	VALY FRC	ZED B S 110	Y IO D1X-	A DU 1107	ЛЕ ТО '9Х.

ASSESSME ASSESSME NASA FME	NT DATE: NT ID: A #:	FRCS-	666				ł	IASA DA' BASELII N	TA: NE [EW []]
SUBSYSTE MDAC ID: ITEM:	M:	FRCS 666 DIODE							Ξ.2	-
LEAD ANA	LYST:									
ASSESSME	NT:									
	CRITICAI FLIGH	ITY T	R	EDUNE	ANCY	SCR	EENS	_	CII ITE	m
	HDW/FU	NC	A	•	E	3	(2		
NASA IOA	[/ [3 /3]	[[]]·] []	[[]]	[[] *] .
COMPARE	[N /N]	[]	[]	٢]	[]
RECOMMEN	DATIONS:	(If	dif	ferer	nt fr	com N	ASA)			
	[/]	[]	[]	[]	[(ADD/D] DELETE)
* CIL RE	TENTION	RATION	ALE:	(If	appl	Licab	le) IN	ADEQUAT ADEQUAT	Ë (E ()]]
FORWARD CHANGE I	MANIFOLI) ISOLA	TION SEE	VAL	7E #9 SSMEN	5 RE- NT ID	ANAL s FR	YZED BY CS 1100	IOA 1 1X-110	DUE TO 079X.

-....

::

-

=

-

... :

	ASSESSM ASSESSM NASA FM	ENT ENT EA	D I #:	ATE: D:	FRCS	5-667				:	NASA BASE	DATA: LINE NEW	: [[]]	
667	SUBSYST MDAC ID	EM: :			FRCS	5									
	ITEM:				DIOI	ЭE									
	LEAD AN	ALY	ŚТ	:											
	ASSESSM	ENT	:												
		CR	IT.		JTY	F	REDUN	IDANCY	SCR	REENS			CIL	M	
			HD	W/FU	NC	F	ł	В	}	-	2	-	TIC	F1	
	NASA IOA	[[3	/ /3]]	[[]	[[]	[[]]		[[] *	r
	COMPARE	[N	/N]	ſ]	[]	ſ]		נ]	
	RECOMME	NDA	TI	ons:	(I	f dif	fere	ent fr	om N	ASA)					
		[-	/]	Γ]	Γ]	[]	(AD	[)D/D] ELET	'E)
	* CIL R	ete:	NT	ION	RATIC	NALE:	(If	appl	icab	le)	DEOU	ATE	r	٦	
	DEMADUC	•								INZ	DEQU	ATE	נ	j	
	FORWARD CHANGE	MA IN	NII CII	FOLD RCUI	ISOL	ATION SEE	I VAL ASSE	.VE #5 SSMEN	RE- T ID	ANALY S FRO	ZED S 11	BY IC 001X-	A D	UE T 79X.	'O

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA # :	1/29/88 FRCS-668 05-6KF-22	: [] [X]			
SUBSYSTEM: MDAC ID: ITEM:	FRCS 668 DRIVER, H	IYBRID			
LEAD ANALYST:	D. HARTMA	N.	-		
ASSESSMENT:					
CRITICAL FLIGH	ITY R T	EDUNDAN	CY SCREE	NS	CIL ITEM
HDW/FU	NC A	L	В	С	
NASA [2 /1R IOA [3 /3] [P]]) [F]]	[P] []	[X]* []
COMPARE [N /N	ן [א	r] [N]	[N]	[N]
RECOMMENDATIONS:	(If dif	ferent :	from NAS	A)	
[3 /2R] [P) [P]	[P] (A)	[D] DD/DELETE)
* CIL RETENTION	RATIONALE:	(If ap	plicable) ADEQUATE INADEQUATE	[]
REMARKS: NASA FMEA CONSID OPEN, LOSE CAPAB	ERS MULTIP ILITY TO M	LE FAIL	URES. H VALVE ST	OWEVER, IF ATUS WITH T	DRIVER FAI HE SWITCH

NASA FMEA CONSIDERS MULTIPLE FAILURES. HOWEVER, IF DRIVER FAILS OPEN, LOSE CAPABILITY TO MONITOR VALVE STATUS WITH THE SWITCH TALKBACK. MDM DISCRETES PROVIDE REDUNDANCY. LOSS OF THIS REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-669 05-6KF-2208	NASA DATA: BASELINE [] 08 -2 NEW [X]				
SUBSYSTEM: MDAC ID: ITEM:	FRCS 669 DRIVER, HYBR	ID				
LEAD ANALYST:	D. HARTMAN					
ASSESSMENT:						
CRITICAL FLIGH HDW/FU	ITY REDU T NC A	NDANCY SCREE	NS C	CIL ITEM		
NASA [3 /1R IOA [2 /1R] [P]] [P]	[P] [F]	[P] [P]	[] * [X]		
COMPARE [N /] []	[N]	[]	[N]		
RECOMMENDATIONS:	(If differ	ent from NAS	A)			
[2 /1R] [P]	[P]	[P] (Af	[A] D/DELETE)		
* CIL RETENTION	RATIONALE: (I	f applicable;) ADEQUATE INADEQUATE	[]		
REMARKS: LOSE CAPABILITY LOSS OF HARDWARE EXPEL PROPELLANT	TO OPEN ISOLA REDUNDANCY M S TO MEET CG	TION VALVE. AY CAUSE LOSS LIMITS.	THIS COUPLE 3 OF JETS RE	D WITH THE QUIRED TO		
ISSUE IS TIED TO CLOSED MANIFOLD	THE IOA HARD 1-4 ISOLATION	WARE CRITICAL	LITY FOR THE	FAILED		

-

_

=

REPORT DATE 2/26/88

•

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-670 05-6KF-2208 -	NASA BASE 1	DATA: LINE [] NEW [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 670 DRIVER, HYBRI	D	•
LEAD ANALYST:	D. HARTMAN		<u>.</u>
ASSESSMENT:			· · · _
CRITICAL	ITY REDUN	DANCY SCREENS	CIL ITEM
HDW/FU	NC A	ВС	
NASA [2 /1R IOA [3 /3] [P]] []	[F] [P] [] []	[X]* []
COMPARE [N /N] [N]	[и] [и]	[И]
RECOMMENDATIONS:	(If differe	nt from NASA)	
[3 /2R] [P]	[P] [P]	[D] (ADD/DELETE)
* CIL RETENTION	RATIONALE: (If	applicable)	
		ADEQUA INADEQUA	ATE [] ATE []
REMARKS: NASA FMEA CONSID OPEN, LOSE CAPAB TALKBACK. MDM D REDUNDANCY MAY L EFFECTING MISSIO	ERS MULTIPLE F ILITY TO MONIT ISCRETES PROVI EAD TO FALSELY N OPERATIONS.	AILURES. HOWEVER, OR VALVE STATUS WI DE REDUNDANCY. LOS FAILING THE VALVE	IF DRIVER FAILS TH THE SWITCH SS OF THIS CLOSED, POSSIBLY
AT MEETING WITH DISCUSSED. IT W DUE TO DIFFERENT ISSUE REMAINS OP	SUBSYSTEM MANA AS AGREED UPON INTERPRETATIO EN.	GER ON 1/20/88, NS THAT THE ISSUE RA NS OF NSTS 22206.	IS 22206 WAS ISED ABOVE WAS THEREFORE, THE

REPORT DATE 2/26/88

≣

=

_

E

ASSESSMEN ASSESSMEN NASA FMEA	T Di T II	ATE: D:	1/29/8 FRCS-6 05-6KH	38 571 5-22	08 -2	2				NZ H	ASA D Basei	ATA: JINE NEW	: [[X]]
SUBSYSTEM MDAC ID: ITEM:	[:		FRCS 671 DRIVEN	х, н	YBRII)								
LEAD ANAL	YST	:	D. HAI	RTMA	N									
ASSESSMEN	T:													
С	RIT	ICAL	ETY F NC	R	EDUNI	DANG	CY B	SCRE	ENS	3 C		,	CIL ITEN	1
	пр	W/ F UI		A			Б			C	· - ·			
NASA IOA	[3 [3	/1R /3]	[P [].	ן נ	Ρ]	[[P]]	···· ·	[[] *
COMPARE	[/N]	[N]	[N]	[N]		[]
RECOMMEND	DATI	ons:	(If	dif	ferer	nt 1	fro	om NA	SA)				
	[/]	[]	[]	[]	(AI	[וס/סכ] CLETE)
* CIL RET REMARKS:	ENT	ION I	RATION	LE:	(If	app	pl i	icabl	e) Il	AI NAI	DEQUA	ATE ATE	[[]
REMARKS: IOA AGREE	s W	ITH 1	NASA FI	IEA.					II	NAI	DEQUA	TE	Ĺ	j

. **-**

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-672 05-6KF-2	2 208 -1	NASA DATA: BASELINE [] -1 NEW [X]				
SUBSYSTEM: MDAC ID: ITEM:	FRCS 672 DRIVER,	HYBRID					
LEAD ANALYST:	D. HARTM	IAN			ан с. н.		
ASSESSMENT:							
CRITICAL	JTY T	REDUNDA	NCY SCRE	ENS	CIL ITEM		
HDW/FU	NC	Α	В	С			
NASA [2 /1R IOA [3 /3] [] [P]]	[F] []	[P] []	[X]* []		
COMPARE [N /N] [N]	[N]	[N]	[N]		
RECOMMENDATIONS:	(If di	fferent	from NA	SA)			
[3 /2R] [P]	[P]	[P] (A	[D] DD/DELETE)		
* CIL RETENTION	RATIONALE	2: (If a	pplicable	e) ADEQUATE INADEQUATE			
REMARKS: NASA FMEA CONSID OPEN, LOSE CAPAB TALKBACK. MDM D REDUNDANCY MAY L EFFECTING MISSIO	ERS MULTI ILITY TO ISCRETES EAD TO FA N OPERATI	IPLE FAI MONITOR PROVIDE ALSELY F IONS.	LURES. 1 VALVE S' REDUNDAI AILING TI	HOWEVER, IF TATUS WITH T NCY. LOSS O HE VALVE CLO	DRIVER FAILS HE SWITCH F THIS SED, POSSIBLY		

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	SSESSMENT DATE:1/29/88NASA DATSSESSMENT ID:FRCS-673BASELINASA FMEA #:05-6KF-2208 -2NI									
SUBSYSTEM: MDAC ID: ITEM:	FRCS 673 DRIVER,	HYBRID								
LEAD ANALYST:	D. HARTI	D. HARTMAN								
ASSESSMENT:										
CRITICAL	ENS	CIL								
HDW/FU	NC NC	A	В		TIEM					
NASA [3 /1R IOA [2 /1R] [P] P]	[P] [F]	[P] [P]	[] * [X]					
COMPARE [N /] []	[N]	[]]	[N]					
RECOMMENDATIONS:	(If di	lfferent	from NAS	SA)						
[2 /1R] [P] ·	[P]	[P] (AI	[A] DD/DELETE)					
* CIL RETENTION 1	RATIONALI	E: (If a	pplicable	adequate Inadequate	[] []					
REMARKS: LOSE CAPABILITY TO OPEN ISOLATION VALVE. THIS COUPLED WITH THE LOSS OF HARDWARE REDUNDANCY MAY CAUSE LOSS OF JETS REQUIRED TO EXPEL PROPELLANTS TO MEET CG LIMITS.										
ISSUE IS TIED TO CLOSED MANIFOLD	THE IOA L-4 ISOLZ	HARDWAR ATION VA	E CRITICA	LITY FOR THE	FAILED					

REPORT DATE 2/26/88

,

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-674 05-6KF-2208 -	NASA I BASEI 1	NASA DATA: BASELINE [] NEW [X]							
SUBSYSTEM: MDAC ID: ITEM:	FRCS 674 DRIVER, HYBRI	D								
LEAD ANALYST:	D. HARTMAN	. HARTMAN								
ASSESSMENT:										
CRITICAL FLIGH	ITY REDUN F	DANCY SCREENS	CIL ITEM							
11Dw/ 1 01										
NASA [2 /1R IOA [3 /3] [P]] []	[F] [P] [] []	[X] * []							
COMPARE [N /N] [N]	[N] [N]	[N]							
RECOMMENDATIONS:	(If differe	nt from NASA)								
[3/2R] [P]	[P] [P]	[D] (ADD/DELETE)							
* CIL RETENTION 1	RATIONALE: (If	applicable) ADEQUA	ATE []							
REMARKS: NASA FMEA CONSID OPEN, LOSE CAPAB TALKBACK. MDM D	ERS MULTIPLE F. ILITY TO MONIT ISCRETES PROVI	AILURES. HOWEVER, OR VALVE STATUS WIT DE REDUNDANCY. LOS	IF DRIVER FAILS TH THE SWITCH SS OF THIS							

TALKBACK. MDM DISCRETES PROVIDE REDUNDANCY. LOSS OF THIS REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

- -

_

-

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-675 05-6KF-22	208 -2	NASA DATA BASELINE NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 675 DRIVER, H	IYBRID		
LEAD ANALYST:	D. HARTMA	AN		
ASSESSMENT:				
CRITICAL FLIGH	ITY F	REDUNDANCY	SCREENS	CIL ITEM
HDW/FU	NC A	В	C	
NASA [3 /1R IOA [3 /3] [1]	P] [P]] [P]] []	[] * []
COMPARE [/N] [N	и] [1] [И]	[]
RECOMMENDATIONS:	(If dif	fferent fro	om NASA)	
[/	ן _{די ד} ו] [] [] _{(A}	[] DD/DELETE)
* CIL RETENTION	RATIONALE:	: (If appli	.cable) ADEQUATE INADEQUATE	
REMARKS: IOA AGREES WITH	NASA FMEA.			

•

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-67 05-6KF-		NASA DATA: BASELINE NEW	: [] [X]	
SUBSYSTEM: MDAC ID: ITEM:	FRCS 676 DRIVER,	HYBRID			
LEAD ANALYST:	D. HART	MAN			
ASSESSMENT:					
CRITICAL FLIGH	ITY T	REDUNDAN	CY SCREENS	1	CIL ITEM
HDW/FU	NC	Α	В	С	
NASA [2 /1R IOA [3 /3] [] [P] [] [F] [] [P]]	[X]* []
COMPARE [N /N] [и] [N] [N]	[N]
RECOMMENDATIONS:	(If d	ifferent	from NASA)		
[3 /2R] [P] [P] [P] (AI	[D] DD/DELETE)
* CIL RETENTION	RATIONAL	E: (If ap	plicable)	ADEQUATE	
REMARKS: NASA FMEA CONSID OPEN, LOSE CAPAB TALKBACK. MDM D REDUNDANCY MAY L EFFECTING MISSIO	ERS MULT ILITY TO ISCRETES EAD TO F N OPERAT	IPLE FAIL MONITOR PROVIDE ALSELY FA IONS.	URES. HOW VALVE STAT REDUNDANCY ILING THE	VEVER, IF I TUS WITH TH T. LOSS OF VALVE CLOS	DRIVER FAILS HE SWITCH F THIS SED, POSSIBLY

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

-

.

-

-

.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	ASSESSMENT DATE: 1/29/88 NASA DATA ASSESSMENT ID: FRCS-677 BASELINE NASA FMEA #: 05-6KF-2208 -2 NEW									
SUBSYSTEM: MDAC ID: ITEM:	FRCS 677 DRIVER,	HYBRID								
LEAD ANALYST:	D. HARTN	IAN								
ASSESSMENT:										
CRITICAL	[TY r	REDUNDA	NCY SCREE	INS	CIL ITEM					
HDW/FUI	4C	A	В	C						
NASA [3 /1R IOA [2 /1R] [] [P] P]	[P] [F]	[P] [P]	[] * [X]					
COMPARE [N /] []	[N]	[]	[N]					
RECOMMENDATIONS:	(If di	ifferent	from NAS	SA)						
[2 /1R] [P]	[P]	[P] (AI	[A] DD/DELETE)					
* CIL RETENTION H	RATIONALE	E: (If a	pplicable	e) ADEQUATE INADEOUATE	[]					
REMARKS: LOSE CAPABILITY TO OPEN ISOLATION VALVE. THIS COUPLED WITH THE LOSS OF HARDWARE REDUNDANCY MAY CAUSE LOSS OF JETS REQUIRED TO EXPEL PROPELLANTS TO MEET CG LIMITS.										
ISSUE IS TIED TO CLOSED MANIFOLD	ISSUE IS TIED TO THE IOA HARDWARE CRITICALITY FOR THE FAILED CLOSED MANIFOLD 1-4 ISOLATION VALVE.									

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-678 05-6KF-2208 -1	NASA DATA BASELINE NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 678 DRIVER, HYBRID		
LEAD ANALYST:	D. HARTMAN		
ASSESSMENT:			
CRITICAL FLIGH	ITY REDUNDANC	SCREENS	CIL ITEM
HDW/FUI	IC A	3 C	
NASA [2 /1R IOA [3 /3] [P] []] [] [F] [P]] []	[X]* []
COMPARE [N /N] [N] []	и] [И]	[N]
RECOMMENDATIONS:	(If different f	com NASA)	
[3 /2R] [P] []	P] [P] (A)	[D] DD/DELETE)
* CIL RETENTION 1	RATIONALE: (If app)	Licable) ADEQUATE INADEQUATE	[]
REMARKS: NASA FMEA CONSIDI OPEN, LOSE CAPAB TALKBACK. MDM DI REDUNDANCY MAY LI EFFECTING MISSION	ERS MULTIPLE FAILU ILITY TO MONITOR V ISCRETES PROVIDE R EAD TO FALSELY FAI N OPERATIONS.	RES. HOWEVER, IF A ALVE STATUS WITH TH EDUNDANCY. LOSS OF LING THE VALVE CLOS	DRIVER FAI HE SWITCH F THIS SED, POSSI

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

-

FRCS-679 05-6KF-22	88 NASA DATA 679 BASELINE F-2208 -2 NEW]	
FRCS 679 DRIVER, H	YBRID							
D. HARTMA). HARTMAN							
ITY R T	EDUNDA	NCY	SCREEI	NS		CIL ITEM		
NC A		В		С			-	
] [P]]]	[P []	[P []	[[] *	
] [N]	[N]	[N]	C]	
(If dif:	ferent	fro	om NASI	A)				
] []	[]	[] (Al] ELETE)	
RATIONALE: NASA FMEA.	(If a	ppli	.cable)) Al INAI	DEQUATE DEQUATE	[[]	
	FRCS-679 05-6KF-22 FRCS 679 DRIVER, H D. HARTMAN D. HARTMAN T NC A] [P] [N (If dif] [RATIONALE: NASA FMEA.	FRCS-679 05-6KF-2208 -2 FRCS 679 DRIVER, HYBRID D. HARTMAN D. HARTMAN LTY REDUNDA T NC A] [P]] [N] (If different] [] RATIONALE: (If a NASA FMEA.	FRCS-679 05-6KF-2208 -2 FRCS 679 DRIVER, HYBRID D. HARTMAN LTY REDUNDANCY T NC A B] [P] [P] [] [] [N] [N (If different from] [] [RATIONALE: (If appli NASA FMEA.	FRCS-679 05-6KF-2208 -2 FRCS 679 DRIVER, HYBRID D. HARTMAN LTY REDUNDANCY SCREEN T NC A B] [P] [P]] [P] [P]] [N] [N] (If different from NASA] [] [] [] RATIONALE: (If applicable)	FRCS-679 05-6KF-2208 -2 FRCS 679 DRIVER, HYBRID D. HARTMAN J. HARTMAN J. P.	FRCS-679 05-6KF-2208 -2 FRCS 679 DRIVER, HYBRID D. HARTMAN ITY REDUNDANCY SCREENS T NC A B C] [P] [P] [P]] [] [] [] []] [N] [N] [N] (If different from NASA)] [] [] [] [] (AI RATIONALE: (If applicable) ADEQUATE INADEQUATE NASA FMEA.	FRCS-679 BASELINE [05-6KF-2208 -2 NEW [X FRCS 679 DRIVER, HYBRID D. HARTMAN ITY REDUNDANCY SCREENS CIL T ITEN NC A B C] [P] [P] [P] [ITEN NC A B C []] [P] [P] [P] [] [N] [N] [N] []] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] []	

the second s

·____

,

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-680 05-6KF-2208 -1	NASA DATA BASELINE NEW	: [】] [】]							
SUBSYSTEM: MDAC ID: ITEM:	FRCS 680 DRIVER, HYBRID	FRCS 680 DRIVER, HYBRID								
LEAD ANALYST:	D. HARTMAN	. HARTMAN								
ASSESSMENT:			. .							
CRITICAL	ITY REDUNDANC	Y SCREENS	CIL ITEM							
HDW/FU	NC A	B C								
NASA [2 /1R · IOA [3 /3] [P] [] [] [F] [P]] []	[X]* []							
COMPARE [N /N] [N] [N] [N]	[N]							
RECOMMENDATIONS:	(If different f	rom NASA)								
[3 /2R] [P] [P] [P] (A	[D] DD/DELETE)							
* CIL RETENTION	RATIONALE: (If app	licable) ADEQUATE INADEQUATE	[]							
REMARKS: NASA FMEA CONSID OPEN, LOSE CAPAB TALKBACK, MDM D	ERS MULTIPLE FAILU ILITY TO MONITOR V ISCRETES PROVIDE R	RES. HOWEVER, IF ALVE STATUS WITH T EDUNDANCY. LOSS O	L J DRIVER FAILS HE SWITCH F THIS							

REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

1 2.....

1.....

1 =

-

ASSESSMENT DATE:1/29/88NASA DATASSESSMENT ID:FRCS-681BASELINNASA FMEA #:05-6KF-2208 -2NE							DATA LINE NEW	: [[]] K]										
SUBSYSTI MDAC ID: ITEM:	EM :			FRCS 681 DRIV	S /ER,	НУ	BRII	כ											
LEAD ANA	LY	ST	:	D. F	IARTI	IAN	T												
ASSESSME	ENT	:																	
	CR	IT: FI HDI	ICALI LIGHT W/FUN	ITY F IC		RF A	DUNI	DAN	сү в	s	CREI	ENS	S C			CII ITI	- EM		
NASA IOA	[[3 2	/1R /1R]	[[P P]	[[P F]	•	[נ	P P]		[]] (]	*	
COMPARE	[N	/]	[]	Γ	N]		[]		[]	i]		
RECOMMEN	IDA'	FI C	ONS:	(1	f di	lff	erer	nt :	fro	om	NAS	5A))						
	[2	/1R]	[P]	[P]		נ	Р]	(AI	<i>۲</i>] D/I	A] DEL	ETE	2)
* CIL RE	TEI	T	ION F	RATIC	NALE	5:	(If	apj	pl i	ica	able	≥) II	ÂÏ JAI	DĒQŪ <i>I</i> DEQU <i>I</i>	ATE ATE	[]		
REMARKS: LOSE CAP LOSS OF EXPEL PF	PAB HAI ROPI	IL RDV ELJ	ITY J VARE LANTS	TO OF REDU TO	EN I NDAN MEEI	SO ICY	LATI MAY G LI	ON CZ	VZ AUS	ALV SE	/E. LOS	r SS	CHI OF	S CC JEI	OUPLI S RI	ED V EQUI	IT RE	H T D T	'HE 'O
Alexandra a secondare	. E C	i i e e		i se de ser s	j ti					. <u></u> .					: <u>'</u>		i un é r	1. 1. ¹	į : .
ISSUE IS CLOSED M	IAN	IEI IFC	D TO DLD 1	THE -4 I	IOA SOLA	HA TI	RDWA ON V	RE	CF VE.	λ Γ Ι	ICA	LI	TY	FOF	R THE	E FA	IL	ED	

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	NASA DATA BASELINI NEW	A: E [] W [X]							
SUBSYSTEM: MDAC ID: ITEM:	FRCS 682 DRIVER,	HYBRID							
LEAD ANALYST:	LEAD ANALYST: D. HARTMAN								
ASSESSMENT:									
CRITICAL	ITY	REDUNDA	NCY SCRE	EENS	CIL				
HDW/FU	NC	A	В	С	1154				
NASA [2 /1R IOA [3 /3] [P]]	[F] []	[P] []	[X] * []				
COMPARE [N /N] [N]	[N]	[N]	[N]				
RECOMMENDATIONS:	(If di	ifferent	: from NA	SA)					
[3 /2R] [P]	[P]	[P] (2	[D] ADD/DELETE)				
* CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE []									
REMARKS: NASA FMEA CONSIDERS MULTIPLE FAILURES. HOWEVER, IF DRIVER FAILS OPEN, LOSE CAPABILITY TO MONITOR VALVE STATUS WITH THE SWITCH TALKBACK. MDM DISCRETES PROVIDE REDUNDANCY. LOSS OF THIS REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.									
		/ \/\\\\~~		0/00 Mart -					

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

_

=

ASSESSMEN ASSESSMEN NASA FMEN	NT DA NT II A #:	ATE: D:	1/29/3 FRCS-0 05-6K	88 683 F-2	3 220)8 -2					NA E	ASA DATA BASELINE NEW	: [[X]
SUBSYSTEM MDAC ID: ITEM:	1:		FRCS 683 DRIVE	R,	НУ	BRID)							
LEAD ANA	LYST	:	D. HAI	RTN	AN	I								
ASSESSMENT:														
CRITICALITY FLIGHT					RI	REDUNDANCY SCREENS				S		CIL ITEN	CIL ITEM	
	HD	W/FUI	٩C		A			В			С			
NASA IOA	[3 [3	/1R /3]]	[[P]]	[[P]	[[₽]	[[] *]
COMPARE	[/N]	ן י	N]	۵	N]	נ	N]	[]
RECOMMEN	DATI	ons:	(If	đ	iff	feren	it :	fro	om NA	SA)			
	ľ	/]	[]	[]	[] (A	[DD/DI] ELETE)
* CIL RE	TENT	ION I	RATION.	ALI	E:	(If	ap	pl:	icabl	e) I	AI NAI	DEQUATE DEQUATE	[[]]
IOA AGRE	LS W	T.L.H	NASA P	ri Li I	A. •									
ASSESSME ASSESSME NASA FME	NT DATE: NT ID: A #:	FRCS-0	584				. 1	NASA BASE	DATA: ELINE NEW	: [[]			
----------------------------------	-----------------------------	-----------------------	---------	-------	--------	--------	--------	--------------	-----------------------	-------------	-------------	-----		
SUBSYSTE MDAC ID: ITEM:	M:	FRCS 684 DRIVEI	R, H	YBRID)									
LEAD ANA	LYST:													
ASSESSME	NT:													
	CRITICAL FLIGH HDW/FU	ITY T NC	R) A	EDUNE	DANCY	SCREI	ENS	2		CII ITE	- SW			
NASA	[/]	Į	j	ŗ]	[ļ		[] '	*		
		J	l r	J	l r	1	l r	L L		l r	ر ۲			
COMPARE	[N/N	1	l	J	L	1	L]		L	1			
RECOMMEN	DATIONS:	(If	dif	feren	t fro	om NAS	SA)							
•	[/]	[]	[]	ַ]	(AI	[)D/[] DELE:	۲E۱		
* CIL RE	TENTION	RATION	ALE:	(If	appl:	icable	€) 	ADEQU	JATE	Ĺ]			
REMARKS:	W1 W7 707 7			***			LNA	NGED	DATE	ן א ד	ן י פוור			

FORWARD MANIFOLD ISOLATION VALVE #5 RE-ANALYZED BY IOA DUE TO CHANGE IN CIRCUITRY. SEE ASSESSMENT IDs FRCS 11001X-11079X.

REPORT DATE 2/26/88

ī

=

-

. :

. .

ASSESSME ASSESSME NASA FME	INT INT IA	D/ I) #:	ATE: D:	FRCS-6	58!	5							N	ASA BASE	DATA LINE NEW	: [[]]	
SUBSYSTE MDAC ID: ITEM:	: М			FRCS 685 DRIVEF	٤,	HZ	BRID)						 				
LEAD ANA	LY	ST	:															
ASSESSME	NT	:																
	CR:	IT: F: HDI	ICALI LIGH W/FUI	ITY F NC		RI A	EDUND	A	NC	Y B	SCRE	EN	s c			CIL	M	
NASA IOA	[[3	/ /2R]	[[P]]	-	[[P]	[[P]]		[[]]	*
COMPARE	[N	/N]	[N]		[N]	[N]		[]	
RECOMMEN	IDA!	FI (ONS:	(If	d:	iff	feren	t	f	rc	om NA	SA)					
	[/]	ן]		[]	[]	(AI	[DD/D] ELE	TE)
* CIL RE	TE	NT:	ION I	RATIONA	ι.	E:	(If	aj	qq	li	.cabl	e) I	A NA	DEQU DEQU	ATE ATE	ן ב]	
REMARKS: FORWARD CHANGE I	MAI N (FOLD	ISOLAT TRY. S	IC El	ОN Е Я	VALV	E SI	# ME	5 NT	RE-A	NA F	LY RC	ZED S 11	BY IC 001X-	DA DI -110	UE 79X	то

REPORT DATE 2/26/88

. -

ASSESSME ASSESSME NASA FME	ENT ENT EA	D2 II #:	ATE: D:	FF	RCS−€	580	5						N2 H	ASA BASE	DATA: LINE NEW	: [[]]	
SUBSYSTE MDAC ID: ITEM:	EM :			FF 68 DF	RCS 86 RIVEF	٤,	H	YBRII)									
LEAD ANZ	LYS	ST:	:															
ASSESSMI	ENT	:												-				
	CR:	IT: Fl HDI	ICALI LIGHI W/FUI	ETY F NC	<u>r</u>		RI A	EDUNI	OAN	CY B	SCRE	ENS	с			CII ITI	L EM	
NASA IOA	[[3	/ /2R]]		[[P]]	[[P]]	[[P]		[[] *]	
COMPARE	[N	/N]		[N]	נ	N]	[N]		[]	
RECOMMEN	NDA!	FI (ONS:		(If	đ	if:	ferer	nt :	fro	om NA	SA)	I					
	[/]		[]	[]	<u></u> []	(Al] כעכ] DELETE)
* CIL RI	ETEI	NT.	ION	RAT	TION	۲T	Е:	(If	apj	p1:	icabl	.e) Ił	A IA	DEQU DEQU	ATE ATE	222 C [[]	
REMARKS	:			<u>.</u>						п 🛏					NI T	~ 1		

FORWARD MANIFOLD ISOLATION VALVE #5 RE-ANALYZED BY IOA DUE TO CHANGE IN CIRCUITRY. SEE ASSESSMENT IDs FRCS 11001X-11079X.

REPORT DATE 2/26/88

:

-

: :

: •

: E

ASSESSME ASSESSME NASA FME	NT NT A	D. I: #:	ATE: D:	FRCS-	687				1	NASA D BASEI	ATA: INE NEW	: [[]]	
SUBSYSTE MDAC ID: ITEM:	M:			FRCS 687 DRIVE	R, F	IYBRI	D							
LEAD ANA	LY	ST	:											
ASSESSME	NT	:												
	CR	IT:	ICAL	ITY	F	REDUNI	DANCY	SCRE	ENS			CIL	M	
	1	HD	W/FU	NC	A	1	E	3	(С		LIL	M	
NASA IOA	[[3	/ /3]	[[]	[[]]	[[]		[[];	*
COMPARE	[N	/N]	[]	[]	[]		[]	
RECOMMEN	'DA'	r I(SNS:	(If	dif	fere	nt fr	om NA	SA)					
	נ		/]	[]	[]	[]	(AI	[0D/D] ELE:	ΓE)
* CIL RE	TEI	NT:	ION	RATION	ALE:	(If	appl	icabl.	e) INZ	ADEQUA ADEQUA	TE TE	[]	·
FORWARD CHANGE I	MAI N (FOLD	ISOLAT	CION SEE	VALV	7E #5 SSMEN	RE-A	NALY FRO	ZED B	Y IC 01X-	A DI	JE 1 79X.	ГО . •

.

- ----

•

i i

= :

ASSESSME ASSESSME NASA FME	NT DATE: NT ID: A #:	FRCS-68	8				ľ	VASA BASE	DATA: LINE NEW	: [[]]
SUBSYSTE MDAC ID: ITEM:	M:	FRCS 688 DRIVER,	H	YBRID							
LEAD ANA	LYST:										
ASSESSME	NT:										
	CRITICAL FLIGH	ITY T	R	EDUND.	ANCY	SCRE	ENS			CIL ITE	м
	HDW/FU	NC	A		В		C	2			
NASA IOA	[/ [3 /2R] [] [Р]]	[[P]]	[]	5] [[[] *]
COMPARE	[N /N] [N]	[N]	[]	4]		[]
RECOMMEN	DATIONS:	(If d	lif:	feren	t fr	om NA	SA)				
	[/] [1]	[]	[]	. (AI	[DD/D] ELETE)
* CIL RE	TENTION	RATIONAL	E:	(If	appl	icabl	e)	ADEQU	ATE	[]
REMARKS: FORWARD CHANGE I	MANIFOLD N CIRCUI	ISOLATI TRY. SE	ON E	VALV	E #5 SMEN	RE-A T IDs	NALY FRO	ZED S 11	BY IC 001X-	L DA D -110	UE TO 79X.

Ξ

Ē

-

ASSESSME ASSESSME NASA FME	ENT ENT EA	D. I: #:	ATE: D:	FRO	CS-689	9				NASA BASI	DATA ELINE NEW	: ; [; []]	
SUBSYSTE MDAC ID: ITEM:	EM:			FRO 689 DRI	CS Ə IVER,	HYBR	ID							
LEAD ANA	LY	SŤ	:											
ASSESSME	INT	:												
	CR	IT:	ICAL	ITY		REDU	NDANG	CY SCI	REENS			CII	L F M	
		HD	W/FU	NC	-	A		В	I	с		¥ 1 1	21.7	
NASA IOA	[[3	/ /3]	[[]	[[]]	[[]]		[[] *]	
COMPARE	[N	/N]	[]	٢]	[]		[]	
RECOMMEN	IDA	TI	ONS:	((If di	lffer	ent f	from 1	NASA)					
	[/]	C]	[]	[]	(A	[.DD/I] DELET	E)
* CIL RE	TE	NT	ION	RATI	CONALE	S: (I	f app	lical	ble)	2 DEOI	13 (11)	·		
551/157/2			-				Ŧ		IN	ADEQU	JATE	Ľ]	
FORWARD	MA		FOLD	IS(LATIC	ON VA	LVE #	5 RE-	-ANAL	YZED	BY I	OA I	UE T	0
Curanen 1	.14	<u>ч</u> .		TUT	גרבי א	1 400	נווינטטענ			<u> </u>	LOOTV	المعاصف	////**	

REPORT DATE 2/26/88

ASSESSMI ASSESSMI NASA FMI	ENT I ENT J EA #:	DATE:	FRO	CS-690)			. 1	NASA BASE	DATA: LINE NEW	[]]	
SUBSYSTE MDAC ID: ITEM:	E M :		FRC 690 DRJ	CS) IVER,	HYBRI	D							
LEAD ANA	LYSI	::											
ASSESSME	ent:												
	CRIT	ICAI	LITY IT		REDUN	IDANCY	SCRI	EENS			CI IT	L EM	
	HI	W/FU	INC		Α	В		(C				
NASA IOA	[3	/ /3]]	[[]]	[[]]	[[]]		[[]]	*
COMPARE	[]	1 /N]	[]	[]	[]		[]	
RECOMMEN	1DAT]	ons:		If di	lffere	ent fro	om N2	ASA)					
	[1]	נ]	[]	[]	(AI	[/00/] DELE	ETE)
* CIL RE	ETENI	'ION	RATI	ONALI	E: (If	appl:	icabl	Le) INZ	ADEQU ADEQU	ATE ATE	[]]	
REMARKS:		TPOT T	TO		NT 177 T	770 #5			7 7 70	שע דעם	או	שוזת	mο

FORWARD MANIFOLD ISOLATION VALVE #5 RE-ANALYZED BY IOA DUE TO CHANGE IN CIRCUITRY. SEE ASSESSMENT IDs FRCS 11001X-11079X.

REPORT DATE 2/26/88

.

Ē.

Ī

ASSESSME ASSESSME NASA FME	ENT ENT EA	D/ I) #:	ATE: D:	FRCS-6	591					NASA BASE	DATA: LINE NEW	: [[]]	
SUBSYSTE MDAC ID: ITEM:	EM:			FRCS 691 DRIVER	२, н	YBRID								
LEAD ANA	LY	ST	:											
ASSESSME	INT	:												
	CR	IT F	ICAL LIGH	ITY F	R	EDUND	ANCY	SCRE	ENS	5		CIL ITE	м	
]	HDI	V/FU	NC	A		В			C		·		
NASA IOA	[[3	/ /3]	[[]]	[[]	[[]		[[] *]	
COMPARE	נ	N	/N]	[]	[]	נ]		[]	
RECOMMEN	IDA'	TI (ons:	(If	dif	feren	t fr	om NA	SA)					
	۵		1]	נ]	٢]	[]	(AI	[נס/סכ] ELET	E)
* CIL RE	TE	NT:	ION	RATION	ALE:	(If	appl	icabl	e) IN	ADEQUI IADEQUI	ATE ATE	יי בי [[]	
FORWARD CHANGE I	MAI N	NII CII	FOLD	ISOLAT	TION SEE	VALV ASSES	E #5 SMEN	RE-AL T IDs	NAL FR	YZED I CS 110	BY IC 001X-	DA DU -1101	JE T 79X.	0

ASSESSME ASSESSME NASA FME	ENT ENT EA #	DATE: ID: :	FRC	5-692				Ņ	IASA DI BASELI	ATA: INE NEW	: [[]]
SUBSYSTE MDAC ID: ITEM:	EM:		FRCS 692 DRIV	S /ER, H	YBRI	D						
LEAD ANA	LYS	г:										
ASSESSME	INT:											
	CRI	TICAL FLIGH	LITY IT	R	EDUN	DANCY	SCR	EENS			CI IT	L EM
	H	DW/FU	NC	A		В		C	2			
NASA IOA	[[:	/ 3 /3]	[[]	[[]]	[[]]		[[] *
COMPARE	[]	N /N]	[]	[]	[]		[]
RECOMMEN	IDAT:	IONS:	(3	f dif	fere	ent fro	om N	ASA)				
	[1.]	[]	[]	ſ]	(AI	[/00/] DELETE
* CIL RE	TEN	TION	RATIO	ONALE:	(If	appl:	lcab	le) A INA	DEQUA'	re re	[]]
REMARKS: FORWARD CHANGE I	MAN N C	IFOLD IRCUI	ISOI	LATION SEE	VAL ASSE	NE #5	RE- r id	ANALY s FRO	ZED B S 110	Y_IC 01X-)A -11	DUE TO 079X.

REPORT DATE 2/26/88

=

i

ASSESSMI ASSESSMI NASA FMI	ENT ENT EA	D2 I1 #:	ATE: D:	FRCS-6	593				1	NASA I BASEI	DATA: LINE NEW	[[]
SUBSYSTI MDAC ID ITEM:	EM: :			FRCS 693 DRIVEF	х, ну	BRID							
LEAD ANA	ALY	ST	:										
ASSESSMI	ENT	:											
	CR	IT	ICAL	LTY	RI	EDUND	ANCY	SCREI	ens			CIL	
	1	F1 HDV	V/FUI	1C	A		В		C	C		TLEN	1
NASA IOA	[[2	/ /2]	[[]] []]	[[]		[[x] *]
COMPARE	[N	/N]	[]	[]	[]		[N]
RECOMMEN	NDA'	FI C	ons:	(If	diff	ferent	t fr	om NAS	SA)				
	[1 .]	[]	[]	[]	(AC	[D/DE] ELETE)
* CIL RI	ete:	NTI	ION I	RATIONA	LE:	(If a	appl	icable	≥) / IN/	ADEQU <i>I</i> ADEQU <i>I</i>	ATE ATE	ľ ľ]
REMARKS FORWARD CHANGE	: MAI IN (NII CII	FOLD	ISOLAT	TION SEE A	VALVI	E #5 SMEN'	RE-AN T IDs	NALY FRO	YZED H CS 110	3Y IO)01X-	A DU	JE TO 9X.

REPORT DATE 2/26/88

ASSESSM ASSESSM NASA FM	ENT ENT EA	D2 II #:	ATE: D:	FRCS	-694				ł	IASA BASE	DATA: LINE NEW	[]]	
SUBSYST MDAC IE ITEM:	'EM:):			FRCS 694 DRIVI	ER, H	IYBRI	D							
LEAD AN	ALY	ST	:											
ASSESSM	ENT	:												
	CR	IT: Fl	ICAL LIGH	ITY F	F	REDUN	DANCY	SCREE	ENS			CIL ITE	м	
]	HDV	V/FUI	NC	A	L	В		C	2				
NASA IOA		3.	/ /3]	[[]]	[[]]	ני ני]]		[[]	*
COMPARE	[N	/N]	[]	ſ]	[]		[]	
RECOMME	'NDA'	TI	ons:	(I	f dif	fere	nt fro	om NAS	SA)					
	[/]	[]	[]	[]	(AI	[)D/D] ELE	ETE)
* CIL F	ETE	NT	ION	RATIO	NALE:	(If	appli	icable	≥) 7 IN7	ADEQU ADEQU	ATE ATE	[[]]	
REMARKS	MTA 1			TCOT		T 177 T	VTF #5	DF-XX	17 T.S	מעדה	BV TO	ת גו	11F	ΨO

FORWARD MANIFOLD ISOLATION VALVE #5 RE-ANALYZED BY IOA DUE TO CHANGE IN CIRCUITRY. SEE ASSESSMENT IDs FRCS 11001X-11079X.

.

REPORT DATE 2/26/88

.

.

Ξ....

--

-

ASSESSME ASSESSME NASA FME	NT NT A	D) I) #:	ATE: D:	FRCS-6	595				ł	NASA D BASEL	ATA: INE NEW	[]
SUBSYSTE MDAC ID: ITEM:	:M:			FRCS 695 DRIVER	х, н	YBRID							
LEAD ANA	LY	ST	:										,
ASSESSME	NT	:											
	CR	IT:	ICAL	ITY	R	EDUNDA	NCY	SCRE	ENS			CIL	,
	1	HD	W/FUI	NC	A		В		Ċ	2		LTEP	1
NASA IOA	[[3	/ ·/3]	[[]]	[[]	[[]		[[] *]
COMPARE	[N	/N]	[]	[]	[]		[]
RECOMMEN	DA!	rI¢	ons:	(If	dif	ferent	: fro	om NAS	SA)				
	[1]	[]	[]	[]	(AD	[DD/DI] Elete)
* CIL RE	TEI	NT:	ION 1	RATION	ALE:	(If a	ppli	lcable	≥) A INA	ADEQUA ADEQUA	TE TE	[[]]
FORWARD CHANGE I	MAI N (FOLD RCUI	ISOLAT	TION SEE A	VALVE	E #5 Sment	RE-AN I IDs	NALY FRC	ZED B S 110	Y IO 01X-	A DU	JE TO 9X.

REPORT DATE 2/26/88

.

C-654

.

E

.

ASSESSME ASSESSME NASA FME	ENT ENT EA	D2 I1 #:	ATE: D:	1/ FF 05	29/8 CS-6 5-6KI	38 59(?-:	6 20(05 -	-1				N2 J	ASA BASI	DAT ELIN NH	FA : IE EW	[[x]]	
SUBSYSTE MDAC ID: ITEM:	EM :			FF 69 FU	RCS 96 JSE, 1	LA								-						
LEAD ANA	LYS	ST	:	D.	HAI	۲T	MAI	N												
ASSESSME	ENT	:																		
	CR	IT: F]	ICAL LIGH	ITY F			RI	EDUN	IDAN	ICY	SCF	EEN	5				CI IT	L EM	ſ	
	1	HDI	V/FU	NC			A			В			С							
NASA IOA	[[3 3	/1R /1R]]		[[P P]]	((P P]]	[[P P]			[[]]	*
COMPARE	[/]		[]	[•]	[]			[]	
RECOMMEN	IDA'	FI (ons:		(If	d:	if	fere	ent	fr	om N	IASA)							
	[/]		[]	[]	[]	((AI] D/D/	DE] :LE	TE)
* CIL RE	TEI	NT:	ION	RAI	'ION	ΥĽ	E:	(If	ar	pl	icab	le) I	IA IAV	DEQU	JATE JATE	2	, [[]]	-
REMARKS: NO DIFFE	EREI	NCI	ES.														-		-	

REPORT DATE 2/26/88

.

=

Ī

- 24

ASSESSMEN ASSESSMEN NASA FMEA	ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-697 IASA FMEA #: 05-6KF-2005 -1 SUBSYSTEM: FRCS IDAC ID: 697										NASA BASE	DATA LINE NEW	: [[X]]
SUBSYSTEM MDAC ID: ITEM:	:		FRCS 697 FUSE,	1A										
LEAD ANALY	YST:		D. HA	RTN	IAN	Ŧ								
ASSESSMEN	r:					-								
CRITICALITY REDUNDANCY SCREENS												CIL ITEN	4	
	HDW	/FUN	IC		A			В			С			
NASA IOA	[3 [3	/1R /1R]	[[P P]	[[P P]	[[P] P]		[[] *]
COMPARE	[/]	[]	נ]	[]		[]
RECOMMENDA	ATIC	ONS:	(If	di	ff	ferent	t :	fro	om NAS	SA))			
	[1]	נ]	[]	[]	(AI	[DD/DE] ELETE)
* CIL RET REMARKS: NO DIFFER	enti Ence	ION F	RATION	ALE	5:	(If a	ap	pli	icablo	e) IN	ADEQU NADEQU	IATE IATE	[[]]

ASSESSMENT ASSESSMENT NASA FMEA #	SSMENT DATE: 1/29/88 NASA DA SSMENT ID: FRCS-698 BASELI FMEA #: 05-6KF-2005 -1 N									DATA LINE NEW	: [[]] x]		
SUBSYSTEM: MDAC ID: ITEM:		FRCS 698 FUSE,1	LA											
LEAD ANALYS	т:	D. HAI	RTM	AN										
ASSESSMENT:														
CRI	TICAL	ITY]	REDU	NDANC	Y	SCRE	ENS	5			CI	L	
F	FLIGH DW/FU	r NC	1	A		в			с				EM	
NASA [IOA [3 /1R 3 /1R]]	[]	P] P]	[[P P]] [P P]		[[]	*
COMPARE [/]	[]	[]	[]		[]	
RECOMMENDAT	IONS:	(If	di	ffer	ent f	rc	om NA	SA))					
C	/]	[]	C		J	[]	(A]]/DD] DELE	TE)
* CIL RETEN	TION I	RATION	LE	: (I	f app	11	cabl	e) Il	AE JAE)EQU))EQU)	ATE ATE	[[]]	

REPORT DATE 2/26/88

-

-

l

.

_

-

s

=

-

·. ·

ASSESSME ASSESSME NASA FME	NT I NT J A #:	DATE: [D: ;	1/29/ FRCS- 05-6K	88 699 F-2	9 20()5 - 3	NASA DATA: BASELINE [] -1 NEW [X]									
SUBSYSTE MDAC ID: ITEM:	М:		FRCS 699 FUSE,	1A												
LEAD ANA	LYSI	[:	D. HAI	RTN	1A1	1										
ASSESSME	NT:															
I	CRII	TCAL	RI	EDUNI	AC	ICY	SCRE	EN	5			CI	L			
	HI	W/FU	NC		A			в			с			T.T.	ЕM	
NASA IOA	[3	3 /1R 3 /1R]	[[P P]	[P P]]	[P P]]		[[]]	*
COMPARE	[/]	[]	[]	[]		[]	
RECOMMEN	DATI	CONS:	(If	đi	lff	ferer	nt	fro	om NA	SA)					
	[. /]	[]	[•]	[]	(Al] DD/1] DELI	ETE)
* CIL RE	TENT	CION	RATION	ALE	2:	(If	aŗ	pl:	icabl	e) Il	AI NAI	DEQUA DEQUA	ATE ATE	[[]	
NO DILLE	VEN(- Cill -														

ASSESSME ASSESSME NASA FME	NT NT A	D2 I1 #:	ATE: D:	FRC	S-700				r	IASA BASE	DATA: LINE NEW	: [[]]	
SUBSYSTE MDAC ID: ITEM:	M:			FRC 700 FUS	S E,1A									
LEAD ANA	LY	ST	:											
ASSESSME	NT	:												
	CR	IT: F	ICAI LIGH	ITY T	R	EDUN	IDANCY	SCF	REENS	_		CI IT	L EM	
		HDI	W/FU	NC	A		В		C	2				
NASA IOA	[[3	/ /3]]	[[]]	[[]]	[[]]		[[]	*
COMPARE	נ	N	/N]	[]	[]	E]	-	[]	
RECOMMEN	'DA'	TI (ONS:	(If dif	fere	ent fro	om N	IASA)					
	[1.]	[]	[]	[]	(AI] /00/] DELE	ETE)
* CIL RE	TE	NT	ION	RATI	ONALE:	(If	appl:	icat	ole) / IN/	ADEQU ADEQU	JATE JATE	[]]	
REMARKS: FORWARD CHANGE I	MA) N (FOLE RCUI) ISO TRY.	LATION SEE 2	VAI ASSE	LVE #5	RE- F II	ANALY	ZED S 11	BY IC	DA -11	DUE 0793	то (.

REPORT DATE 2/26/88

÷

-

ASSESSM ASSESSM NASA FM	ENT ENT EA	D/ I) #:	ATE: D:	FRCS	-7	01	L							N	IASA BASI	DAT ELIN NE	A: E W	[[]]	
SUBSYST MDAC ID ITEM:	EM: :			FRCS 701 FUSE	,1	А														a · .
LEAD AN	ALY	ST	:																	
ASSESSM	ENT	:																		
	CR	IT: F: HDI	ICALI LIGHT W/FUN	CTY C IC			RE A	DUN	DAI	NC	ey B	SCI	REEN	s c	2			CIL ITEI	M	
NACA	г		,	٦		r		٦		г		٦	r		٦			г	٦	*
IOA	ľ	3	/2R]		[P]		נ [Ρ]	[P	,]			[]	
COMPARE	[N	/N]		[N]		[N]	[N	[]			[]	
RECOMME	NDA	TI	ONS:	(I	f	dj	ff	ere	nt	f	irc	om l	NASA)						
	[/]		[]		[]	[]	(,	AD	[וס/סו] ELF	TE)
* CIL R	ETE	NT	ION P	RATIO	NA	LF	:	(If	aj	qq	11	.cał	ble) I	A NA	DEQU	JATE JATE		[[]	
REMARKS	: MA	NTI	FOT D	TSOT	אידי	тс	N	<u>т</u>	য়া	.: #	5	ਸੂਰ	-212	T.V	750	BV	ТО	זרו גו	ना	тО
CHANGE	IN	CI	RCUIT	CRY.	S	Ē	E A	SSE	SSI	π ME	NT	'II	Ds F	RC	S 11	1001	x-	1107	79X	τ.

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	NT DATE: NT ID: A #:	1/29/88 FRCS-70 05-6KF-	3)2 -2128A-1		NASA DA BASELI N	TA: NE [] EW [X]
SUBSYSTE MDAC ID: ITEM:	: M :	FRCS 702 RELAY				
LEAD ANA	LYST:	D. HARI	MAN			
ASSESSME	INT:					
	CRITICAL FLIGH HDW/FU	ITY T NC	REDUND. A	ANCY SCRI B	EENS	CIL ITEM
NASA IOA	[3 /1R [2 /1R] [P] P]	[P] [P]	[P] [P]	[] * [X]
COMPARE	[N /] []	[]	[]	[N]
RECOMMEN	DATIONS:	(If d	lifferen P]	t from NZ	ASA) [P]	[A] (ADD/DELETE
* CIL RE	TENTION	RATIONAI	LE: (If	applicabi	le) ADEQUAT INADEQUAT	E [] E []
LOSE CAP LOSS OF PROPELLA	PABILITY HARDWARE NTS TO M	TO OPEN REDUNDA EET CG I	ISOLATI NCY MAY LIMITS.	ON VALVE CAUSE II	. THIS, CONNABILITY TO	UPLED WITH S EXPEL
ISSUE IS CLOSED M	TIED TO ANIFOLD	THE IOA 1-4 ISOI	A HARDWA LATION V	RE CRITIO	CALITY FOR	THE FAILED

-

-

-

;

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-70 05-6KF-	3 2128A-2		NASA DATA BASELINE NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 703 RELAY				
LEAD ANALYST:	D. HART	MAN			
ASSESSMENT:					
CRITICAL	JTY T	REDUNDANC	CY SCREEN	S	CIL ITEM
HDW/FU	NC	A	В	С	
NASA [2 /1F IOA [3 /3	·] [P][][F][][P]]	[X]* []
COMPARE [N /N] [N] [N] [М]	[N]
RECOMMENDATIONS:	(If d	ifferent f	from NASA)	
[3 /1F	[]	P] [F] [P] (AI	[A] DD/DELETE)
* CIL RETENTION	RATIONAL	E: (If app	olicable) II	ADEQUATE NADEQUATE	[]
REMARKS: NASA FMEA CONSID HIGH CREATES INA THE LOSS OF ALL THRUSTER LEAK.	ERS MULT BILITY T HARDWARE	IPLE FAILU O CLOSE TH REDUNDANC	JRES. HOW HE VALVE. CY PREVENT	WEVER, RELA THIS, COU IS ISOLATIO	AY FAILING JPLED WITH DN OF A
AT MEETING WITH DISCUSSED. IT W DUE TO DIFFERENT ISSUE REMAINS OF	SUBSYSTE AS AGREE INTERPR EN.	M MANAGER D UPON THA ETATIONS C	ON 1/20/8 AT THE ISS OF NSTS 22	38, NSTS 22 SUE RAISED 2206. THEF	206 WAS ABOVE WAS REFORE, THE

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	NT NT A #	DATI ID: :	E: 1 F 0	1/29/88 FRCS-704 05-6KF-2128 -1								N2]	ASA DA' BASELII N	TA: NE EW	[[1 x]	
SUBSYSTE	М:		F	'R(CS												
MDAC ID:			7	04	1												
TIEW:			R	(C) 1	АТ												
LEAD ANA	LYS	т:	D).	HART	MA	N										
ASSESSME	NT:																
	CRI	TIC	ALIT	Y		R	ED	JNDANC	Y	SCRE	EENS	5			cı	L	
	Н	FLIC DW/1	GHT FUNC			A			в			с			IT	EM	
NASA	[3 /:	1R]		[Р]	[NA]	[P]		[]	*
IOA	Ĩ	3 /:	3 j		ĺ		j	ſ]	[]		[]	
COMPARE	נ	/1	N]		[N]	[N]	[N]	2	[]	
RECOMMEN	DAT	IONS	5:	ł	(If d	if	fei	rent f	ro	m NA	SA)					
	[/]		[]	·[]	[]	(AD	[D/] DEI	LETE
* CIL RE	TEN	TIO	N RA	T	IONAL	Е:	(:	If app	li	cabl	.e)	Al	DEQUAT	E	[]	

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	SESSMENT DATE: 1/29/88 NASA DATA SESSMENT ID: FRCS-705 BASELINE ASA FMEA #: 05-6KF-2128 -2 NEW								
SUBSYSTEM: MDAC ID: ITEM:	FRCS 705 RELAY								
LEAD ANALYST:	D. HARTMA	NN							
ASSESSMENT:				• • ••••••					
CRITICAL	JITY F	REDUNDANCY	SCREENS	CIL					
HDW/FU	INC A	В	C en a	LTEM					
NASA [2 /1F IOA [2 /1F	2] [F) [F] [P] [P]] [P]	[X] * [X]					
COMPARE [/] [] [N] []	[]					
RECOMMENDATIONS:	(If dif	ferent fro	m NASA)						
[2 /1F	2] [F) [P] [P] ([A] ADD/DELETE)					
* CIL RETENTION	RATIONALE:	(If appli	cable) ADEQUATE INADEQUATE						
REMARKS:		TE FATLIRE	S LOSE CAPABI	LITY TO OPEN					
THE VALVE. THIS REDUNDANCY MAY C TO MEET CG LIMIT	AUSE LOSS	WITH THE L OF JETS RE	OSS OF ALL HARD QUIRED TO EXPEL	WARE PROPELLANTS					
AT MEETING WITH	SUBSYSTEM	MANAGER ON	1/20/88, NSTS THE ISSUE BAISE	22206 WAS D ABOVE WAS					

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DSCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-706 05-6KF-2128A-1	NASA DATA BASELINE NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 706 RELAY		
LEAD ANALYST:	D. HARTMAN		
ASSESSMENT:			
CRITICAL FLIGH	ITY REDUNDAN	ICY SCREENS	CIL ITEM
HDW/FU	NC A	BC	
NASA [3 /1R IOA [2 /1R] [P] [] [P] [P] [P] P] [P]	[] * [X]
COMPARE [N/] [] [[]][]	[N]
RECOMMENDATIONS:	(If different	from NASA)	
[2 /1R] [P] [[P] [P] (A	[A] DD/DELETE)
* CIL RETENTION H	RATIONALE: (If ag	oplicable) ADEQUATE INADEQUATE	[]
REMARKS: LOSE CAPABILITY 7 LOSS OF HARDWARE PROPELLANTS TO MI	TO OPEN ISOLATION REDUNDANCY MAY C EET CG LIMITS.	VALVE. THIS, COUP CAUSE INABILITY TO E	LED WITH THE XPEL

ISSUE IS TIED TO THE IOA HARDWARE CRITICALITY FOR THE FAILED CLOSED MANIFOLD 1-4 ISOLATION VALVE.

REPORT DATE 2/26/88 C-665

-

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-707 05-6KF-2	7 2128A-2		NASA DATA BASELINE NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 707 RELAY				
LEAD ANALYST:	D. HARTM	IAN			
ASSESSMENT:					
CRITICAL	ITY	REDUNDA	NCY SCREI	ens	CIL ITEM
HDW/FU	NC	Α	В	С	
NASA [2 /1R IOA [3 /3] [] [P]]	[F] []	[P] []	[X]* []
COMPARE [N /N] [N]	[N]	[и]	[N]
RECOMMENDATIONS:	(If di	fferent	from NAS	SA)	
[3 /1R] [Ϋ́Ρ]	[F]	[P] (A	[A] DD/DELETE)
* CIL RETENTION	RATIONALE	S: (If a	pplicable	e) ADEQUATE INADEQUATE	[]
REMARKS: NASA FMEA CONSID HIGH CREATES INA THE LOSS OF ALL I THRUSTER LEAK.	ERS MULTI BILITY TC HARDWARE	PLE FAI CLOSE REDUNDA	LURES. I THE VALVI NCY PREVI	HOWEVER, REL E. THIS, CO ENTS ISOLATI	AY FAILING UPLED WITH ON OF A
AT MEETING WITH	SUBSYSTEM	MANAGE	R ON 1/20)/88, NSTS 2	2206 WAS

DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

AS AS NA	ASSESSMENT DATE ASSESSMENT ID: NASA FMEA #:						: 1/29/88 NASA DATA: FRCS-708 BASELINE 05-6KF-2128 -1 NEW										[[x]]			
SU MD IT	BSY: AC 'EM:	STEN ID:	1:			FRO 708 REI	CS 3 LAY															
LE	AD 2	ANAI	LYS	ST:	;	D.	HAF	(TS	IAN	T												
AS	SES	SMEN	IT:	:																		
		C	R	T] FI	CAL LIGH	ITY F			RE	DUN	DAN	СҮ	SCREE	ENS	5				С] Г]	IL YEM	ſ	
			F	IDV	V/FUI	NC			Α			В			С							
	NA: I	SA OA	[[3 3	/1R /3]		[[P]]	[[NA]	[[Ρ]]			[[]	*
со	MPA	RE	[/N]		۵	N]	[N]	Γ	N]			[]	
RE	COM	MENI	DAT	ric	ons:	I	(If	d	iff	ere	nt	fro	om NAS	SA))							
			ן		/]		[]	[]	[]		(AE	[)D/	'DE] ELE	TE)
* RE	CIL	RET	rei	4TJ	ION I	RATI	IONF	L	Ξ:	(If	ap	pli	cable	e) Il	IA IAV	DEQI DEQI	UATI UATI	E	[]]	
IO	A A	GREI	ΞS	W]	TH 1	NASA	A FN	IE2	Α.													

REPORT DATE 2/26/88

_

. .

_

=

≡: ■:

ASSESSMENT ASSESSMENT NASA FMEA #	DATE: ID: :	1/29/88 FRCS-70 05-6KF-	9 2128 -2			NASA DATA: BASELINE NEW	[] [X]
SUBSYSTEM: MDAC ID: ITEM:		FRCS 709 RELAY					
LEAD ANALYS	T:	D. HART	MAN				
ASSESSMENT:							
CRI	TICALI FLIGHI	TY	REDUND	ANCY	SCREENS	1	CIL ITEM
Н	DW/FUN	IC	A	В		с	
NASA [IOA [2 /1R 2 /1R] [P] P]	[F [P] [] [P] P]	[X]* [X]
COMPARE [1] []	[N] []	[]
RECOMMENDAT	IONS:	(If d	ifferen	t fro	m NASA)		
ſ	2 /1R] [P]	[P] [P] (AI	[A] DD/DELETE)
* CIL RETEN	TION F	RATIONAL	E: (If	appli	cable) IN	ADEQUATE ADEQUATE	[]
REMARKS: NASA FMEA C THE VALVE. REDUNDANCY TO MEET CG	ONSIDE THIS, MAY CA LIMITS	COUPLE COUPLE SUSE LOS	IPLE FA D WITH S OF JE	ILURE THE L TS RE	S. LOS OSS OF QUIRED	E CAPABILI ALL HARDWA TO EXPEL F	TY TO OPEN RE PROPELLANTS
AT MEETING DISCUSSED. DUE TO DIFF ISSUE REMAI	WITH S IT WA ERENT NS OPE	UBSYSTE S AGREE INTERPR N.	M MANAG D UPON ETATION	ER ON THAT S OF	1/20/8 THE ISS NSTS 22	8, NSTS 22 UE RAISED 206. THER	206 WAS ABOVE WAS REFORE, THE

REPORT DATE 2/26/88

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-72 NASA FMEA #: 05-6KF) 212	28A-:	1				N 2	ASA DAJ BASELIN NI	CA NE EW	: []	x]		
SUBSYSTEM MDAC ID: ITEM:	1:			FR 71 RE	CS 0 LAY														
LEAD ANALYST: D. HART								1											
ASSESSMENT:																			
C			RI	EDUNI	DAN	CY	S	CREEI	15			CI IT	L EM						
	F	łDV	V/FUI	NC			A			B			С						
NASA IOA	[[3 2	/1R /1R]]		[[P P]	[[P P]		[P [P]]		[[x]	*	
COMPARE	[N	/]		[]	[]		[]		Γ	N]		
RECOMMENI)A]	CIC	ONS:		(If	d:	iff	fere	nt	fr	om	NASZ	A)						
	[2	/1R]		[Ρ]	[P	']	.	[P]	(Al] DD/	A] DEL	ETI	E)
* CIL RET	* CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEOUATE []																		
REMARKS: LOSE CAPA LOSS OF H PROPELLAN	REMARKS: LOSE CAPABILITY TO OPEN ISOLATION VALVE. THIS, COUPLED WITH THE LOSS OF HARDWARE REDUNDANCY MAY CAUSE INABILITY TO EXPEL PROPELLANTS TO MEET CG LIMITS.																		

ISSUE IS TIED TO THE IOA HARDWARE CRITICALITY FOR THE FAILED CLOSED MANIFOLD 1-4 ISOLATION VALVE.

REPORT DATE 2/26/88

_

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-71 05-6KF-	1 2128A-2			NASA DATA: BASELINE NEW	: [] [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 711 RELAY					
LEAD ANALYST:	D. HART	MAN				
ASSESSMENT:						
CRITICAL	ITY T	REDUND	ANCY	SCREENS	'	CIL
HDW/FU	NC	A	В		С	
NASA [2 /1R IOA [3 /3] [P]]	[F [] [] [P]]	[X]* []
COMPARE [N /N] [И]	[N] [N]	[и]
RECOMMENDATIONS:	(If d	ifferent	t fro	om NASA)		
[3 /1R] [P]	[F] [P] (AI	[A] DD/DELETE)
* CIL RETENTION	RATIONAL	E: (If a	appli	.cable) IN	ADEQUATE ADEQUATE	
REMARKS: NASA FMEA CONSID HIGH CREATES INA THE LOSS OF ALL THRUSTER LEAK.	ERS MULT BILITY T HARDWARE	IPLE FAI O CLOSE REDUND?	LURE THE ANCY	S. HOW VALVE. PREVENT	EVER, RELA THIS, COU S ISOLATIC	AY FAILING JPLED WITH DN OF A
AT MEETING WITH DISCUSSED. IT W DUE TO DIFFERENT	SUBSYSTE AS AGREE INTERPR	M MANAGI D UPON 1 ETATIONS	ER ON THAT 5 OF	I 1/20/8 THE ISS NSTS 22	8, NSTS 22 UE RAISED 206. THEF	206 WAS ABOVE WAS REFORE, THE

ISSUE REMAINS OPEN.

C-670

,

ASSESSME ASSESSME NASA FME	NT DATE NT ID: A #:	: 1/29 FRCS 05-6	/88 -712 KF-2128 -	-1	NASA DA BASELI N	TA: NE [] EW [X]
SUBSYSTE MDAC ID: ITEM:	:M :	FRCS 712 RELA	Y			
LEAD ANA	LYST:	D. H.	ARTMAN			
ASSESSME	NT:					
	CRITICA	LITY HT	REDUN	IDANCY SCR	EENS	CIL ITEM
	HDW/F	UNC	Α	В	С	
NASA IOA	[3 /1 [3 /3	R]]	[P] []	[NA] [] .	[P] []	[]*
COMPARE	[/N]	[N]	[N]	[N]	[]
RECOMMEN	DATIONS	: (I	f differe	ent from N	ASA)	
	[/]	[]	[]	[]	[] (ADD/DELETE)
* CIL RE	TENTION	RATIO	NALE: (If	applicab	le) ADEQUAT INADEQUAT	E [] E []
REMARKS: IOA AGRE	ES WITH	NASA	FMEA.	- 11 - 11 - MA		-

: :

2

Ξ

3

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-713 05-6KF-23	128 -2	NASA DAT BASELIN NE	'A: IE [] IW [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 713 RELAY			
LEAD ANALYST:	D. HARTM	AN		
ASSESSMENT:				
CRITICAL	ITY I	REDUNDANCY S	CREENS	CIL TTEM
HDW/FU	NC A	A B	C	
NASA [2 /1R IOA [2 /1R] []	P] [F] P] [P]	[P] [P]	[X]* [X]
COMPARE [/] [][М]	[]	[]
RECOMMENDATIONS:	(If dia	fferent from	NASA)	
[2 /1R] []	P] [P]	[P]	[A] ADD/DELETE)
* CIL RETENTION	RATIONALE	: (If applic	able) ADEQUATE INADEQUATE	
REMARKS: NASA FMEA CONSID THE VALVE. THIS REDUNDANCY MAY C TO MEET CG LIMIT	ERS MULTII , COUPLED AUSE LOSS S.	PLE FAILURES WITH THE LO OF JETS REQ	LOSE CAPABI SS OF ALL HARI UIRED TO EXPEI	LITY TO OPEN WARE PROPELLANTS
	GUDGVCMEN	NANACED ON	1/20/00 NGTG	22206 WAS

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-714 05-6KF-2	1 2128A-1		NASA DATA BASELINE NEW	: [x] [x]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 714 RELAY				
LEAD ANALYST:	D. HARTN	IAN	• *		
ASSESSMENT:					·
CRITICAL	ITY	REDUNDA	NCY SCREE	INS	CIL ITEM
HDW/FU	NC	A	В	С	
NASA [3 /1R IOA [2 /1R] [] [P] P]	[P] [P]	[P] [P]	[] * [X]
COMPARE [N /] []	[]	[]	[и]
RECOMMENDATIONS:	(If d	ifferent	: from NAS	SA)	
[2 /1R	2] [P]	[P]	[P] (1	[A] ADD/DELETE)
* CIL RETENTION	RATIONAL	E: (If a	applicable	ADEQUATE INADEQUATE	
REMARKS: LOSE CAPABILITY LOSS OF HARDWARE PROPELLANTS TO M	TO OPEN C REDUNDA MEET CG L	ISOLATIO NCY MAY IMITS.	ON VALVE. CAUSE IN	THIS, COUI ABILITY TO I	PLED WITH THE EXPEL

ISSUE IS TIED TO THE IOA HARDWARE CRITICALITY FOR THE FAILED CLOSED MANIFOLD 1-4 ISOLATION VALVE.

REPORT DATE 2/26/88

1

: : : -

. . . . سن د

- -

•

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-715 NASA DATA: BASELINE [] NASA FMEA #: 05-6KF-2128A-2 NEW [X] SUBSYSTEM: FRCS MDAC ID: 715 ITEM: RELAY LEAD ANALYST: D. HARTMAN ASSESSMENT: CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM HDW/FUNC A B C
 NASA
 [2/1R]
 [P]
 [F]
 [P]

 IOA
 [3/3]
 []
 []
 []
[X]* COMPARE [N/N] [N] [N] RECOMMENDATIONS: (If different from NASA) [3/1R] [P] [F] [P] [A] (ADD/DELETE) * CIL RETENTION RATIONALE: (If applicable) ADEQUATE [INADEQUATE [] **REMARKS**: NASA FMEA CONSIDERS MULTIPLE FAILURES. HOWEVER, RELAY FAILING HIGH CREATES INABILITY TO CLOSE THE VALVE. THIS, COUPLED WITH THE LOSS OF ALL HARDWARE REDUNDANCY PREVENTS ISOLATION OF A THRUSTER LEAK.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

SUBSYST	EM:			FR	cs												
MDAC ID	:			71	6												
ITEM:				RE	LAY												
LEAD AN	ALY	ST:	:	D.	HAI	RTI	MAI	N									
ASSESSM	ENT	:															
	CR	ITI		ITY			R	EDUN	DAN	CY	SCR	EEN	s			CII	L
]	HDW	V/FU	NC	•••		A			в			С			ITE	CM
NASA IOA	[[3 3	/1R /3]]		[[P]]	l L	NA]	[[P]]		[[:
COMPARE	[/N]		נ	N]	[N]	נ	N]		[•
RECOMME	NDAT	ΓIC	NS:		(If	d	ifi	fere	nt :	fro	m N2	ASA)				
	Г		/	٦		٢		1	г] .	Г	•	1		r	
	•		,	2		Ľ			L		1	Ľ		J	(AC	ם / ם)Eİ
* CIL R	ETE	1. I	ON I	RAT	IONA	LI	2:	(If	apı	pli	.cab]	Le)					
												TI	IA I K V	DEQUATI	E	[ן
REMARKS	:											T 1	121	JEQUAL I	6	L	٦
IÓA AGRI	EES	ŴĬ	THN	NASZ	A FM	IE2	١.										

REPORT DATE 2/26/88

È E

6 - 4

8.3

ASSESSMENT DATE: 1/29/8 ASSESSMENT ID: FRCS-7 NASA FMEA #: 05-6KF							, 212	8 -2					N7 F	ASA DATA BASELINE NEW	: [[x]	
SUBSYSTE MDAC ID: ITEM:	CS 7 LAY																	
LEAD ANA	LYS	ST	:	D.	HAF	(T	IAN	T										
ASSESSME	ENT	:														'	•	
	CR	IT: F	ICAL LIGH	ITY F			RE	DUND	AN (CY	SCRI	EEN	s C		CI IT	L EM	I	
	1	HD	W/FUI	NC			A			B			Ç					
NASA IOA	[[2 2	/1R /1R]]		[[P P]	[[F P]	[[P P]]	[[X X]	*
COMPARE	[/]		נ]	٢	N]	[]	[]	
RECOMMEN	1DA	TI	ons:		(If	đ:	if	feren	t :	fro	om Nž	ASA)					
	[2	/1R]		[Ρ]	נ	P]	[P] (A] DD/	A ⁄DI] ELI	ETE)
* CIL RI	ETE	NT	ION	RAI	NOI	AL	E:	(If	ap	pl:	icab	le) I	A NA	DEQUATE DEQUATE	[[]	
REMARKS NASA FMI THE VALV REDUNDAI TO MEET	EA VE. NCY CG	CO M L	NSID THIS AY C IMIT	ERS , (AUS S.	5 MUI COUPI SE LA	LT LE SS	IP D N S (LE FA WITH OF JE	IL Th TS	URI E R	ES. LOSS EQUI	LO OF RED	SE A T	CAPABIL LL HARDW O EXPEL	ITY ARI PR(Z E OPI	ro Eli	OPEN LANTS
አጠ Μ ΈΈΠ.	TNC	w	TTH	SIII	3575	TE.	MI	MANAG	ER	0	N 1/	20/	88	, NSTS 2	220	06	W	AS

64

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-718 05-6KF-2089 -1	NA B	SA DATA: ASELINE [] NEW [X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 718 RESISTOR, 1.2K 2	2W	
LEAD ANALYST:	D. HARTMAN		
ASSESSMENT:			
CRITICALI FLIGHT HDW/FUN	ITY REDUNDAN F IC A	NCY SCREENS B C	CIL ITEM
NASA [2 /1R IOA [3 /3] [P]] []	[F] [P [] [] [X]*] []
COMPARE [N /N] [N]	[N] [N	ן א]
RECOMMENDATIONS:	(If different	from NASA)	
[3 /2R] [P]	[P] [P] [D] (ADD/DELETE)
* CIL RETENTION F	RATIONALE: (If a	pplicable) AD TNAD	EQUATE [] EQUATE []
REMARKS:			
NASA FMEA CONSIDE CAPABILITY TO MON THE VALVE CLOSED	ERS MULTIPLE FAIL NITOR VALVE STATU POSSIBLY EFFECT	LOKES. HOWEV JS MAY LEAD T ING MISSION O	ER, LOSS OF O FALSELY FAILING PERATIONS.

AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88, NSTS 22206 WAS DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

REPORT DATE 2/26/88

C-677

.

÷

:

2

.

-

ASSESSME ASSESSME NASA FME	NT C NT I A #:	DATE:	1/29/ FRCS- 05-6F	88 719 (F-20	89 -	2		1	NASA BASE	DATA: LINE NEW	; [[X]			
SUBSYSTE MDAC ID: ITEM:	М:		FRCS 719 RESIS	TOR,	1.2	K 2W									
LEAD ANA	LYST	:	D. HA	RTMA	N										
ASSESSME	NT:														
	CRIT	ICAL	ITY	R	EDUN	DANCY	SCR	EENS			CIL	1 ' N T			
	HD	W/FU	NC	A		E	3	C	2	, -	110	м			
NASA IOA	[3 [3	/3 /3]]	[[]]	[[]]	[[]]		[[]	*		
COMPARE	Γ	/]	[]	[]	[]		[]			
RECOMMEN	DATI	ons:	(If	dif	fere	nt fr	om N	ASA)							
	[/]	[]	[]	· []	(AI	[)D/D] ELE	ΓE)		
* CIL RE REMARKS: NO DIFFE	TENT RENC	ION ES.	RATION	ALE:	(If	appl	icab	le) 7 IN7	ADEQÜ ADEQU	ATE ATE	Î []			
ASSESSME ASSESSME NASA FME	ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-720 NASA FMEA #: 05-6KF-20					NASA DATA: BASELINE [] 37 -1 NEW [X]									
----------------------------------	---	----------	---------------------	--------	------	---	--------	-----------------	--------	------------	-----------	------------	----	--	--
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 720 RESI	STOR,	5.1	K 1/4	W								
LEAD ANA	LYST	:	D. Н	ARTMA	N										
ASSESSME	NT:														
	CRIT	ICAL	ITY	R	EDUN	DANCY	SCR	EENS	- ·		CIL	M			
	HC	W/FU	NC	А		В		C			***				
NASA IOA	[3 [3	/3 /3]]	[[]	[[]]	[[]]		[[] *]			
COMPARE	[/]	[]	Γ]	[]		[]			
RECOMMEN	DATI	ons:	(I	f dif	fere	nt fr	om N	ASA)							
	[1]	[]	[]	[]	(A)	[DD/D] ELETE	2)		
* CIL RE	TENI	NOI	RATIO	NALE:	(If	appl	icab	le) A INA	DEQU.	ATE ATE	[[]]			
REMARKS: NO DIFFE	RENC	CES.													

•

1.484

া ক

ASSESSMENT DATE:1/29/88NASA DATA:ASSESSMENT ID:FRCS-721BASELINE []NASA FMEA #:05-6KF-2087 -1NEW [X]											
SUBSYSTEM: MDAC ID: ITEM:	FRCS 721 RESISTOR, 5.	1K 1/4W									
LEAD ANALYST:	D. HARTMAN										
ASSESSMENT:											
CRITICAL FLIGH	ITY REDU F	NDANCY SCR	REENS	CIL ITEM							
HDW/FUI	NC A	В	C								
NASA [3 /3 IOA [3 /3] []	[] []	[]]	[] * []							
COMPARE [/] []	[]]	[]	[]							
RECOMMENDATIONS:	(If differ	ent from N	(ASA)								
. [/] []	[]	·[]]	[] ADD/DELETE)							
* CIL RETENTION 1	RATIONALE: (I	f applicab	le) ADEQUATE INADEQUATE								
REMARKS: A SHORT ACROSS A RLR TYPE RESISTOR IS NOT A CREDIBLE FAILURE. IOA RECOMMENDS REMOVAL OF THE "SHORT" FAILURE MODE FROM THIS FMEA.											
ISSUE RESOLVED AS (SHORT FAILURE MO	T MEETING WIT DDE TO BE REM	H SUBSYSTE OVED).	M MANAGER ON	1/20/88							

REPORT DATE 2/26/88

C-680

. .

-

1

- -

ASSESSMEN ASSESSMEN NASA FMEA	IT DATE: IT ID: A #:	1/29/88 NASA DATA: FRCS-722 BASELINE [05-6KF-2087 -1 NEW [X]]		
SUBSYSTEM MDAC ID: ITEM:	I :	FRCS 722 RESIS	for,	5.1K	: 1/4	W						
LEAD ANAL	YST:	D. HAI	RTMA	N								
ASSESSMEN	IT:											
c	RITICAL	JTY	R	EDUND	ANCY	SCRE	ENS			CIL	M	
	HDW/FU	NC	A		E	3	c	•		TIC	M	
NASA IOA	[3 /3 [3 /3]]	[[]]	[[]	[[]		[] *]	
COMPARE	[/]	[]	[]	[]		[]	
RECOMMEND	DATIONS:	(If	dif	feren	it fr	om NA	SA)					
	[/]	[]	[]	[]	(A)	[DD/D] ELETI	E)
* CIL RET	TENTION	RATION	ALE:	(If	appl	icabl	e) A INA	DEQUA DEQUA	TE TE	[[]]	
NO DIFFER	RENCES.											

REPORT DATE 2/26/88

-

1

ASSESSMI ASSESSMI NASA FMI	ENT ENT EA ‡	D2 II #:	ATE: D:	1/29 FRC9 05-6	9/88 5-723 5KF-20	IASA BASE	DATA: LINE NEW	: [[X]					
SUBSYSTI MDAC ID: ITEM:	EM:			FRCS 723 RESI	s Istor,	5.1	LK 1/41	ন						
LEAD ANA	ALYS	5 T :	:	D. H	IARTMA	N								
ASSESSME	ENT	;												
	CRI	T] T		ITY r	R	EDU	IDANCY	sc	REENS			CIL ITE	м	
	Ī	IDV	V/FU	NC	A		В		C	2			••	
NASA IOA	[[3 3	/3 /3]	[[]	[[]]	[[]]		[[]]	*
COMPARE	C		/]	Γ]	E]	[]		נ]	
RECOMMEN	IDAI	CIC	ONS:	()	(f dif	fere	ent fro	σm	NASA)					
	[/]	ľ]	[]	[]	(AI	[DD/D] ELE	TE)
* CIL RE	ETE	1TI	ION I	RATIC	DNALE:	(If	appl:	Lca	ble) A INA	DEQUI	ATE ATE	[[j]	
REMARKS: A SHORT IOA RECO FMEA.	ACI DMMI	ROS	SS A DS RI	RLR EMOVA	TYPE L OF	RESI THE	ISTOR I "SHORT	[S ["	NOT A FAILUF	CREDI RE MOI	IBLE DE FF	FAI	LUR THI	E. S
ISSUE RE (SHORT E	ESOI FAII	LVI	ED A' RE MO	r men Ode 1	ETING TO BE	WITH REMC	I SUBS) OVED).	(ST	'EM MAN	IAGER	ON 1	/20	/88	

REPORT DATE 2/26/88

ASSESSMENT DATE: 1/29/88 ASSESSMENT ID: FRCS-724 NASA FMEA #: 05-6KF-2088 -1						-1		N	iasa Basi	DATA ELINE NEW	.: : [/ [:	1 x]	
SUBSYSTE MDAC ID: ITEM:	M:			FRC 724 RES	SISTOR,	5.2	1K 1/4	W					
LEAD ANA	LYS	ST	:	D.	HARTMA	N			· ·· · -				
ASSESSME	NT	:											
	CR] H	IT F HD	ICAL LIGH W/FU	ITY F NC	F	EDUI	NDANCY B	SC	REENS C			CII ITI	L EM
NASA IOA	[[3 3	/3 /3]]	[[]]	ן נ]]	[]]		[[] *]
COMPARE	[/]	ſ]	C]	[]		[]
RECOMMEN	DAI	rı(ONS:	(If dif	fere	ent fro	om 1	NASA)				
	[3	/2R]	[F	']	[P]	[F]	(A] .DD/1] DELETE
* CIL RE	TEN	T	ION	RATI	ONALE:	(11	f appl:	ical	ole) A INA	DEQU DEQU	JATE JATE	[[]]
REMARKS: THIS FAI POSITION TO FALSE OPERATIO	LUH LY NS.	RE R F	MAY EDUNI AILII	CAU DANC NG T	SE LOS Y PROV HE VAL	S OI IDEI VE (F ACCUI D. LOS CLOSED	RATI 55 (, P(E INDI OF ALL OSSIBL	CATI REI Y EF	ON O OUNDA FECT	F TH NCY ING	HE VALN MAY LI MISSI(
ISSUE NO	тв	RE	SOLV	ED A	т меет	ING	אדייא א	SUBS	SYSTEM	MAN	AGER	ON	1/2078

REPORT DATE 2/26/88

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-725 05-6KF-20	88 -1	N2 1	ASA DATA: BASELINE NEW	[[X]]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 725 RESISTOR,	5.1K 1/4V	4			
LEAD ANALYST:	D. HARTMA	N				
ASSESSMENT:						
CRITICAL	ITY R	EDUNDANCY	SCREENS		CIL TTEM	r
HDW/FU	NC A	В	С			-
NASA [3 /3 IOA [3 /3] [] [] [] [) [] []	[[] *
COMPARE [/] [] [] []	[]
RECOMMENDATIONS:	(If dif	ferent fro	om NASA)			
[/] [] [] [] (AI	[DD/DE] :LETE)
* CIL RETENTION	RATIONALE:	(If appl	icable) Al INA	DEQUATE DEQUATE	[[]]
REMARKS: A SHORT ACROSS A IOA RECOMMENDS F FMEA.	RLR TYPE EMOVAL OF	RESISTOR THE "SHOR	IS NOT A F" FAILUR	CREDIBLE E MODE FI	FAII ROM I	JURE. THIS

ه

5

ISSUE RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88 (SHORT FAILURE MODE TO BE REMOVED).

REPORT DATE 2/26/88

.

.

ASSESSME ASSESSME NASA FME	NT NT A #	DATE: ID: :	1/29/8 FRCS-7 05-6KI	38 726 F-208	88 -1			ł	IASA DAT BASELII NI	TA: NE [EW [x]	
SUBSYSTE MDAC ID: ITEM:	:M:		FRCS 726 RESIST	ror,	5.1K	1/4	W						
LEAD ANA	LYS	r:	D. HAI	RTMAI	N								
ASSESSME	NT:												
	CRI	FICAL	CTY C	R	EDUND	ANCY	SCRE	ens		C T	IL TEM		
	H	DW/FUI	NC	A		B		C	:	-		•	
NASA IOA	[]	3 /3 3 /3]]	[[]	[[]	[[]	[[]	*
COMPARE	[/]	[]	[]	[]	[]	
RECOMMEN	DAT	IONS:	(If	dif	feren	t fro	om NA:	SA)					
	[:	3 /2R]	[P]	[P]	[F)] (ADD	/DE] LE'	FE)
* CIL RE	TENT	FION I	RATIONA	LE:	(If	appl	lcablo	∋) A INA	DEQUATE DEOUATE	C []	
REMARKS: THIS FAI	LURI	E MAY	CAUSE	LOSS	SOF	ACCUI	RATE :	INDI	CATION	OF	THE	V	ALV

THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

- -

÷ -7

- ---

-4

5

Ξ

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-727 05-6KF-20)88 - 1			NA E	SA DAT BASELIN NE	'A: IE [IW [] X]	
SUBSYSTEM: MDAC ID: ITEM:	FRCS 727 RESISTOR,	5.1K	1/41	7					
LEAD ANALYST:	D. HARTM	N				-			-
ASSESSMENT:									
CRITICAL. FLIGH	LTY I C	REDUNDA	ANCY	SCREE	ENS		C I	IL TEM	
HDW/FUI	NC Z	ł	В	·	С				
NASA [3 /3 IOA [3 /3] [] []]	[[]]	[[] 、	່ [[]	*
COMPARE [/] []	[]	[]	[]	
RECOMMENDATIONS:	(If dia	fferen	t fro	om NAS	SA)				
[/] []	[]	[] .] ADD] /DEI	LETE)
* CIL RETENTION	RATIONALE	: (If a	appl	icable	2)				ł
						DEQUATE DEQUATE]	-
REMARKS: A SHORT ACROSS A IOA RECOMMENDS R FMEA.	RLR TYPE EMOVAL OF	RESIS' THE "	TOR : SHOR	IS NOT F" FAI	r a c Luri	REDIBI MODE	LE F FRO	AILU M TH	JRE. IIS

ISSUE RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88 (SHORT FAILURE MODE TO BE REMOVED).

REPORT DATE 2/26/88

.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-728 05-6KF-20	88 -1		N 2]	ASA DATA BASELINE NEW	: [x]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 728 RESISTOR,	5.1K 1/4	IW			vit 4	
LEAD ANALYST:	D. HARTMA	N			-		
ASSESSMENT:		•					
CRITICAL FLIGH HDW/FU	ITY R F NC A	EDUNDANC)	SCREI	ens C		CIL ITE	M
NAGA [2 /2		- -	1	r	1	r	7 *
IOA [3 /3] [] []	[]	[]
COMPARE [/	ן נ] []	[]	[]
RECOMMENDATIONS:	(If dif	ferent fi	com NAS	SA)			
[/] [] []	[] (A	[DD/D] ELETE)
* CIL RETENTION H	RATIONALE:	(If app]	licable	e) Al INAI	DEQUATE DEQUATE	[[]]
REMARKS: A SHORT ACROSS A IOA RECOMMENDS RI FMEA.	RLR TYPE : EMOVAL OF '	RESISTOR THE "SHOP	IS NO' RT" FA	F A (ILUR)	CREDIBLE E MODE F	FAI ROM	LURE. THIS
ISSUE RESOLVED AT (SHORT FAILURE MO	T MEETING DDE TO BE I	WITH SUBS REMOVED).	SYSTEM	MAN	AGER ON	1/20	/88

REPORT DATE 2/26/88

-

. . ____

=

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-729 05-6KF-208	1/29/88 NASA DATA: FRCS-729 BASELINE [] 05-6KF-2088 -1 NEW [X]											
SUBSYSTEM: MDAC ID: ITEM:	FRCS 729 RESISTOR,	5.1K 1/	4W										
LEAD ANALYST:	D. HARTMAN	N											
ASSESSMENT:	ASSESSMENT:												
CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM													
FLIGHT ITEM HDW/FUNC A B C													
NASA [3 /3 IOA [3 /3] [] [] [] []]		[]*								
COMPARE [/	<u>ן</u> נ] []	[]	[]]								
RECOMMENDATIONS:	(If dif:	ferent f	from NAS	SA)									
[3 /2R] [P] [P]	[P] (Al	[] DD/DELETE)								
* CIL RETENTION RATIONALE: (If applicable) ADEQUATE [] INADEQUATE []													
REMARKS: THIS FAILURE MAY POSITION. REDUN TO FALSELY FAILI	CAUSE LOSS DANCY PROVI NG THE VAL	S OF ACC IDED. I VE CLOSH	CURATE 1 LOSS OF LD, POSS	INDICATION OF ALL REDUNDAN SIBLY EFFECT	F THE VALVE NCY MAY LEAD ING MISSION								

 \equiv

=

=

_

OPERATIONS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

•

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-730 05-6KF-2) 2088 -1			NASA DATA: BASELINE [] NEW [X]							
SUBSYSTEM: MDAC ID: ITEM:	FRCS 730 RESISTOR	R, 5.1K	1/41	พ								
LEAD ANALYST:	D. HARTM	IAN										
ASSESSMENT:												
CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM												
HDW/FU	INC	A	B	÷.,	С	renna na 1. s						
NASA [3 /3 IOA [3 /3] [] []]	[[]	[[]	[[] *]				
COMPARE [/] []	[]	[]	[]				
RECOMMENDATIONS	(If di	fferen	t fro	om NAS	5A)							
[3 /2]	k] [P]	[P]	[P] (A	[DD/I] DELETE)				
* CIL RETENTION	RATIONALE	: (If	appl	icable	e) Al INAI	DEQUATE DEOUATE	[[]				
REMARKS: THIS FAILURE MAY POSITION. REDUN TO FALSELY FAILJ OPERATIONS.	CAUSE LC IDANCY PRO ING THE VA	SS OF VIDED. LVE CL	ACCUI LOS OSED	RATE : SS OF , POSS	INDI(ALL SIBLY	CATION O REDUNDA Y EFFECT	F TH NCY ING	E VALVE MAY LEAD MISSION)			

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

• .

REPORT DATE 2/26/88

· ·

ASSESSMI ASSESSMI NASA FMI	MENT DATE: 1/29/88 MENT ID: FRCS-731 MEA #: 05-6KF-2088 -1									N	IASA I BASEI	DATA: LINE NEW	[[X]
SUBSYSTI MDAC ID: ITEM:	EM : :			FR 73 RE	CS 1 SISI	OR,	5.1K	1/41	W					
LEAD AND	ALYS	ST	:	D.	HAF	TMAI	N							
ASSESSM	ENT	:												
	CR:	IT: FI	ICAI LIGH	LITY IT INC		RI A	EDUND	ANCY B	SC	REENS			CIL ITE	м
		_	·/ • •			,	۰.	-	-		٦		r	1.
NASA IOA	[[3 3	/3]		[]	L []	Ĺ]		[]
COMPARE	נ		/]		[]	נ]	[]		נ]
RECOMME	NDA'	FI (ONS:		(If	dif	feren	t fr	om	NASA)				
	[/]		[]	[]	[]	(AI	[DD/D] ELETE)
* CIL R	ETE	NT	ION	RAT	IONA	ALE:	(If	appl	ica	ble) A INA	DEQU	ATE ATE	[[]]
REMARKS A SHORT IOA REC FMEA.	: AC: OMM	RO	SS A DS F	A RL REMO	R TY	OF	RESIS THE "	TOR SHOR	IS T"	NOT A FAILUF	CRED RE MO	IBLE DE FI	FAI ROM '	LURE. THIS
ISSUE R (SHORT	ESO FAI	LV. LU.	ED A RE M	AT M IODE	EET] TO	ING BE	WITH REMOV	SUBS ED).	YST	em man	IAGER	ON 1	L/20,	/88

C-690

= =

-

_

1.0

.

-

•

ASSESSMENT ASSESSMENT NASA FMEA ‡	DATE: ID: :	1/29/88 FRCS-73 05-6KF-	2 208	9 -1					NA E	ASA DAT BASELIN NE	CA: NE EW	[[x]	
SUBSYSTEM: MDAC ID: ITEM:		FRCS 732 RESISTO	R,	1.2K	2W										
LEAD ANALYS	ST:	D. HART	MAN	ſ			- <u>-</u>	···	5						
ASSESSMENT:	:														
CRI	TICALI FLIGHT	LTY F IC	RE A	DUNDA	NC	Y B	SCREE	NS	c			CI IT	L EM	I	
NASA [IOA [2 /1R 3 /3] [] [P]]	[[F]]	[[P]		[[x]]	*
COMPARE [n /n] [N]	[N]	[N]		[N]	
RECOMMENDAJ	TIONS:	(If d	iff	erent	f	ro	m NAS	A)							
ſ	3 /2R] [P]	[P]	[P]	(AC	[)D/	D DE] LE	TE)
* CIL RETEN	ITION I	RATIONAL	Е:	(If a	pp	li	cable) IN	AE)EQUATE)EOUATE	E	[]	
REMARKS: NASA FMEA (CAPABILITY THE VALVE (CONSIDI TO MON CLOSED	ERS MULT NITOR VA POSSIBL	IPL LVE Y E	LE FAI STAT FFECT	LU US 'IN	RE M G	S. H AY LE MISSI	OW AE ON	IEV I C	YER, LO O FALS OPERATI	DSS SEL	v V S	F FA	II	ING
AT MEETING DISCUSSED.	WITH S	SUBSYSTE	M M D U	IANAGE IPON T	R	ON T	1/20 THE I	/8 55	8, UF	NSTS RAISE	22 2D	20 AB	6 0V	WA 'E	.S WAS

DISCUSSED. IT WAS AGREED UPON THAT THE ISSUE RAISED ABOVE WAS DUE TO DIFFERENT INTERPRETATIONS OF NSTS 22206. THEREFORE, THE ISSUE REMAINS OPEN.

Ε

نيتي ا

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-733 05-6KF-2	089 -2		NASA BASE	DATA: LINE NEW	[[X]]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 733 RESISTOR	, 1.2K	2₩				
LEAD ANALYST:	D. HARTM	AN					
ASSESSMENT:							
CRITICAL		REDUNDA	NCY SCRE	ENS		CIL	ĸ
HDW/FU	NC	A	В	С			•
NASA [3 /3 IOA [3 /3] [] []]	[] []	[] []		[[] *]
COMPARE [/] []	[]	[]		[]
RECOMMENDATIONS:	(If di	fferent	from NA	SA)			
[/.] []	[]]	[]	(AI	[)D/DE] ELETE)
* CIL RETENTION REMARKS: NO DIFFERENCES.	RATIONALE	: (If a	pplicabl	e) ADEQU INADEQU	ATE ATE	[[]

REPORT DATE 2/26/88

C-692

Ξ.=

_

_

=

ASSESSME ASSESSME NASA FME	NT DATH NT ID: A #:	1/29 FRCS 05-0	9/88 5-734 5KF-208	7 -1		N	IASA BASE	DATA LINE NEW	: [[]] K]				
SUBSYSTE MDAC ID: ITEM:	:M:	FRCS 734 RESI	S ISTOR,	5.1K 1/	4W									
LEAD ANA	LYST:	D. H	IARTMAN											
ASSESSME	NT:													
CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM														
	FLIC HDW/I	FUNC	A		в	c	2	· · · · · · · · · · · · · · · · · · ·	_ T.T.1	-M				
NASA IOA	[3 /3 [3 /3]	[[] [] []	[[]	:]] *]				
COMPARE	[/]	[] []	[]		[]				
RECOMMEN	DATIONS	s: (:	[f diff	erent f	from N	IASA)								
	[/]	[] []	[]	(A)	[DD/I] DELETE)				
* CIL RE REMARKS: NO DIFFE	TENTION	I RATIO	ONALE:	(If app	olicat	ole) // IN/	ADEQU ADEQU	JATE JATE	[[]]				

C-10

. -*

.

- ---

>

> > -

-

-

ASSESSME ASSESSME NASA FME	ENT ENT EA	D. I #:	ATE D:	E: 1/29/88 FRCS-735 05-6KF-2087 -1						ł	NASA DATA: BASELINE [] NEW [X]					
SUBSYSTE MDAC ID: ITEM:	EM:			FR 73 RE	CS 5 SIS:	FOR	, 5.1	.K 1/4	W							
LEAD ANA	LY	ST	:	Ď.	HAI	RTM	AN									
ASSESSME	ENT	:														
	CR	IT F HD	ICAI LIGI W/FU	LITY HT JNC	•		REDUN A	IDANCY E	SCI S	REENS	5		CII ITH	S M		
NASA IOA	[[3 3	/3 /3]]		[[]]	[[]]	[[]]		[[]	*	
COMPARE	[/]		[]	[]	[]		[]		
RECOMMEN	IDA	TI	ONS	:	(If	di	ffere	nt fr	om 1	NASA)						
	[-	1]		[]	[]	[]	(Al	[0D/1] DELF	TE)	
* CIL RE	ETE	NT	ION	RAT	IONZ	ALĒ	: (If	appl	icab	ole) A INA	DEQU	JATE JATE	[[]]		
REMARKS: A SHORT IOA RECO FMEA.	AC MM	RO: ENI	SŠ 1 DS 1	A RLI REMOV	R TY VAL	YPE OF	RESI THE	STOR "SHOF	IS N T" H	IOT A FAILUF	CRED RE MC	DIBLE DE FI	FAI ROM	LUF. THI	E. S	
 ISSUE RE (SHORT F	ESO FAI	LU	ED J RE 1	AT MI IODE	EETI TO	ING BE	WITH REMO	SUBS VED).	YSTI	em man	IAGER	R ON 3	1/20)/88		

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	NT I NT J A #:	DATE: [D:	1/29 FRCS 05-0	9/88 5-736 5KF-20	87 -	1		NASA DATA: BASELINE [] NEW [X]						
SUBSYSTE MDAC ID: ITEM:	M:		FRCS 736 RESI	S ISTOR,	5.1	K 1/4	W							
LEAD ANA	LYSI	::	D. 1	HARTMA	N									
ASSESSME	NT:													
	CRIJ H	TICAL TLIGH	LITY IT	R	EDUN	DANCY	SCR	EENS		CII	L E M			
	HI	W/FU	INC	A		E	5	C	2					
NASA IOA	[3	3 /3 3 /3]]	[[]]	[[]]	[[]]	[] *]			
COMPARE	[/]	[]	[]	[]	[]			
RECOMMEN	DATI	IONS:	(:	[f dif	fere	nt fr	om N	iasa)						
	[/]	[]	[]	[]	[(ADD/I] DELETI	E)		
* CIL RE REMARKS:	TENI	TION	RATIO	ONALE:	(If	appl	icab	ole) 7 IN7	ADEQUAT ADEQUAT	E [E []]			
NO DIFFE	KENC	LD.												

REPORT DATE 2/26/88

=

- -

ASSESSMI ASSESSMI NASA FMI	ENT ENT EA	D/ I) #:	ATE: D:	: 1/ FR 05	29/88 CS-73 -6KF-	7 208	7 -1				NASA DA' BASELII NI	TA: NE EW	[[x]]	
SUBSYSTI MDAC ID ITEM:	em : :			FR 73 RE	CS 7 SISTC	R,	5 . 1K	1/41	Ñ						
LEAD AND	ALY	ST	:	D.	HART	MAN									
ASSESSMI	ENT	:													
	CR	IT F	ICA LIGI	LITY HT		RE	DUND	ANCY	SCRE	ENS			CIL ITE	м	
]	HD	W/FI	JNC		A		В		i	C				
NASA IOA	[[3 3	/3 /3]]	[]]	[[]	[[]]		[[]]	*
COMPARE	[/]	(]	[]	[]		[]	
RECOMME	NDA	FI	ONS	:	(If d	liff	erent	t fro	om NA	SA)					
	[/]	[]	[]	[]	(AE	[)D/D] ELF	ETE)
* CIL R	ETE	NT	ION	RAT	IONAI	E:	(If a	appl:	icabl	e) IN	ADEQUATI ADEQUATI	E	[[]]	
REMARKS A SHORT IOA RECO FMEA.	ACI	RO: EN:	SS 2 DS 1	A RLI REMO	R TYI VAL C	PER OFT	ESIS HE "S	FOR I SHORT	IS NC F" FA	T A	CREDIB RE MODE	LE FF	FAI COM	LUF THI	ε. Is
ISSUE RI (SHORT I	ESO FAI	LV. LU:	ED Z RE J	AT M MODE	EETIN TO E	ig W Be R	ITH S EMOVI	SUBSY	STEM	(MA	NAGER OI	N 1	./20	/88	3

REPORT DATE 2/26/88

ASSESSMEN ASSESSMEN NASA FMEA	T DA T II #:	ATE: D:	1/29/8 FRCS- 05-6K	88 738 F-208	38 -:	L]	NASA DA BASELI N	ATA: INE [NEW [X]
SUBSYSTEM MDAC ID: ITEM:	:		FRCS 738 RESIS	for,	5.11	X 1/41	พ				
LEAD ANAL	YST		D. HAI	RTMAI	1						
ASSESSMEN	T:										
с	RIT: FI	ICALI LIGHI	LTY P	RI	EDUNI	DANCY	SCRE	EENS		CII ITE	M
	HD	N/FUI	NC	A		В		(С		
NASA IOA	[3 [3	/3 /3]]	[]]	[[]]	[[]]_ [] *]
COMPARE	[/]	[]	Γ]	[]	[]
RECOMMEND	ATI	ONS:	(If	dif	ferei	nt fro	om NA	SA)			
	[3	/2R]	[P]	[P]	[P]	[(ADD/C] DELETE
* CIL RET	'ENT	ION 1	RATION	ALE:	(If	appl	icabl	e) IN	ADEQUAT ADEQUAT	CE (CE (]]
REMARKS:	JIRE	ΜΑΥ	CAUSE	LOSS	S OF	ACCU	RATE	IND	TCATION	I OF TH	IE VAL

THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

ti de la comunita

۲

- --

· .

ASSESSMEN ASSESSMEN NASA FMEN	TV TV A #	DA IC	ATE:):	1/29/88 FRCS-739 05-6KF-2088 -1								NASA BAS	DATA ELINE NEW	: []	1 x]	
SUBSYSTEN MDAC ID: ITEM:	4:			FRC 739 RES	s Is	ror	,	5.1K	1/4	W						-
LEAD ANA	LYS	ST:		D.	HAI	RTM	AN	ſ								
ASSESSMEN	NT:															
CRITICALITYREDUNDANCY SCREENSCILFLIGHTITEMHDW/FUNCABC																
	H	IDW	I/FUI	NC			A		F	3		С		. 		
NASA IOA	[[3 3	/3 /3]]		[[]]	[[]	[[]		[[]	*
COMPARE	[/]		[]	[]	C]		[]	
RECOMMENI	DAT	'IO	NS:	(If	di	ff	eren	t fr	rom	NASA)				
	[/]		[]	[]	[]	(A] /0C] DELI	ETE)
* CIL RET	FEN	ITI	ON I	RATI	ONZ	ALE	:	(If a	appl	ica	uble) I	ADEQ NADEQ	UATE UATE]]]]	
A SHORT A IOA RECON	EMARKS: SHORT ACROSS A RLR TYPE RESIS DA RECOMMENDS REMOVAL OF THE " MEA.											A CRE URE M	DIBLE ODE FI	F'A ROM	ILUI THI	RE. IS

ISSUE RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88 (SHORT FAILURE MODE TO BE REMOVED).

.

ASSESSMENT DATE: ASSESSMENT ID: NASA FMEA #:	1/29/88 FRCS-740 05-6KF-20	88 -1	-		N 2	ASA DATA BASELINE NEW	: [[X]
SUBSYSTEM: MDAC ID: ITEM:	FRCS 740 RESISTOR,	5.18	(1/4)	4				
LEAD ANALYST:	D. HARTMA	N						
ASSESSMENT:								
CRITICALI	ITY F	REDUNE	DANCY	SCRE	ENS		CIL	ı NAT
HDW/FUN		1	В		с		TIC	111
NASA [3 /3 IOA [3 /3] [] . []	[[]]	[[]]	ׂ [[] *]
COMPARE [/] []	[]	[]	[]
RECOMMENDATIONS:	(If dif	feren	nt fro	om NA	SA)			
[3 /2R] [F)	[P]	[₽] (A] D / D 0] ELETE)
* CIL RETENTION F	RATIONALE:	(If	appl:	icabl	e) Al INA	DEQUATE DEQUATE	[[]
REMARKS: THIS FAILURE MAY	CAUSE LOS	S OF	ACCUI	RATE	INDI	CATION O	F TH	E VALV

THIS FAILURE MAY CAUSE LOSS OF ACCURATE INDICATION OF THE VALVE POSITION. REDUNDANCY PROVIDED. LOSS OF ALL REDUNDANCY MAY LEAD TO FALSELY FAILING THE VALVE CLOSED, POSSIBLY EFFECTING MISSION OPERATIONS.

ISSUE NOT RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88.

REPORT DATE 2/26/88

ASSESSME ASSESSME NASA FME	NT NT A	D2 I1 #:	ATI D:	2: :] 	1/29/8 FRCS-7 05-6KI	38 741 F-20	N2]	ASA I BASEI	DATA: LINE NEW	[[X]				
SUBSYSTEM MDAC ID: ITEM:	M:]	FRCS 741 RESIST	FOR,	5.1K	1/40	N						
LEAD ANA	LYS	ST	:	1	D. HAI	RTMA	N								
ASSESSME	NT	:													
CRITICALITY REDUNDANCY SCREENS CIL FLIGHT ITEM HDW/FUNC A B C															
NASA IOA	[[3 3	/: /:	3]].]	ך נ]]	[[]		[[]]	*
COMPARE	[_	/]	[]	נ]	[]		[]	
RECOMMEN	DA	TI	ONS	5:	(If	dif	feren	t fro	om	NASA)					
	[/]	[]	[]	[]	(AI	[)D/D] ELF	ETE)
* CIL RE	TE	NT:	IOI	N R	ATION	ALE:	(If	appl:	ica	ble) Al INA	DEQUA DEQUA	ATE ATE	[]]	
REMARKS: A SHORT IOA RECO FMEA.	ACI MM	RO: EN	SS DS	A RE	RLR TY MOVAL	VPE OF	RESIS THE "	TOR I SHOR	IS T"	NOT A (FAILUR)	CREDI E MOI	IBLE DE FF	FAI ROM	LUF THI	RE. IS
	~ ~				10750			cuper	vem			ON 1	120	/00	· · · · · · · · · · · · · · · · · · ·

•••••

ISSUE RESOLVED AT MEETING WITH SUBSYSTEM MANAGER ON 1/20/88 (SHORT FAILURE MODE TO BE REMOVED).

REPORT DATE 2/26/88

ت . . 1 • • U ا -

*

____ — Q