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VOLUME 5 DATA MANAGEMENT STUDY

APPENDIX C CONTRACTOR DATA PACKAGE MANUFACTURING (MG)

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Manufacturing Management
Voyager Spacecraft System Project

APPROVED BY

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DATA MANAGEMENT AND CONTROL TASK

VOYAGER SPACECRAFT SYSTEM PROJECT

PREPARED FOR

JET PROPULSION LABORATORY

CALIFORNIA INSTITUTE OF TECHNOLOGY

4800 OAK GROVE DRIVE

PASADENA, CALIFORNIA

UNDER JPL CONTRACT No. 951112



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6	DATA ITEM PHASING/FREQUENCY

INTRODUCTION

This appendix presents the Contractor Data Package (Data Item Matrix, Data Requirement Descriptions, User Flow Diagrams, Document Relationship Tree, and Frequency and Phasing Charts) for Manufacturing (MG).

These data relate to the planning, designing, tooling and processes, scheduling, ordering, manufacturing, testing, fabricating, production control, assembly, and reporting necessary to produce a finished product from a set of drawings and specifications.

The complete list of Contractor Data Package appendixes is as follows:

Appendix A - Technical Description and System Engineering (SE)

Appendix B - Planetary Quarantine (PQ)

Appendix C - Manufacturing (MG)

Appendix D - Configuration Management (CM)

Appendix E - Quality Assurance (QA)

Appendix F - Test (TE) and Mission Operations (MP)

Appendix G - Reliability Assurance (RA)

Appendix H - Logistics and Support (LS)

Appendix I - Overall Management (MA), Scheduling (SC), and Manning and Financial (MF)

Appendix J - Procurement and Contracting (PC)

Appendix K - Data Management (DM)

Appendix L* - Facilities (FA)

Appendix M* - Safety (SA)

Appendix N* - Site Activation for Launch (AL)

Appendix O* - Science (SI)

Appendix P* - Related Project Interfaces (RP)

Appendix Q* - Advanced Missions (AM)

^{*} Appendixes L through Q prepared under Contract NAS 7-584

		
	1 of 3	
DATA ITEM	DATA ITEM	DESCRIPT
NUMBER	MANUFACTURING	
	ITMALT O LATO L CAME. C	
	DRAWINGS	
MG- 001	Drawings, Interface Tools, Jigs and Fixtures	Drawings for tools, jigs, and fixtures cointerfaces.
MG- 002	* Drawings, Tools, Jigs and Fixtures	Drawings for tools, jigs, and fixtures oth with system interfaces.
	MANUALS	
MG- 005	* Manual, Certification and Training	A manual based on NASA military and cu be used in GE/customer approved trainin tion of operators/inspectors.
MG- 006	* Manual, Hardware Handling	An instruction manual for protecting and during transportation and at work place i during test and inspection.
	PLANS	
MG- 009	Plan, Manufacturing	Defines the contractual requirements to reliability, and schedules for the assemprime hardware.
MG- 010	Plan, Storage	A plan to stock and store completed flig manner assuring prime status.
MG- 011	Plan, Manufacturing Detailed Flow and Inspection (Assembly Diagram)	A hardware flow plan for sequential fabr
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^{*} KEY INFORMAL DATA

DATA ITEM LIST/USER MATRIX

															
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2 of 3	
DATA ITEM MANUFACTURING	DESCRIF
PROCEDURES	
Procedure, Manufacturing Operating	Defines the controls and manufacturing into detailed shop planning.
Manufacturing Standing Instructions (MSIs)	
RECORDS	
Record, Methods and Tool Sheets	
Sheet, Planning Fabrication/Assembly	A detailed step-by-step instruction for a sequence, including implementation step
REPORTS	
Report, Line of Balance	Report to determine planned manufactural actual performance in meeting overall s
* Report, Producibility	Summarizes the producibility analysis a potential problem areas caused by design good control during fabrication.
* Report, Receiving	
* Report, Stock Inventory	This report is used to determine the available hardware needed for meeting fabrication lished reorder cycle.
	PROCEDURES Procedure, Manufacturing Operating Manufacturing Standing Instructions (MSIs) RECORDS Record, Methods and Tool Sheets Sheet, Planning Fabrication/Assembly REPORTS Report, Line of Balance * Report, Producibility * Report, Receiving

^{*} KEY INFORMAL DATA

DATA ITEM LIST/USER MATRIX

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	3 of 3	
DATA ITEM Number	DATA ITEM	DESCRIP
	MANUFACTURING	
	REPORTS (Cont'd)	
MG- 020	Report, Fabrication/Assembly	
MG- 021	Report, Hardware Status	
	REQUESTS	
MG- 012	*Request, Manufacturing Planning	A production control request specifying a manufacturing operations to be performed
MG- 013	*Request, Special Tool(s)	A request to build special tools for the magnetic acoustic drawing so that changes may
	SCHEDULES	
MG- 014	Schedule, Detail Assembly	
MG- 015	Schedule, Shop Loading	
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DATA ITEM LIST/USER MATRIX

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U - USE R - REVIEW AUTHORITY

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PM - PROJECT MANAGER A

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USER FLOW DIAGRAMS

Manufacturing Data User Flow Diagrams have been developed to show the time phasing functions and data uses during the Voyager Program. The principal feature of these diagrams is the identification of functions which interface with systems office, contractor Voyager Project and procurement source activities.

Following contract award, early emphasis is placed on preparation of the major subcontractor's work statements and schedule requirements. After systems design review, and continuing through launch, major manufacturing activities are:

SDR through PDR

- Finalize manufacturing plan.
- Formulate make or buy plan.
- Review subcontractor make or buy plans.
- Conduct producibility engineering studies on contract technical requirements.

PDR through HDR

- Develop manufacturing operating procedures.
- Continue producibility engineering evaluations.
- Establish plan to meet storage requirements.
- Develop special tooling drawings.
- Prepare detailed procurement plan.
- Procure component parts and materials.
- Prepare hardware sterilization and handling manuals.
- Fabricate thermal and structural model hardware.

HDR through CDR

- Update manufacturing technical procedures, plans, and schedules.
- Fabricate or modify tools, jigs and fixtures.
- Review engineering model drawings and material requirements.
- Procure component parts.

- Fabricate engineering model components.
- Receive and checkout purchased materials.

CDR through FACI

- Prepare purchase requisitions for substituted parts and materials.
- Evaluate suppliers and quotes.
- Establish resident prime contractor production engineers at selected subcontractors.
- Update Manufacturing Standing Instructions.
- Procure, fabricate and assemble TA, PTM & OSE hardware.

FACI through MAR

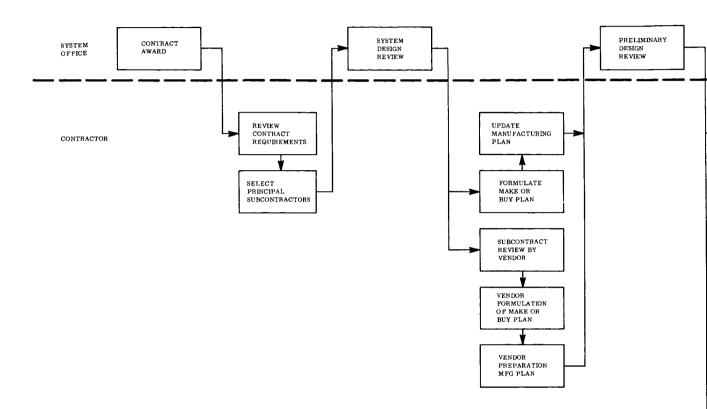
- Modify tools, jigs and fixtures.
- Establish packing and shipping and storage procedures for launch operations.
- Release all flight hardware purchase orders.
- Reevaluate fabrication and assembly techniques.
- Fabricate and assemble FA and OSE.
- Submit hardware for mission acceptance review.

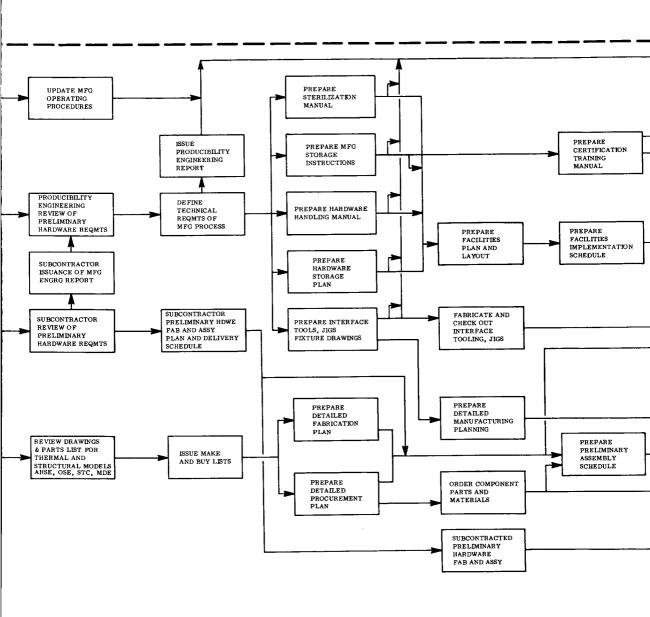
MAR through Launch

- Pack and ship flight articles and OSE.
- Receive and store hardware at launch site.
- Provide manufacturing support for launch operations.

Manufacturing User Flow Diagrams

Figure Number	<u>Title</u>
C-1	Manufacturing User Flow Diagram - Summary (2 sheets)
C-2	Manufacturing User Flow Diagram - Contract Award Through Preliminary Design Review
C-3	Manufacturing User Flow Diagram - Preliminary Design Review Through Hard Design Review (2 sheets)
C-4	Manufacturing User Flow Diagram - Hard Design Review Through Critical Design Review (3 sheets)
C-5	Manufacturing User Flow Diagram - Critical Design Review Through First Article Configuration Inspection
C-6	Manufacturing User Flow Diagram - First Article Configuration Inspection Through Launch





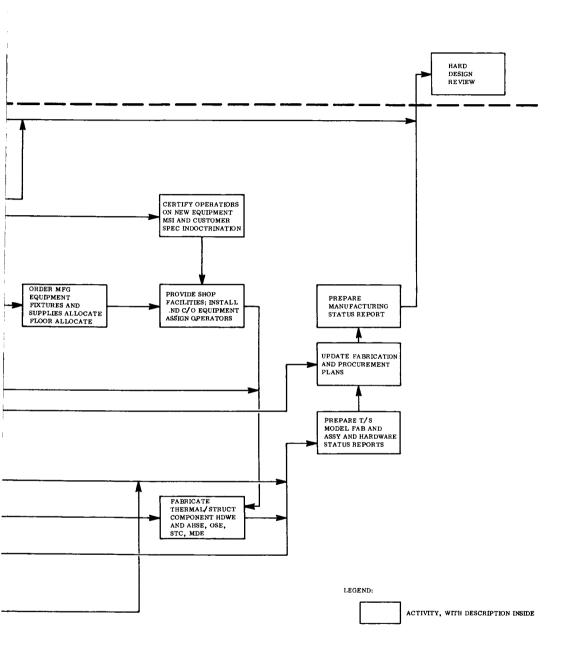
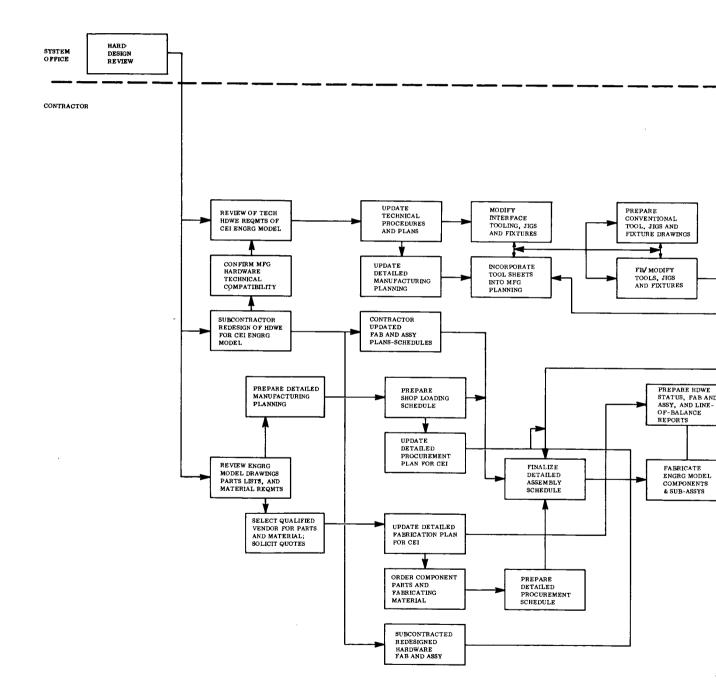
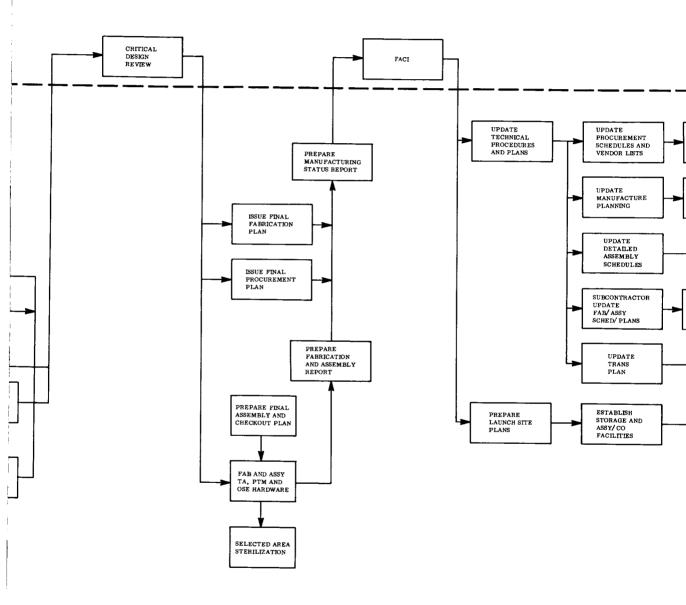


Figure C-1. Manufacturing User
Flow Diagram - Summary
(Sheet 1 of 2)









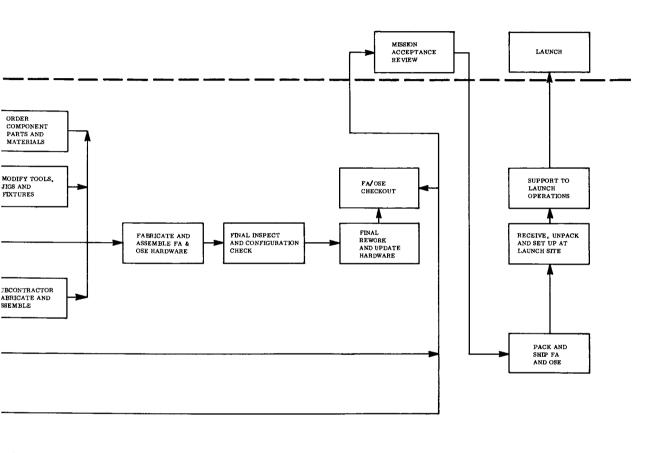
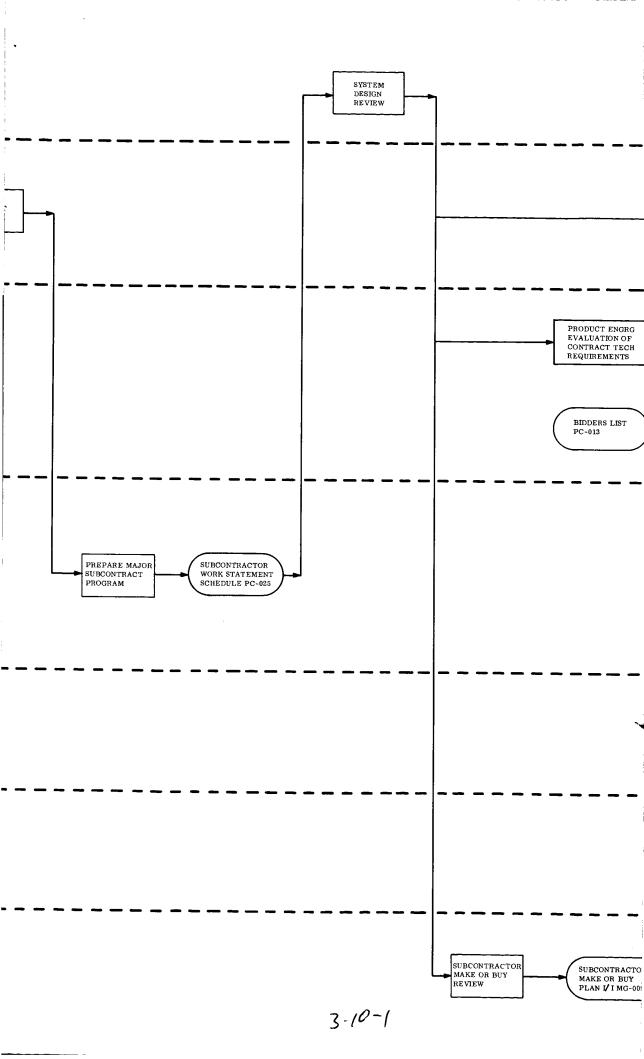


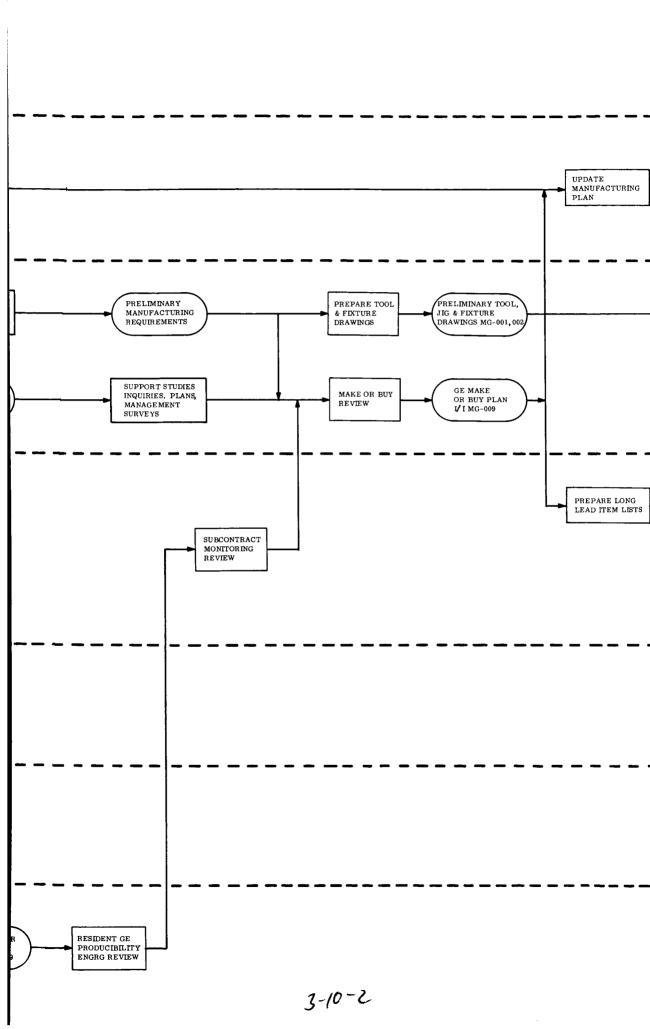


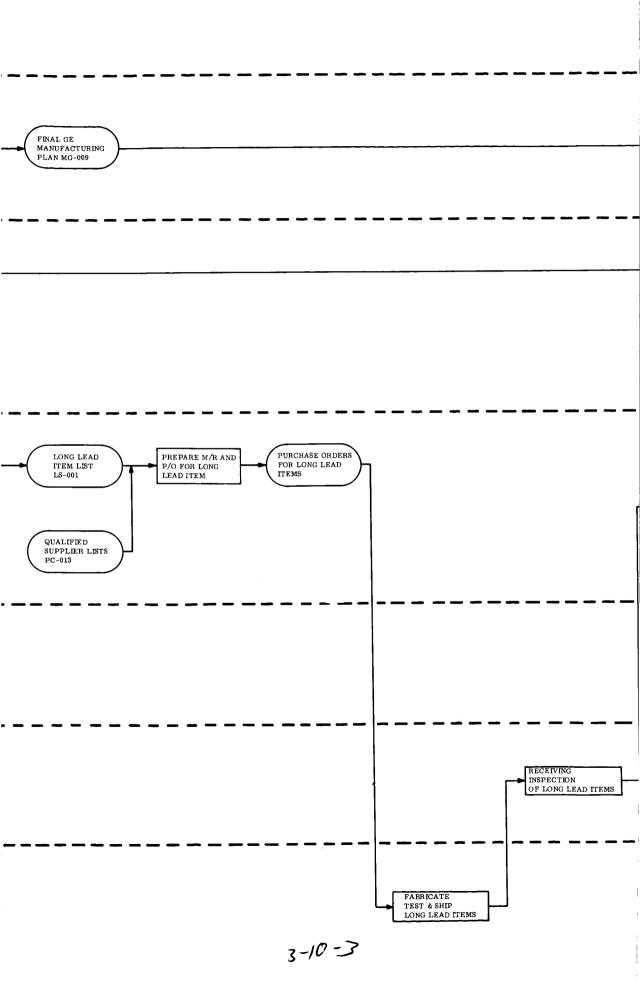
Figure C-1. Manufacturing User Flow Diagram - Summary (Sheet 2 of 2)

SYSTEM OFFICE	CONTRACT SPECS & WORK STATEMENT SCHEDULE)	
CONTRACTOR			_ ~
MANU FACTURING PLANNING & STATUS		PROJECT PLAN & SCHEDULE MA-007	REVIEW CONTRAC AND WORK SCHEDULI
TECHNICAL DEFINITION AND SUPPORT			
PRODUCTION CONTRO AND PROCUREMENT	DL		
FABRICATION AND ASSEMBLY			
STOCK & INVENTORY STORAGE			
			

SUBCONTRACTOR VENDOR







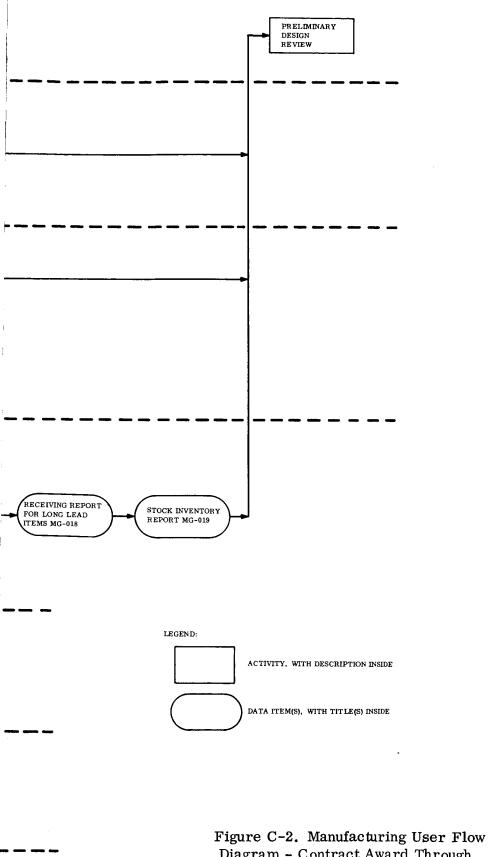
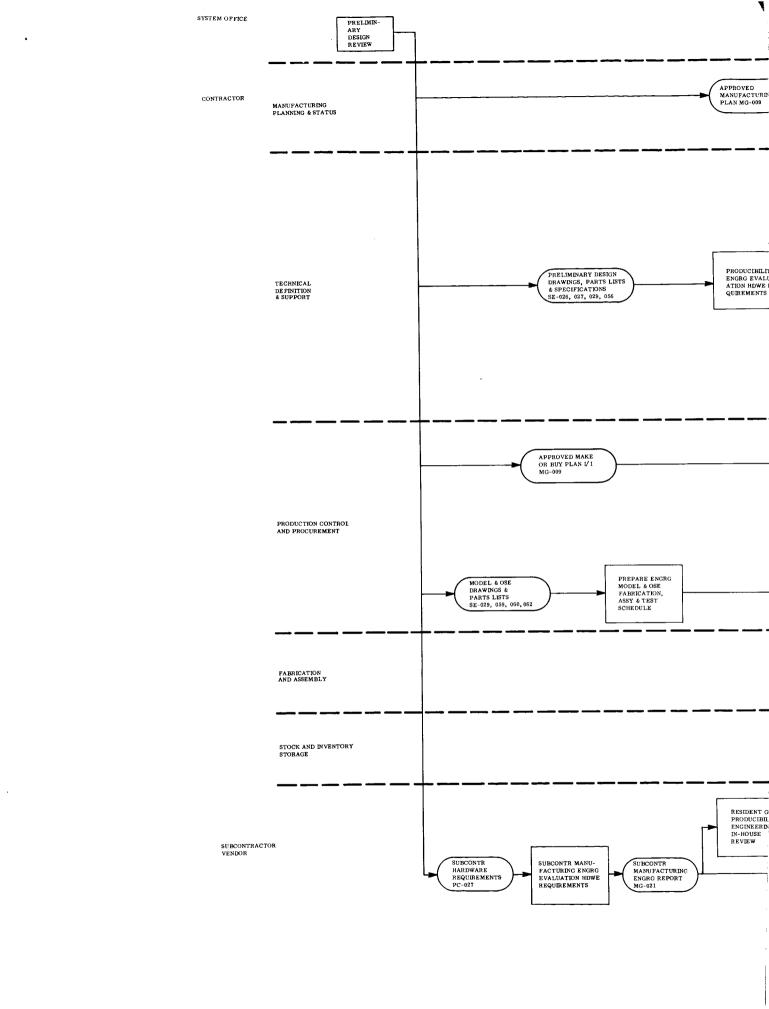
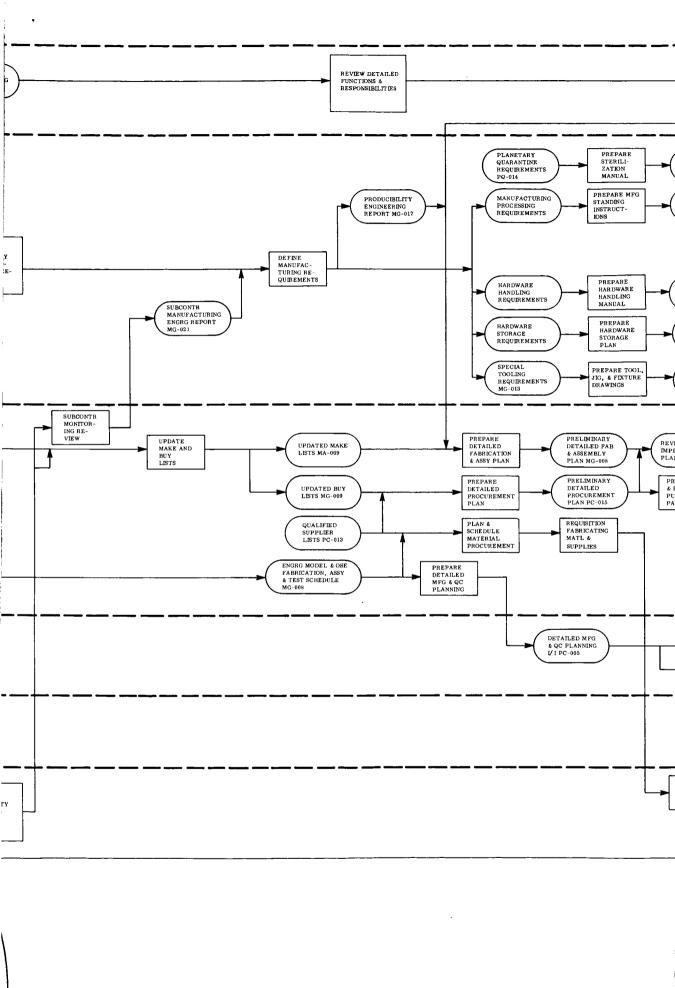


Diagram - Contract Award Through Preliminary Design Review





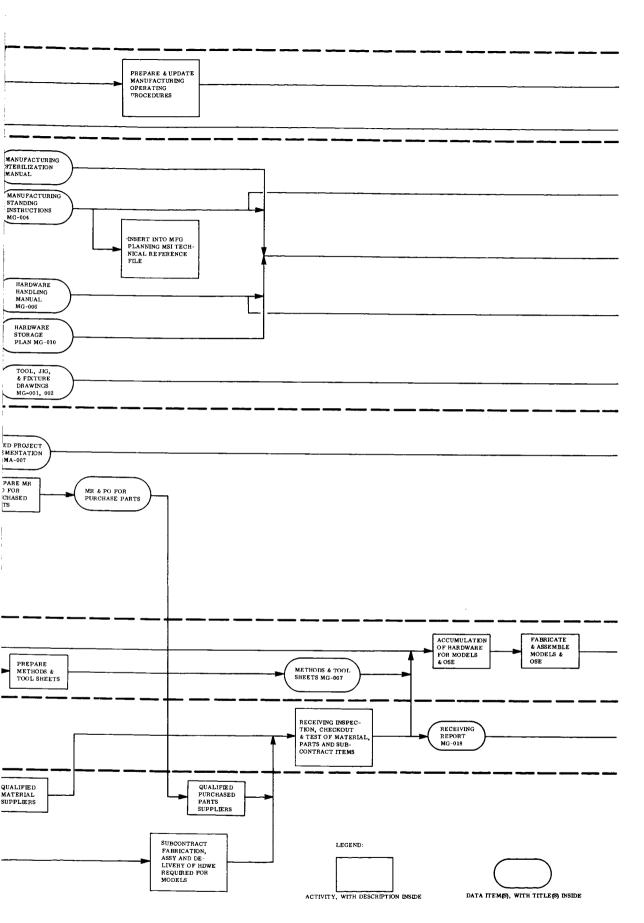
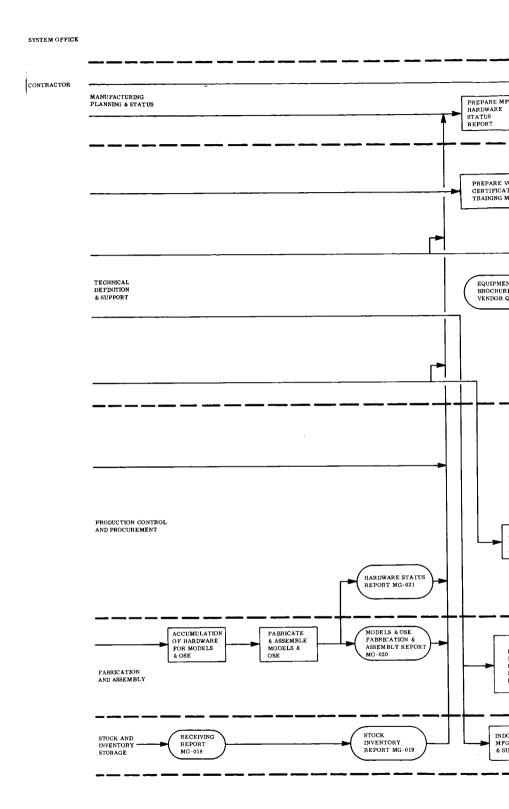
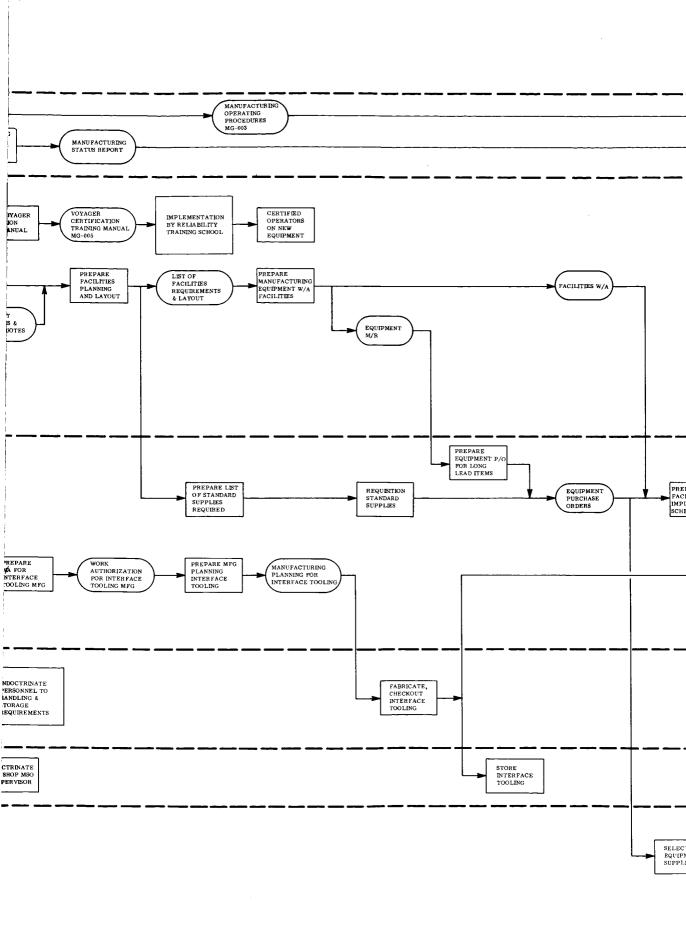


Figure C-3. Manufacturing User Flow Diagram - Preliminary Design Review Through Hard Design Review (Sheet 1 of 2)



SUBCONTRACTOR VENDOR



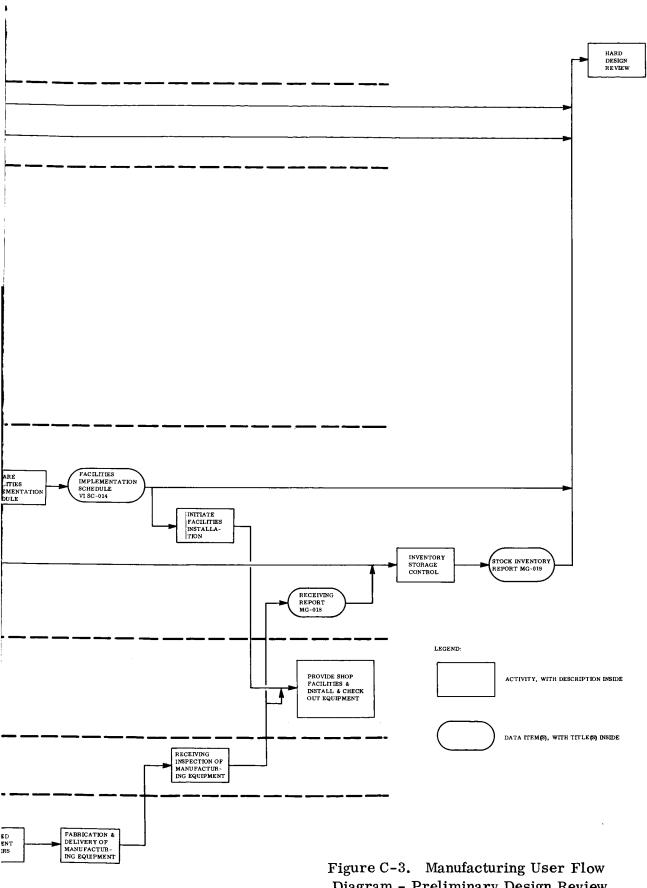
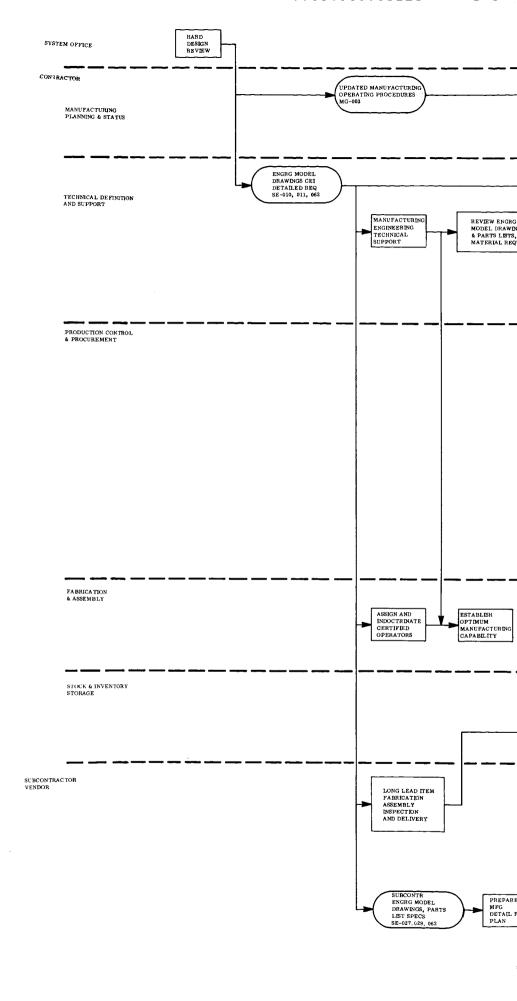
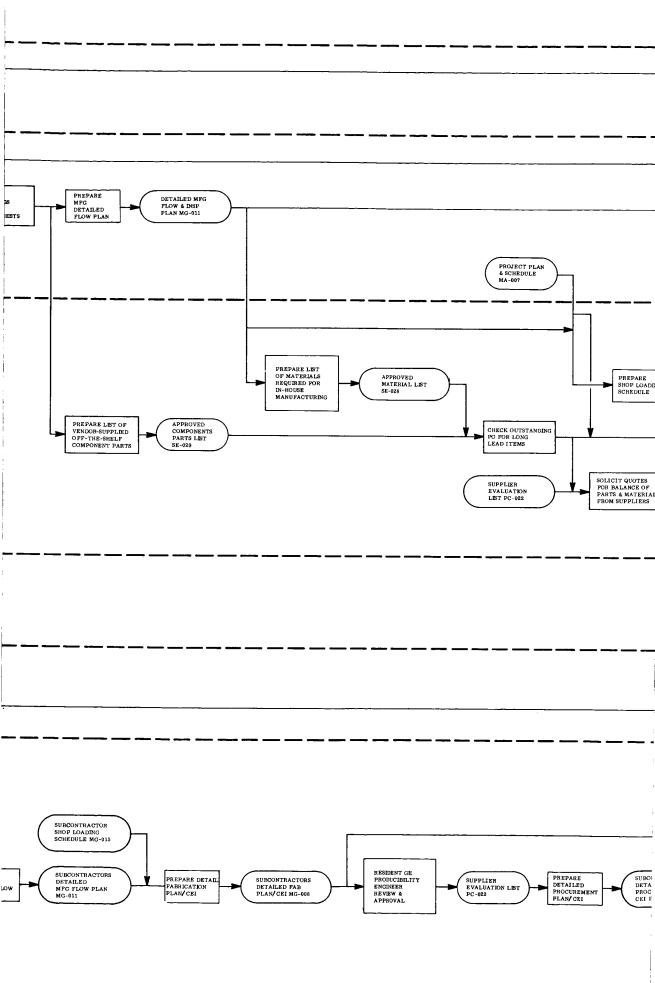
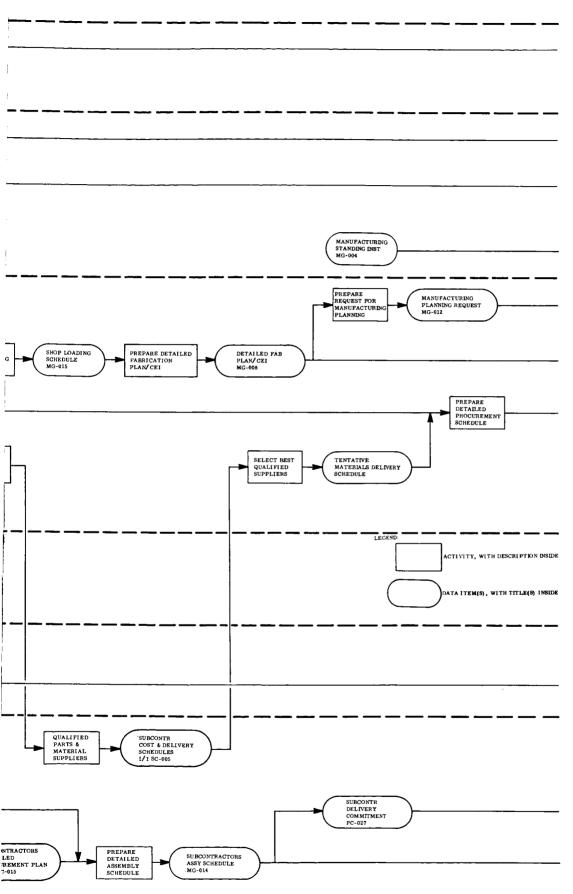


Figure C-3. Manufacturing User Flow Diagram - Preliminary Design Review Through Hard Design Review (Sheet 2 of 2)





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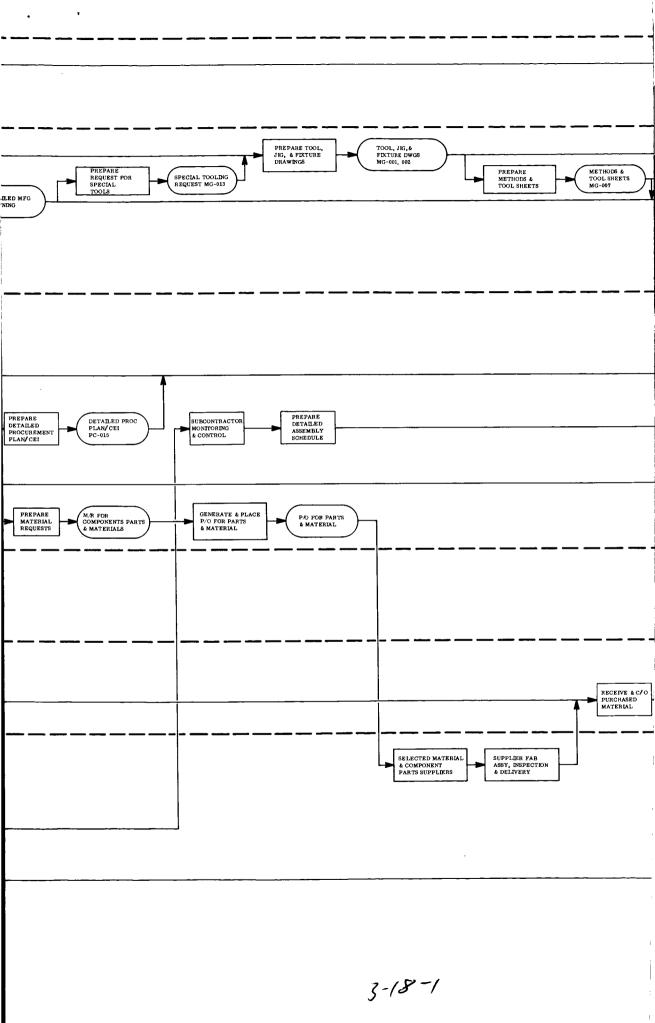
Figure C-4. Manufacturing User Flow
Diagram - Hard Design Review Through
Critical Design Review
(Sheet 1 of 3)

3-16-2



SUBCONTRACTOR VENDOR

SUBCONTRACTOR
DELIVERY
COMMITMENT
PC-027



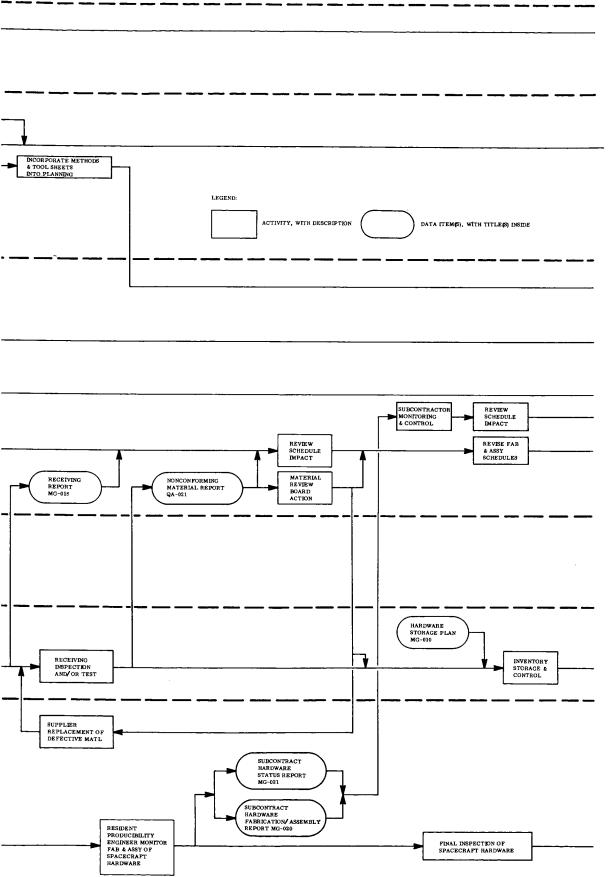
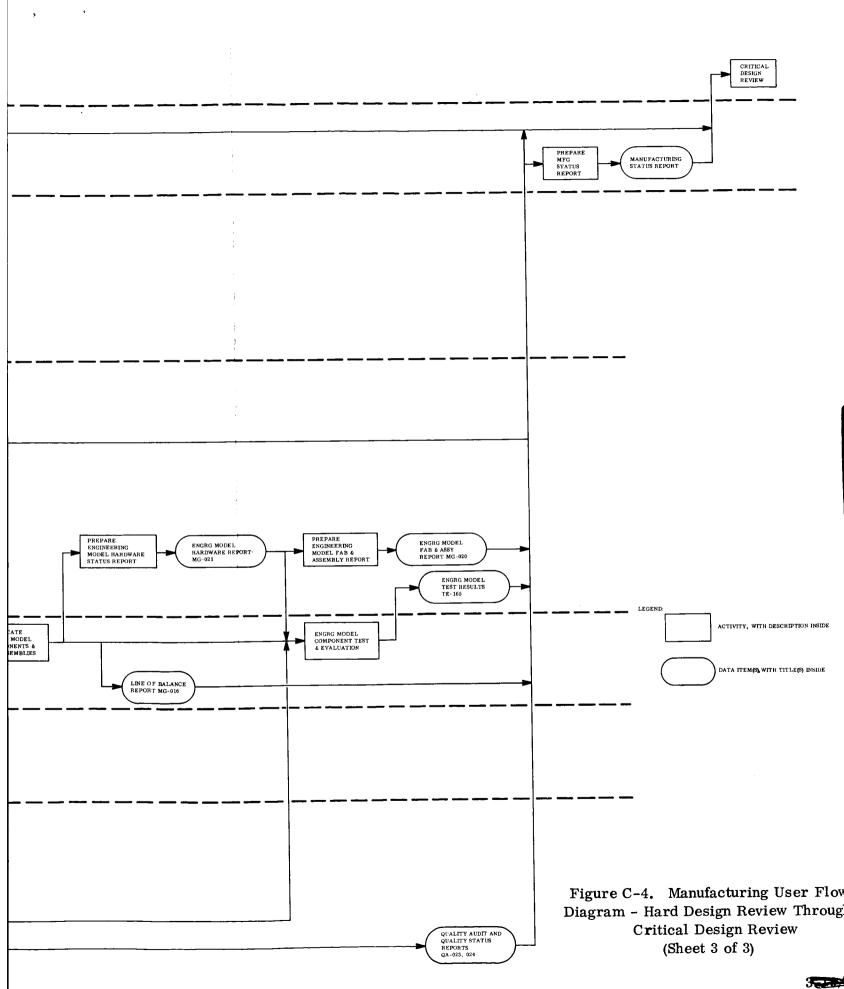
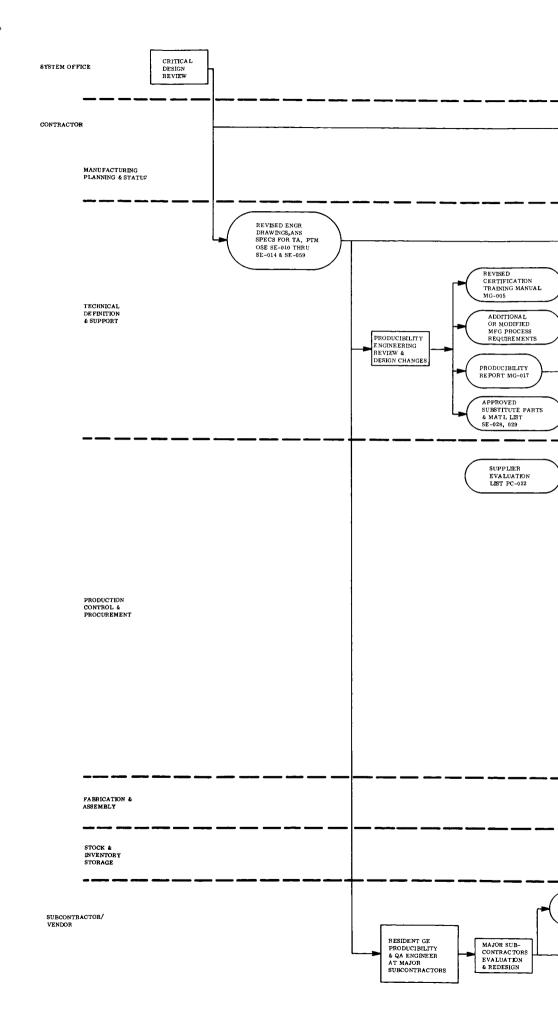
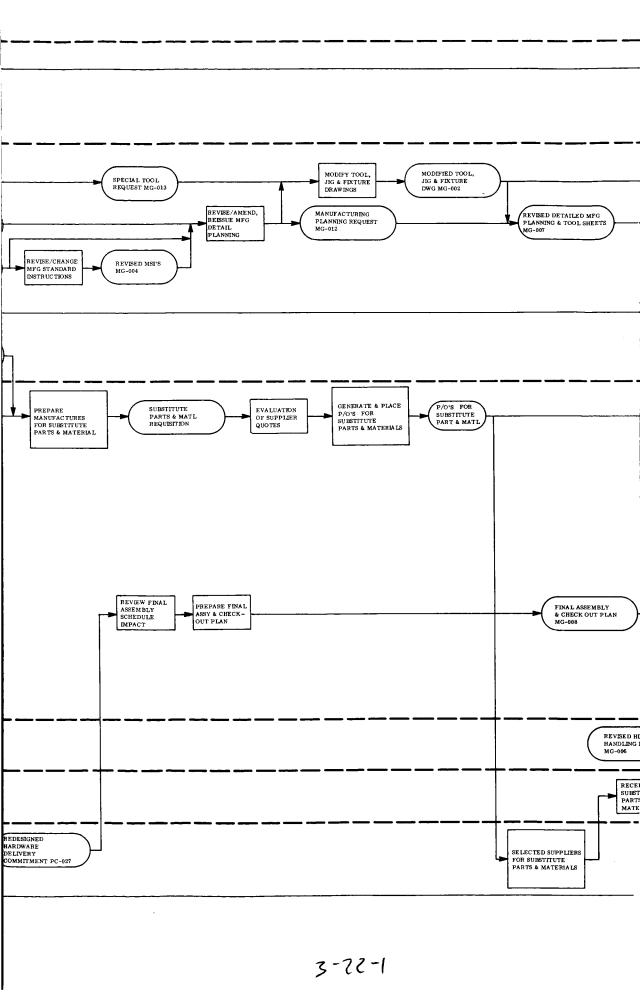
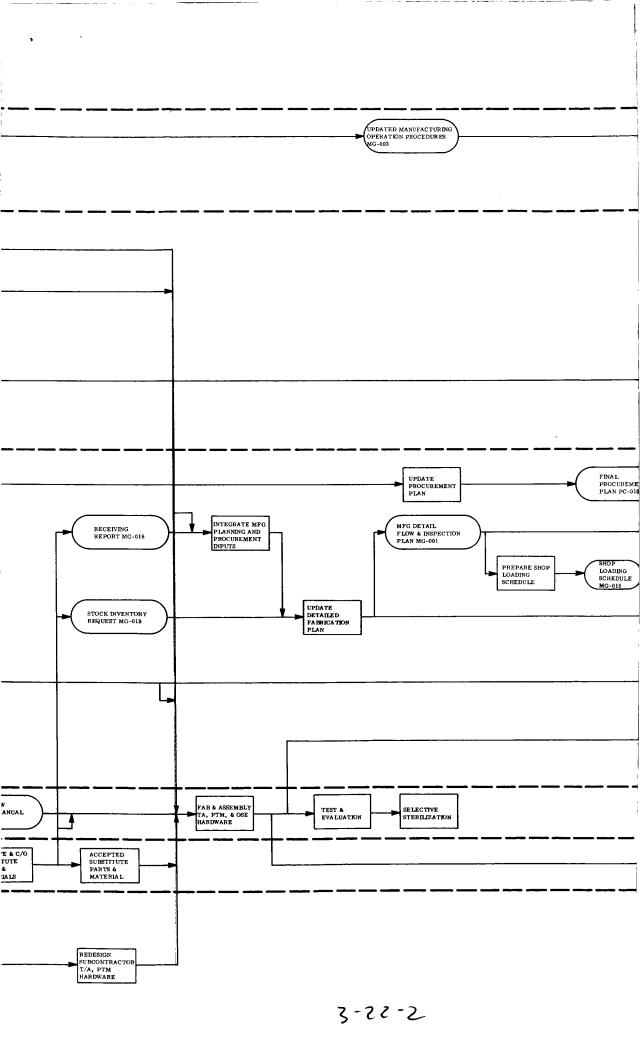


Figure C-4. Manufacturing User Flow Diagram - Hard Design Review Through Critical Design Review (Sheet 2 of 3)









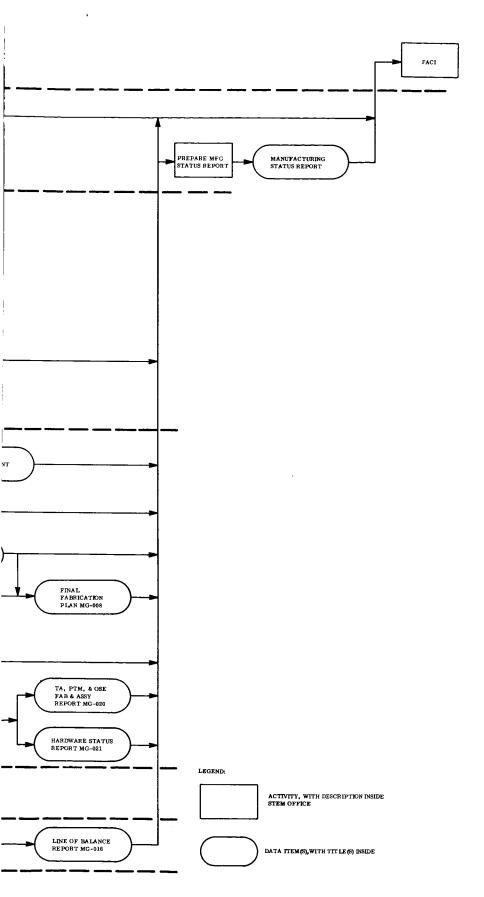
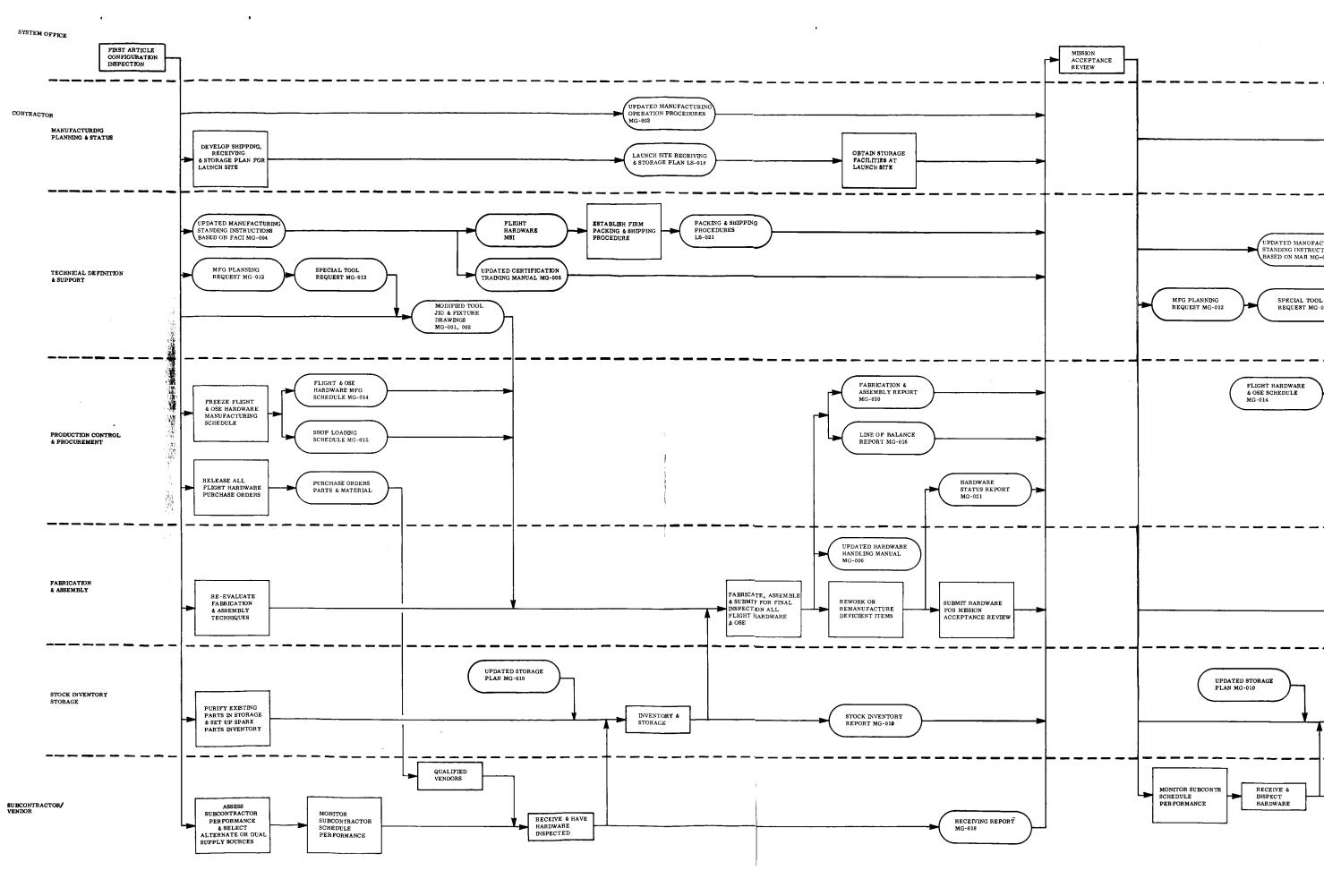
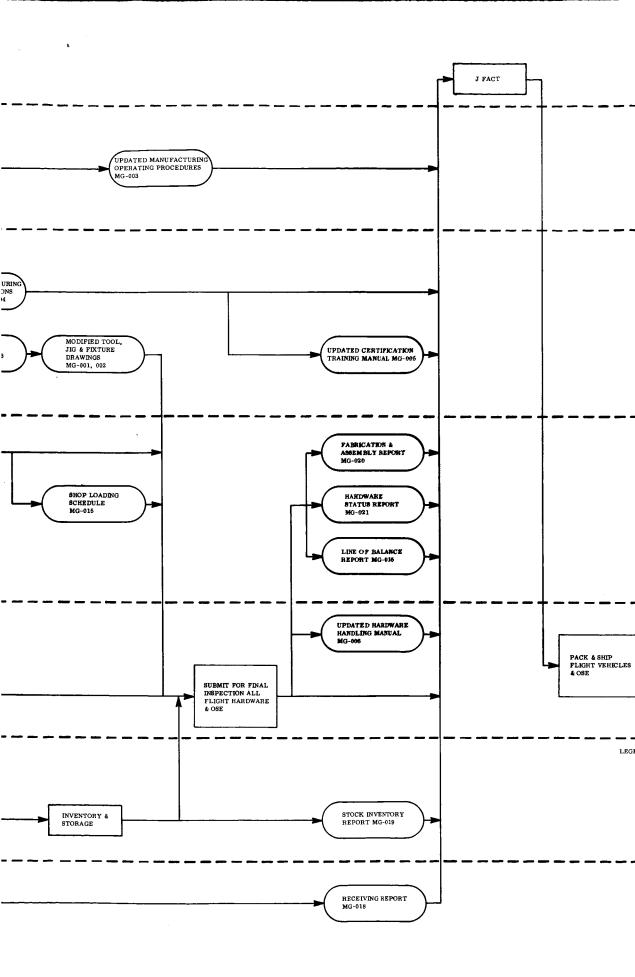


Figure C-5. Manufacturing User Flow Diagram - Critical Design Review Through First Article Configuration Inspection







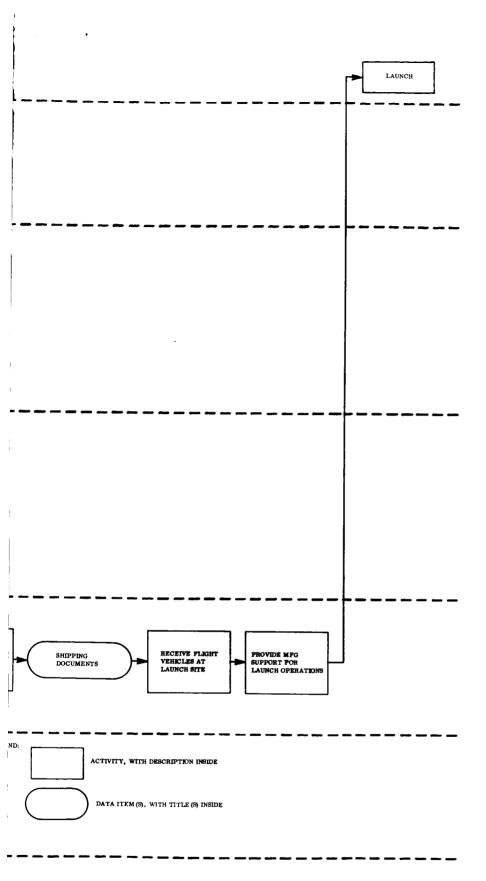


Figure C-6. Manufacturing User Flow
Diagram - First Article Configuration
Inspection Through Launch



Manufacturing Data Requirement Descriptions

DRD Number	<u>Title</u>
MG-001	Drawings, Interface Tools, Jigs and Fixtures
MG-002	*Drawings, Tools, Jigs and Fixtures
MG-003	Procedure, Manufacturing Operating
MG-004	Manufacturing Standing Instruction (MI)
MG-005	*Manual, Certification and Training
MG-006	*Manual, Hardware Handling
MG- 007	Record, Methods and Tool Sheet
MG-008	Sheet, Planning, Fabrication/Assembly
MG-009	Plan, Manufacturing
MG-010	Plan, Storage
MG-011	Plan, Manufacturing Detailed Flow and Inspection (Assembly Diagram)
MG-012	*Request, Manufacturing Planning
MG-013	*Request, Special Tool(s)
MG-014	Schedule, Detail Assembly
MG-015	Schedule, Shop Loading
MG-016	Report, Line of Balance
MG-01 7	*Report, Producibility
MG-018	*Report, Receiving
MG-019	*Report, Stock Inventory
MG-020	Report, Fabrication/Assembly
MG-021	Report, Hardware Status

^{*}Key Informal Data

VOYAGER DATA REQUIREMENT DESCRIPTION			DRD APPROVED BY:		DATE:	DATA CATEGORY:			
					·			<u> </u>	
ORGANIZATION ORIGINATING REQUIREMENT:	CODE: C	OFFICE RESPONSIBLE FOR (DRD: COD	l l	ARED BY: F. Smyth	DATE: 7/28/67	CONTRACT NO.:	DRD NO.: MG-001	
TITLE OF DOCUMENT:	<u> </u>				organization re for document p Manufacturii	PREPARATION:	TASK OR SUBTASK:	DRL ITEM NO.:	
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SPECIAL DISTRIBUTION: (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)
OUTLINE OF CONTENTS:
1. These drawings shall include all the information necessary to fabricate the tooling. They will include sufficient information to satisfy the needs for acquiring identical items as defined in MIL-D-1000.
2. These drawings shall conform to the requirements for Form 2 drawings as specified in MIL-D-1000.
3. A set of drawings for tooling shall consist of, as appropriate, those drawings specified in MIL-STD-100 and shall meet the requirements specified therein.
4. Drawings shall be maintained current with the configuration of the tooling.

JPL 2568-1 OCT 65

ORGANIZATION ORIGINATING CODE: OFFICE RESPONSIBLE FOR DRD: CODE: DRD PREPARED BY: T. F. Smyth 7/28/67 MG-002 T. F. Smyth 7/28/67 MG-002 T. F. Smyth 7/28/67 MG-002 T. F. Smyth 7/28/67 T. F. S					DRD APPROVED B	Υ:	DATE:	DATA CATEGORY:	
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OUTL	INE OF CONTENTS:	
1.	These drawings shall include all the information necessary to fabricate the tooling a as certification and verification of their proper calibration and suitability.	s well
2.	These drawings shall consist of, as appropriate, those drawings specified in MIL-STD-100 and shall meet the requirements specified therein.	
3.	Drawings may be prepared in conformance to the Form 3 requirements of MIL-D-10	000.
4.	The following relaxed provisions are applicable: a. Noncritical dimensions may be indicated as nominal, minimum or maximum b. Noncritical surfaces need not be indicated. c. Common hardware and materials may be specified by their commercial desired. Marking of parts may be omitted. e. Scale need not be maintained.	

(CONTINUE ON THIRD SHEET, IF NECESSARY, AND AFFIX TO THIS DRD.)

Free hand drafting may be used if desired.

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OUTLINE OF CONTENTS:
The procedures define the internal administrative and functional manufacturing responsibilities to meet the overall program objectives and requirements and consist of the following:
1. Purpose
2. Definitions of terminology
3. Detailed description of procedure
4. Number of procedure
5. Date issued
6. Revision status

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SPECIAL INS	TRUCTIONS	DRD NO.: MG-004
The app	roved parts list will be the basis for determining materials to be d in the MSI for use in the fabrication processes.	
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OUTLINE OF	CONTENTS:	
1.	Subject and scope	
2.	Related material and process specifications	
3.	Materials and equipment to be used	
4.	Safety precautions	
5.	Detailed description of the process, including the use material and the critical control procedures	
6.	Criteria for in-process and final inspection of process results	

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OUTLINE OF CONTENTS:	
This document will define the following:	
 Outlines all processes requiring training certification. Course content. 	
3. Identifies certification and recertification periods for the various processes.	
4. Instructions for operator training and good workmanship acceptance criteria are base	ed
on approved NASA and military training school documents.	
5. Pictorial illustration for defining good workmanship.	
6. Delineates approved ancillary materials to support the process and the approved process.	ess
equipment. 7. Defines the approved training time requirements for certification.	
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OUTLINE OF CONTENTS:	
This document will define the following:	-Electrical and chain hoists
Lifting and turnover slings -	-Rider fork and pallet trucks -Handling and installation fixtures
	-Sketches and drawings will be included
The manual specifies the procedure that must be in specific detail the "Do" and the "Do Not" me accomplish is identified to the various subasses number if applicable.	thods that will be used. The how to

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MG-008, Sheets, Planning, Fabrication	•	•	SEMI-ANNUAL	LY	PD	R	
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Sketches are recommended to describe more clearly the operation and/or use of the tool. A second sheet is supplied with the form for this purpose.	
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SPECIAL DISTRIBUTION: (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)	
OUTLINE OF CONTENTS:	_
1. Drawing number of parts or assemblies upon which the operation or tool was us	ed.
2. Operation name, i.e., milling, drilling, etc.	
3. Work station designation.	

- 4. Operation cycle time.
- 5. Detailed description of method to be employed including instructions for use of tools.
- 6. Revision status of the record sheet and current issue date.
- 7. Planner's name (original).
- 8. Date planned (original).

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VOYAGER DATA REQUIREMENT DESCRIPTION - 2ND SHEET
SPECIAL INSTRUCTIONS: MG-008
Changes to Planning, Fabrication/Assembly are made in response to alteration notices (AN's) of hardware drawing changes. Changes are recorded on the change record sheet.
SPECIAL DISTRIBUTION: (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)
outline of contents: 1. Part or assembly drawing reference 2. Program name
3. Planner's name 4. Planning bill of material (if required) 5. Tool and fixture list
6. Work station designation 7. Operation standard times
8. Detailed step-by-step fabrication or assembly instructions 9. Detailed step-by-step inspection instructions 10. Method sheets (as required)
11. Change record sheet

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SPECIAL INSTRUCTIONS: MG-009
SPECIAL DISTRIBUTION: (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)
OUTLINE OF CONTENTS:
The Manufacturing Plan defines the following: 1. Functional responsibilities and organizational elements 2. Facilities required
3. Manpower levels required 4. Program, detail assembly, shop and procurement schedules that will be used
 5. Labor reporting system that will be used 6. Documentation systems (formal and informal) 7. Stock keeping philosophy and method of charging materials and standard stock items
8. Transportation system to be used on the program 9. Logistic support
10. Hardware handling procedures 11. Preliminary make or buy decisions

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OUTLINE OF CONTENTS:	
1. Purpose and scope	
2. Applicable documents	
3. Reference	
4. Matrix of items to be stored	
5. Storage schedule	
6. Environmental requirements	
7. Handling and protection	
8. Control procedures	
9. Interface checking equipment - special requirements and agreements	
10. Revision status	
(CONTINUE ON THIRD SHEET, IF NECESSARY, AND AFFIX TO THIS DRD.)	

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PAGE I OF 2

VOYAGER DATA REQUIREMENT DESCRIPTION - 2ND SHEET	
SPECIAL INSTRUCTIONS:	DRD NO.:
The manufacturing hardware flow plan is especially useful when alternate assembly sequences are requested because of late deliveries, incorporation of alteration notices, etc.	
SPECIAL DISTRIBUTION: (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)	
OUTLINE OF CONTENTS:	
This plan will be in the form of a diagram and contain the following:	
1. The flow of hardware in the normal buildup of the hardware.	
2. It will show the test cycles of the various subassemblies, the location of them an	ıd

- 2. It will show the test cycles of the various subassemblies, the location of them and also their duration.
- 3. The terminal location of certain specific subassemblies beyond which the assembly cannot continue until the designated operations are performed.
- 4. The timing sequence for the availability of the shipping containers and handling dollies.
- 5. The inspection stations for the assembly buildup.
- 6. Subassembly drawing numbers.
- 7. Manufacturing and inspection operation numbers (correlated to the applicable planning).

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OUTLINE OF CONTENTS:		
1.	Drawing number of part or assembly to be planned	
2.	Description of item (i.e., name or designation)	ļ
3.	Quantity required	
4.	Date planning required	
5.	Date planning promised	
6.	Actual completion date	
7.	Program name	
8.	Shop order number	
9.	Requestor's name and phone number	1
10.	Planner's name and phone number	
11.	Production control code	

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OUTLIN	NE OF CONTENTS:	
1.	Part or assembly drawing number of item requiring the tool	
2.	Shop order number	
3.	Requestor's name	
4.	Program name	
5.	A detailed description of tool desired and of its specific use. This may include ske	etches.
6.	Proposed vendor (if applicable)	
7.	Date tool is required	
8.	Number and date of request	

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OUTLINE OF CONTENTS:	
This document will define the following:	
1. A list of all parts and subassemblies	
2. The date the items on the list will be delivered to test	
3. The date the items on the list will be delivered to stock4. The date the vendor will deliver the items that are purchased	
5. Fabrication and test cycle times	
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OUTLINE OF CONTENTS:	
This document will contain the following:	
1. A list of all parts and subassemblies that will be fabricated in house	
2. The date the item will be delivered to test or stock whichever is applicable3. The number of hours allocated to the job	
4. The quantity of items required	
5. Remarks (problems anticipated, slippage dates, etc)	
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	MG			T.F. S	Smyth	7/28/67		MG-016
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VOYAGER DATA REQUIREMENT DESCRIPTION - 2ND SHEET
SPECIAL INSTRUCTIONS: DRD N MG-0
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OUTLINE OF CONTENTS: The report shall consist of the following three interrelated charts:
1. Objective Chart - Cummulative graph of quantity of items versus schedule time.
2. <u>Production Plan Chart</u> - Manufacturing cycle chart depicting predicted fabrication time versus time left to complete to meet project schedule.
3. Progress Chart - Depicts planned rate of production to meet project schedule against which actual hardware status is plotted.

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VOYAGER DATA REQUIREMENT DESCRIPTION - 2ND SHEET

SPECIAL INSTRUCTIONS:

DRD NO.: MG-017

The Producibility Report may be used to document requests for producibility changes in the event agreement cannot be reached verbally between the design engineer and the producibility engineer and the producibility engineer does not sign the drawing.

SPECIAL DISTRIBUTION: (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)

OUTLINE OF CONTENTS:

- 1. Name of hardware item
- 2. Drawing number
- 3. Producibility engineer's name
- 4. Memorandum number
- 5. Distribution list
- 6. A detailed review of those design features and requirements which are deemed to be excessively difficult and/or costly to fabricate.
- 7. Detailed recommendations for improvements and/or changes which will render the designs more producible.

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VOYAGER DATA REQUIREMENT DESCRIPTION - 2ND SHEET

SPECIAL INSTRUCTIONS:

DRD NO.:

MG-018

The Receiving Report is prepared on one of the multiple copies of the purchase order so that the order and the record of its receipt are recorded on the same page. Copies for distribution are made of this sheet.

SPECIAL DISTRIBUTION: (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)

OUTLINE OF CONTENTS:

- 1. Purchase order number
- 2. Vendor number
- 3. Various control code numbers (internal)
- 4. Delivery instructions
- 5. Material request (MR) number and date
- 6. Shop order number
- 7. Requestor
- 8. Buyer
- 9. Order date
- 10. Price of total order
- 11. Contract number
- 12. Vendor certification status
- 13. Vendor name and address
- 14. Procurement approval
- 15. Items procured (name and quantity and price each)
- 16. Quantity received
- 17. Date received
- 18. Signature of receiving clerk.

GE EXHIBIT DRD MG-019 DATA DRD APPROVED BY CATEGORY: VOYAGER DATA REQUIREMENT DESCRIPTION DRD NO DRD PREPARED BY: CONTRACT CODE: OFFICE RESPONSIBLE FOR DRD: CODE ORGANIZATION ORIGINATING DATE REQUIREMENT MG T. F. Smyth 7/28/67 MG-019 DRL ITEM ORGANIZATION RESPONSIBLE TASK OR TITLE OF DOCUMENT: FOR DOCUMENT PREPARATION: SUBTASK: NO.: Manufacturing *REPORT, STOCK INVENTORY ORGANIZATION RESPONSIBLE DRL NO.: LEVEL NO. FOR DOCUMENT REPRODUCTION ORGANIZATION RESPONSIBLE DDL NO.; FILE NO. FOR DOCUMENT DISTRIBUTION: TYPE OF DOCUMENT: ☐ CONTROL DACTION DREFERENCE **₩** INFORMATION USE OF DOCUMENT: NO. OF COPIES: ORGANIZATION RESPONSIBLE FOR DOCUMENT STOWAGE: 5 The stock inventory report is used by production control (PC) in determining the availability of hardware INFORMATION CUTOFF ESTIMATED MANHOURS necessary to meet production schedules and in determining FOR SINGLE PREPARATION: DATE OR MILESTONE: the reorder point for additional quantities. DATE DATA DUE ESTIMATED COST (\$) INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS: FOR SINGLE PREPARATION: TO USER: Report, Receiving MG-018. PC-026, *Schedule, Project Procurement FREQUENCY OF ISSUE: PUBLICATION DATE: ANNUALLY SEMI-ANNUALLY QUARTERLY UPDATE (FREQUENCY BI-MONTHLY OR MILESTONE): MONTHLY SEMI-MONTHLY CLASSIFICATION GROUP I BI-WEEKLY Not applicable SPECIAL HANDLING □ SECRET ☐ GROUP 2 WEEKLY DAILY CONFIDENTIAL SECRET RESTRICTED DATA □ NASA DISCREET
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OUTLINE OF CONTENTS:	
The stock inventory report itemizes the following:	
 An alpha-numeric listing of all parts, ie., piece parts, electronic parts, completed assemblies and subassemblies by program. 	
2. Quantity in stock.	·
3. Stock withdrawals by quantity and date.	:
4. Usage code.	
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VOYAGER DATA REQUIREMENT DESCRIPTION - 2ND SHEET					
SPECIAL INSTRUCTIONS:	DRD NO.:				
Reports are updated weekly and constitute a continuous history of schedule problem resolution.	MG-020				
Updated reports are presented for discussion at weekly status meetings with the Manager, Manufacturing.					
SPECIAL DISTRIBUTION: (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)					
OUTLINE OF CONTENTS:					
Problem and action summary.					
 Component name and identification number Priority of action Fiscal week the problem was reported Problem statement Required action Date action promised complete Function responsible for action Name of manager preparing report and date 					

GE EXHIBIT DRD MG-021 DATE DATA DRD APPROVED BY: CATEGORY VOYAGER DATA REQUIREMENT DESCRIPTION DRD NO.: ORGANIZATION ORIGINATING CODE: OFFICE RESPONSIBLE FOR DRD: CODE DRD PREPARED BY: DATE: CONTRACT REQUIREMENT: 7/28/67 T.F. Smyth MG-021 MG TASK OR DRL ITEM TITLE OF DOCUMENT: ORGANIZATION RESPONSIBLE FOR DOCUMENT PREPARATION: SUBTASK NO.; Manufacturing REPORT, HARDWARE STATUS ORGANIZATION RESPONSIBLE DRL NO.: LEVEL NO. FOR DOCUMENT REPRODUCTION ORGANIZATION RESPONSIBLE DDL NO.: FILE NO. FOR DOCUMENT DISTRIBUTION: TYPE OF DOCUMENT ☐ CONTROL DACTION **DREFERENCE MINFORMATION** USE OF DOCUMENT: ORGANIZATION RESPONSIBLE NO. OF COPIES: FOR DOCUMENT STOWAGE. The hardware status report is used to record the status of hardware by reporting the latest schedule changes as INFORMATION CUTOFF ESTIMATED MANHOURS FOR SINGLE PREPARATION: they occur. DATE OR MILESTONE DATE DATA DUE ESTIMATED COST (\$) INTERRELATIONSHIP WITH OTHER DATA REQUIREMENTS: FOR SINGLE PREPARATION: TO USER! MG-014. Schedule, Detail Assembly FREQUENCY OF ISSUE: PUBLICATION DATE: MG-015, Schedule, Shop Loading T ANNUALLY PDR PC-003, *Report, Incentive Contract Analysis SEMI-ANNUALLY QUARTERLY UPDATE (FREQUENCY BI-MONTHLY OR MILESTONE): MONTHLY SEMI-MONTHLY CLASSIFICATION: GROUP I Weekly BI-WEEKLY ☐ SECRET GROUP 2 SPECIAL HANDLING WEEKLY ☐ NASA DISCREET
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☐ PROJECT DISCREET CONFIDENTIAL GROUP 3 ESTIMATED SECRET RESTRICTED DATA EXPIRATION DATE: OTHERWISE, AS SPECIFIED O CONFIDENTIAL RESTRICTED DATA ☐ PROPRIETARY D PUBLIC DOMAIN □ NOFORN **₩** UNCLASSIFIED REFERENCE DOCUMENTS: FORM OF DATA: KIND OF DATA: ☐ INSTRUCTION - PRINTED DOCUMENT ☐ ABSTRACT O LETTER 171 CHART C BROCHURE □ LIST ☐ DIAGRAM D BULLETIN □ LOG □ DRAWING ☐ CATALOG ☐ FILM (STATIC OR MOTION) MANUAL CONTRACT ☐ MEMORANDUM ☐ ILLUSTRATION D DIRECTIVE ☐ MODEL □ DISCLOSURE ☐ MINUTES APPLICABLE STANDARDS O PLAN ☐ RECORDING (TAPE OR DISC) ☐ ENGINEERING CHANGE ORDER ☐ PROCEDURE ☐ COMPUTER CARD ☐ REQUEST FOR ENGINEER- ☐ REGULATION COMPUTER TAPE ☐ MICROFILM (W/OR W/O CARD) ING CHANGE PROPOSAL E REPORT O SCHEDULE ☐ OTHER ☐ ENGINEERING CHANGE ☐ SPECIFICATION PROPOSAL ☐ HANDBOOK ☐ STANDARD INDEX □ VOUCHER REVIEWS AND/OR APPROVALS REQUIRED: (LIST IN ORDER OF SUBMITTAL) DRAFT DATE PREPUBLICATION PROOF DATE SUBMIT FOR REVIEW TO: -BY SUBMIT FOR APPROVAL TO: Manager, Manufacturing

GE EXHIBIT DRD MG-021				
VOYAGER DATA REQUIREMENT DESCRIPTION - 2ND SHEET				
SPECIAL INSTRUCTIONS:	DRD NO.: MG-021			
A weekly meeting is held where the latest promises are reviewed. A plan is made to improve the promises, if possible, and the hardware status is updated and reissued.				
SPECIAL DISTRIBUTION: (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)				
OUTLINE OF CONTENTS:				
The Hardware Status Report identifies the following:				
1. Lists all the parts and subassemblies by name and identification number that are required in the fabrication of the vehicle	i			
2. Depicts whether it is a make item or a buy item	į			
3. Shows current promise date of each item resulting from activities of subordinate items	;			
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DOCUMENTATION RELATIONSHIP TREES

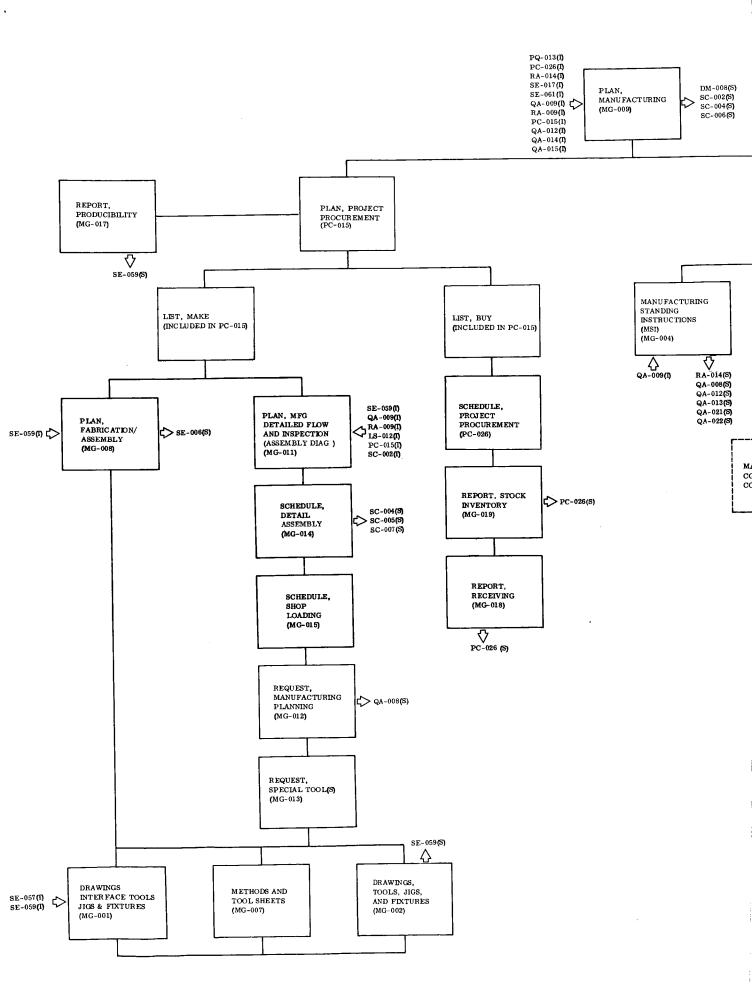
A documentation relationship tree has been prepared to show the relationships of data items within each functional category as well as their relationships across categories.

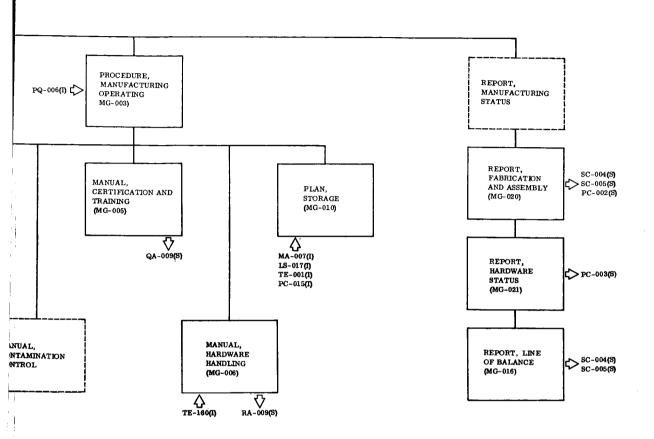
Relationships within each functional category are shown by constructing a tier pattern beginning with the top-level (or governing) data item and relating in descending order all data items within the category to this top-level data item. (The location of a data item at a given level on the diagram does not necessarily indicate the importance of that specific item but identifies and defines its relation to all other data items in that category.)

Relationships between data items in one category and data items in other functional categories are shown by (1) shaded arrows to indicate the direction of the relationship and (2) an alphabetic code to indicate the nature of the interrelationship as follows:

- a. Data items needed for preparation and/or support of the referenced item. (I)
- b. Data items that are supported or needed by this data item. (S)
- c. Data items that relate "to" and provide information of a general nature but are not required in an input or support role. (G)

Each data item appearing on the Data Item List (DIL) was examined and evaluated with respect to its contribution to, or dependence upon, data items appearing in other categories and is included in the diagrams. Additionally, certain data elements indicated in the user flow diagrams (but currently not identified as individual data items) have been shown within a dashed rectangle to clarify relationships.





LEGEND:

- (I) INDICATES DATA ITEMS NEEDED FOR PREPARATION OR SUPPORT OF THE REFERENCED ITEM (INPUT).
- (S) INDICATES DATA ITEMS THAT ARE SUPPORTED OR NEEDED BY THIS ITEM.
- (G) DATA ITEMS THAT RELATE TO AND PROVIDE INFORMATION OF A GENERAL NATURE BUT ARE NOT REQUIRED IN AN INPUT OR SUPPORT ROLE
- \bigwedge indicates principal relationship (i, s, or g) between data items in other functional categories.

[__] data element not currently identified as a data item.

Figure C-7. Manufacturing Documentation Relationship Tree (MG)



DATA ITEM PHASING/FREQUENCY

Time phasing and preparation of data items associated with the Manufacturing function are shown on the Manufacturing Data Item Phasing and Frequency Matrix, Figure C-8. The following assumptions were used as a basis for determining these estimates:

- a. Data items list of December 15, 1966, was used as the baseline.
- b. Eight equivalent spacecraft will be produced (including breadboards, structural test models, thermal test models, proof test models, system test models and two flight vehicles).
- c. Two sets of OSE will be produced.
- d. Spacecraft and OSE will consist of approximately 352 CEI's.

	••••	
e.	Each spacecraft will consist of: (estimated)	
	28 Prime equipment (CEI's) broken down into	
	36 Identification Items (CEI's) and	
	85 Engineering Critical Components (CEI's)	149
	Assume 11 Subassemblies for each Identification Item	396
	Assume 34 Subassemblies for each Engineering Critical	
	Component (CEI's)	2,040
	Total Spacecraft Assemblies	2,585
	8 Equivalent Spacecraft	20,680
f.	Each set of OSE, AHSE, MDE will consist of: (estimated)	
	36 Prime equipment (CEI's) broken down into	
	135 Identification Items (CEI's) and	
	18 Engineering Critical Components (CEI's)	
	ll Subassemblies for each Identification Item	1,485
	24 Subassemblies for each Engineering Critical Component	432
	Total OSE, AHSE, MDE Assemblies	2,106
	Two sets of OSE	4,212
g.	Estimated piece parts per spacecraft	100,000
h.	Estimated piece parts per set OSE	70,000

Distribution and density of data item preparation requirements are shown in Manufacturing Data Item Density Profile, Figure C-9. Requirements are shown as averages per month by project review periods and include both formal and key informal data items.



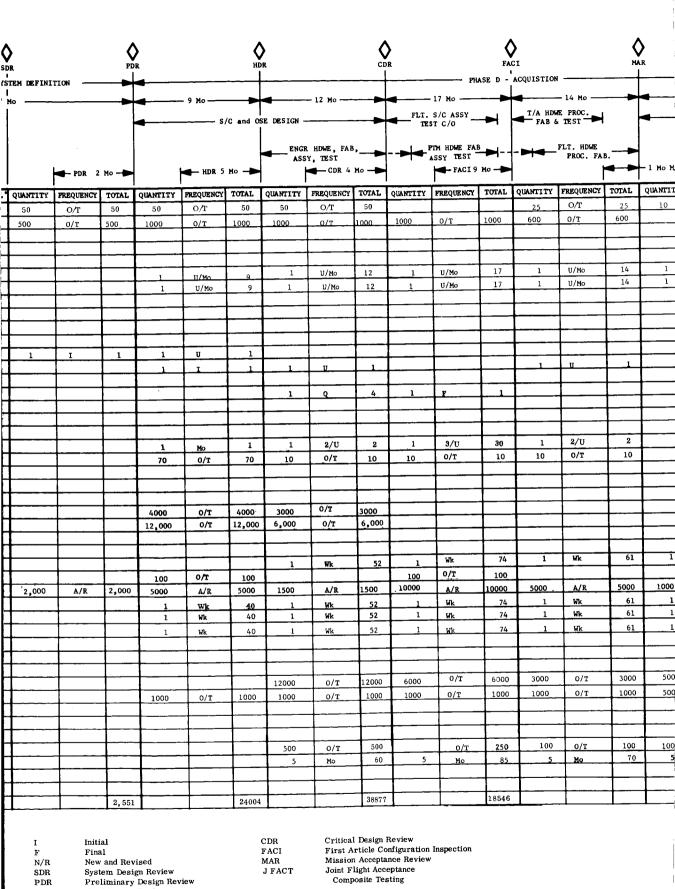
MANUFACTURING (MG)

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MO	Monthly	I/U	One Update
B/W	Bi-Weekly	DA	Daily
B/M	Bi-Monthly	Q	Quarterly



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Composite Testing

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HDR

Hard Design Review

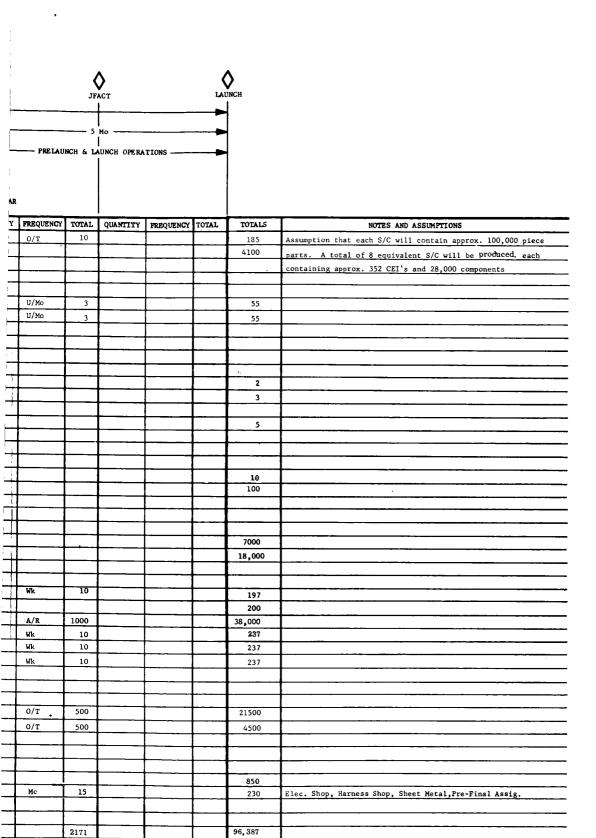


Figure C-8. Manufacturing Data Item Phasing and Frequency Matrix

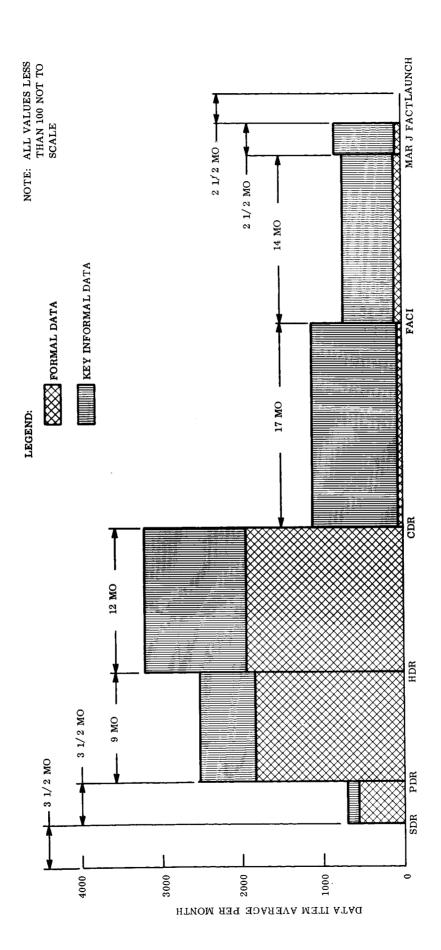


Figure C-9. Manufacturing Data Item Density Profile