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FINAL REPORT DATA MANAGEMENT STUDY APPENDIX M

CONTRACTOR DATA REQUIREMENTS SAFETY (SA)

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Voyager Spacecraft System Project

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VOYAGER SPACECRAFT SYSTEM PROJECT

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A. FRANK, COGNIZANT ENGINEER

DATA MANAGEMENT AND CONTROL TASK

VOYAGER SPACECRAFT SYSTEM PROJECT

Prepared for
National Aeronautics and Space Administration
NASA Pasadena Office
Pasadena, California

UNDER NASA CONTRACT No. NAS7-584



P.O. Box 8555 • Philadelphia, Penna. 19101

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INTRODUCTION

1.1 DEFINITION - SAFETY (SA)

These data describe the procedures, controls, methods, studies, and reporting needed to ensure the safety of Voyager operations.

1.2 SCOPE

The System Safety Engineering Plan describes the actions and activities required to ensure maximum protection of personnel, facilities and equipment associated with all phases of the Voyager Project from design to flight of the spacecraft.

The safety operation through the application of management and engineering resources will emphasize awareness and resolution of potential safety problems associated with the development, evaluation and reporting of safety.

DATA ITEM NUMBER	DATA ITEM SAFETY	DESCRIPTION
SA- 001	Plan, System Safety Engineering	Describes System Safety Engineering criteri in applicable disciplines and the approach/m during design, development, manufacturing
SA- 002	Manual, Safety	Implement general Departmental policies and cedures for handling hazardous materials; as equipment and facilities.
SA- 003	Report, Safety Training Program	Provides Safety Training for specific hazard Voyager Project.
SA- 004	Report, Systems Interfaces, Hazards and Analysis	Analysis of system and subsystems to determ modes and subsystem interfaces to determin of the total system.
SA- 005	Report, Safety Recommendations	Reports safety recommendations made by the records the action taken.
SA- 006	Report, Accident/Incident	Used to assure that accidents or incidents whave a potential to do so, are thoroughly investigated in the control of the contr
SA- 007	Minutes, Integrated Safety Board Meetings	Minutes of formal meetings of the Integrated
SA- 008	Report, Safety	Provides a summary of components analyzed acceptability, summarizes test plans review safety requirements reviewed and approved documents the results of safety audits perfor with requirements set forth in the Safety Mar
SA- 009	Directive, Safety	Communicates urgent safety requirements to Compliance is mandatory.
SA- 010	Report, Personnel Certification Program	Reports individuals by name who are certific i.e., propellant handling, system test, etc.
SA- 011	Report, Ordnance Accountability	Reports quantity and type of pyrotechnics in expended items.

^{*} KEY INFORMAL DATA

DATA ITEM LIST/USER MATRIX

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USER FLOW DIAGRAMS

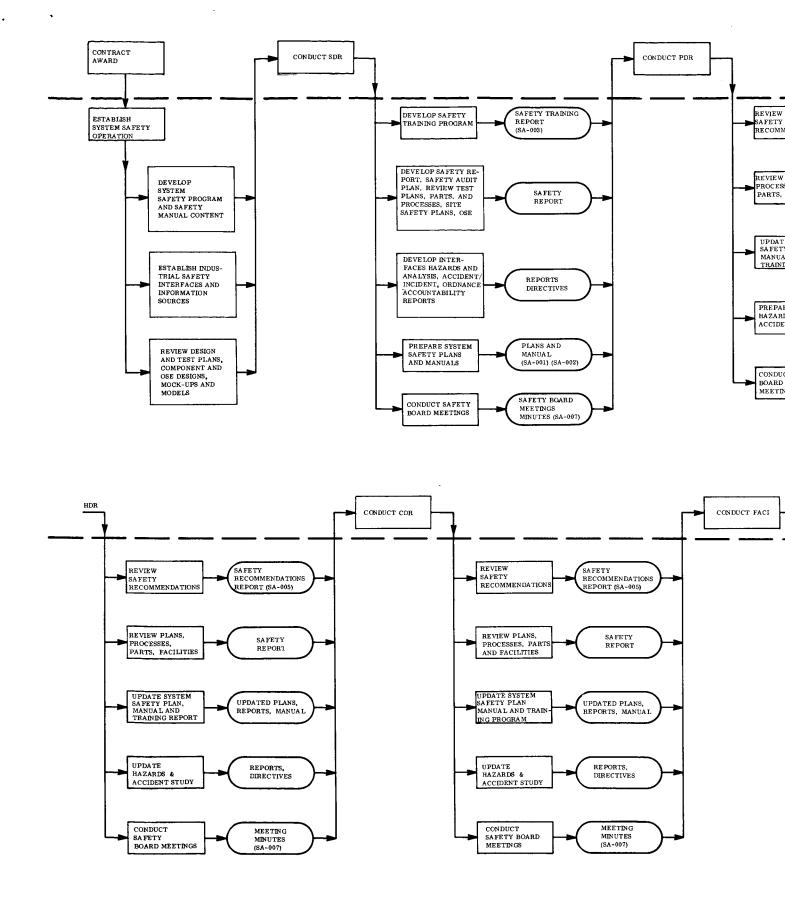
Contractor - user flow diagrams (show the relationship between Voyager system documentation and the activities undertaken by the prime spacecraft contractor. The diagrams are intended to be a communication tool which describes the project in terms which emphasize documentation and as a planning tool for the integration of data management activities into the overall project management scheme.

The project is considered in a generalized sense in that subsystems and components are each treated as collective entities; that is, the documentation flows associated with the several separate subsystems are not distinguished. A single representative flow is presented.

The drawings show the detail activities and are keyed to the formal design and hardware reviews. A generalized summary flow is also included.

Safety User Flow Diagrams

Figure Number	Title
M-1	Safety User Flow Diagram - Summary
M-2	Safety User Flow Diagram - Contract Award Through Critical Design Review
M-3	Safety User Flow Diagram - Critical Design Review Through Launch



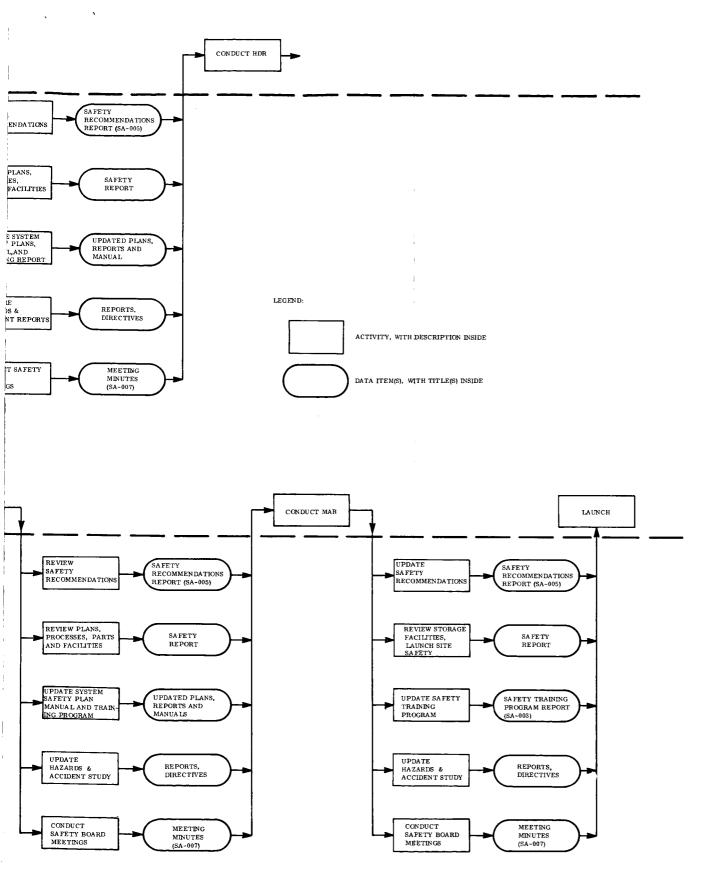
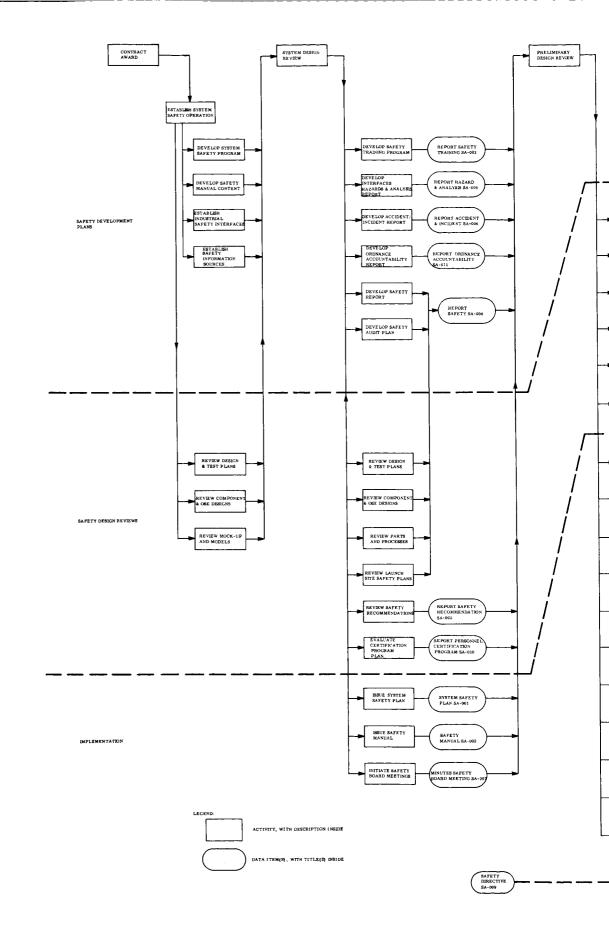


Figure M-1. Safety User Flow Diagram - Summary



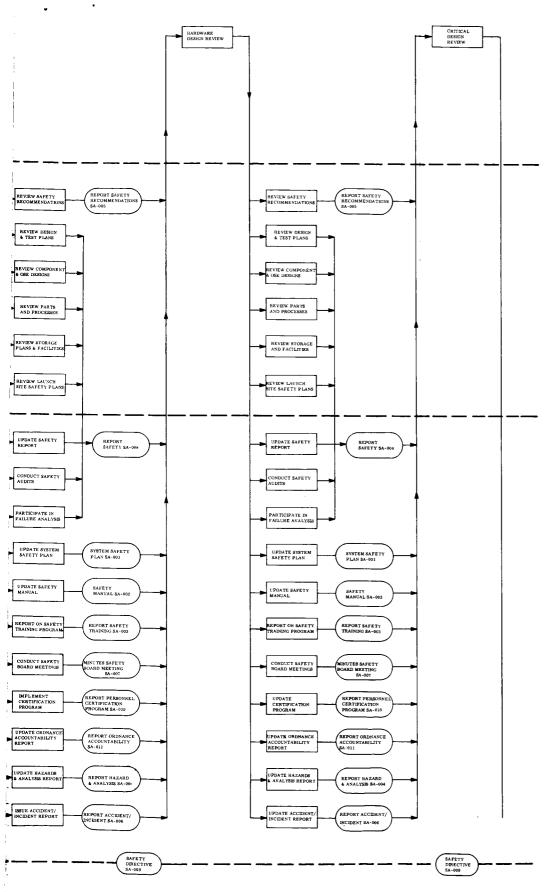
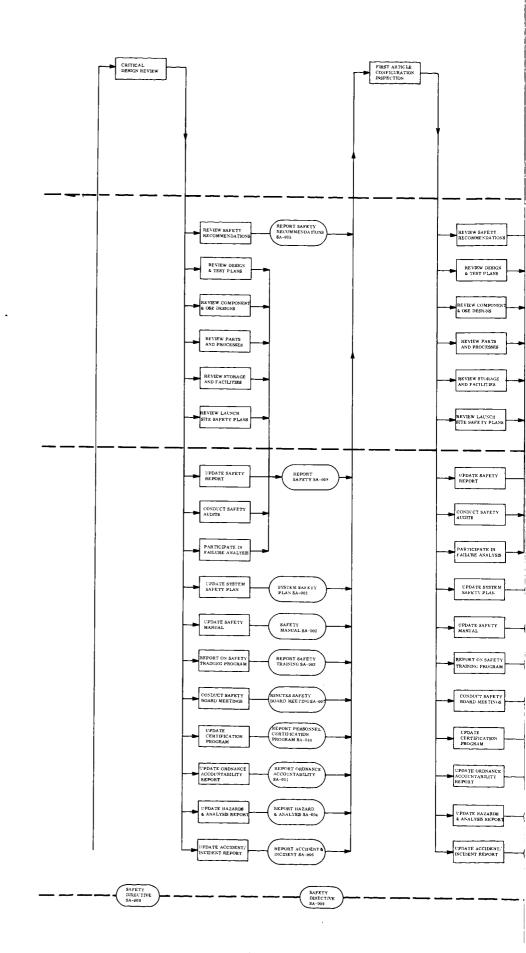


Figure M-2. Safety User Flow Diagram-Contract Award Through Critical Design Review



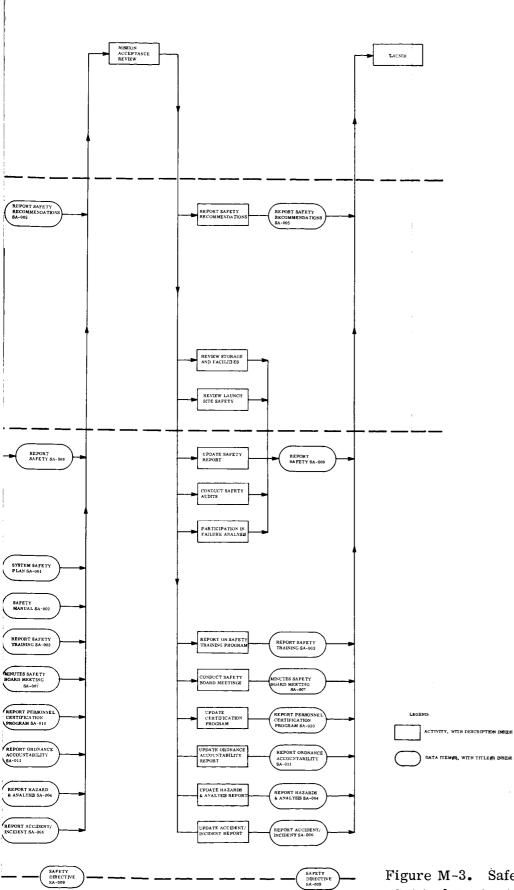


Figure M-3. Safety User Flow Diagram-Critical Design Review Through Launch

Safety Data Requirement Descriptions

DRD Number	Title
SA-001	Plan, System Safety Engineering
SA-002	Manual, Safety
SA-003	Report, Safety Training Program
SA-004	Report, Systems Interfaces, Hazards and Analysis
SA-005	Report, Safety Recommendations
SA-006	Report, Accident/Incident
SA-007	Minutes, Integrated Safety Board Meetings
SA-008	Report, Safety
SA-009	Directive, Safety
SA-010	Report, Personnel Certification Program
SA-011	Report, Ordnance Accountability

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VOYAGER DATA REQUIREMENT DESCRIPTION - 2ND SHEET

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SA-001

The System Safety Engineering Plan is the vehicle for defining the overall safety plan for controlling safety on the Voyager Project. This plan will be information and definition of intent for NASA, direction for operations, and a general guide document for subcontractors and launch test centers compliance.

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

OUTLINE OF CONTENTS:

The System Safety Engineering Plan presents the overall system safety plan and identifies the planned state-of-the-art engineering techniques to be implemented on the Voyager Project, to meet the safety requirements related to personnel, flight hardware, and test equipment.

Authorities and responsibilities will be documented, and enforcement plans will be presented. The safety plan objectives to be implemented during the design, development, manufacturing and testing phases of the program will be described.

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VOYAGER DATA REQUIREMENT DESCRIPTION - 2ND SHEET	
SPECIAL INSTRUCTIONS:	DRD NO.: SA-002
Safety Manual will be descriptive and detailed in content.	
SPECIAL DISTRIBUTION: (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)	
OUTLINE OF CONTENTS:	
The Safety Manual will describe all safety related subjects, policies, instructions, and directives, define responsibilities and authorities, and also explain safety operating procedures. It will list hazardous materials, and operations related to the Voyager vehicle, with special emphasis on those hazards that cannot be minimized under present day knowledge.	
The Safety Manual will be required reading for all supervising personnel and completion of this reading will be documented by signed statement.	

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VOYAGER DATA REQUIREMENT DESCRIPTION - 2ND SHEET	
SPECIAL INSTRUCTIONS:	DRD NO.: SA-003
Management and supervision should use this report to maintain an awareness of required Safety Training Programs.	
SPECIAL DISTRIBUTION: (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)	
OUTLINE OF CONTENTS:	
Describes Safety Training Program, and plans. Subject matter will be general safety as well as specific Voyager-related safety.	
This report will also report on the number of personnel and safety programs that they are certified in, i.e., propellant handling, explosive handling, systems testing, etc.	

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JPL 2568 OCT 65

VOYAGER DATA REQUIREMENT DESCRIPTION - 2ND SHEET	
SPECIAL INSTRUCTIONS: SA-00	
This report should be considered as required reading for all management and supervisory personnel on the Voyager Project.	
SPECIAL DISTRIBUTION: (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)	
OUTLINE OF CONTENTS:	
Describes subsystems, systems analysis performed to identify hazards and failure modes; it will also identify interface hazards which require subcontractor awareness, or those hazards identified by subcontractors for our attention.	
This report will be a compilation of all the known hazards resulting from design interface and/or testing in critical areas. This report will be used to report these conditions in a summary format for ready reference through all management responsible areas.	

JPL 2568-1 OCT 65

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VOYAGER DATA REQUIREMENT DESCRIPTION - 2ND SHEET	
SPECIAL INSTRUCTIONS:	DRD NO.: SA-005
Voyager supervisor will review and comment on recommendations made by the customer.	
SPECIAL DISTRIBUTION: (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)	
OUTLINE OF CONTENTS:	
Report, Safety Recommendation	
1. Introduction and scope 2. Summary of recommendations	
 3. Responsible operations review list 4. Action due dates assignments 5. Summary of company answer 	

VOYAGER DATA REQUIREMENT DESCRIPTION					DRD APPROVED BY	DATE	DATA CATEGORY:		
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SPECIAL INSTRUCTIONS:	DRD NO.: SA-006
Monthly issuance will be maintained even if no accidents or incidents have occurred.	
SPECIAL DISTRIBUTION: (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)	
	}
OUTLINE OF CONTENTS:	
Used to assure communications of accidents or incidents which degrade the system, or have a potential to do so, and to report on results of related investigations.	
This report will be maintained throughout the life of the Voyager Project and will be issued to launch site personnel identifying the accidents and/or incidents noted at the launch site.	

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Minutes, Integrated Safety Board	
1. Title of Board	
2. Date of meeting3. Names of personnel attending	
4. Purpose of board meeting5. Subject matter discussed	
6. Findings and resolutions	
7. Follow up or subsequent actions necessary8. Distribution	

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VOYAGER DATA REQUIREMENT DESCRIPTION - 2ND SHEET	
SPECIAL INSTRUCTIONS: SA-0	ĺ
This report will be broken down into sections, design phase, test plans, range safety, and periodic audits. This report should be considered by Voyager management as required reading item.	
SPECIAL DISTRIBUTION: (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)	
OUTLINE OF CONTENTS:	
Report, Safety	
1. Introduction and scope	
2. Summary matrix, approved hardware 3. Summary matrix, test plans reviewed	
4. Summary OSE reviewed for safety	
5. Audit reports 6. Follow-up action identification	
7. Range safety	
a. Voyager required by prime contractor b. Launch center requirements	

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VOYAGER DATA REQUIREMENT DESCRIPTION - 2ND SHEET
SPECIAL INSTRUCTIONS:
<u>SA-00</u>
Safety directives are the responsibility of management, and as such are mandatory reading.
SPECIAL DISTRIBUTION: (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)
OUTLINE OF CONTENTS:
The Safety directive will be a document requiring mandatory compliance by all operations concerned. It will be issued by the Safety Operation, Voyager. This directive has the authority to stop work.
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(CONTINUE ON THIRD SHEET, IF NECESSARY, AND AFFIX TO THIS DRD.)

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Rep	ort, Personnel Certification Program	
1.	Introduction and scope	
2.	Requirements and objectives	
	a. Personnel	
	b. Flight hardwarec. Test equipment	
	d. Handling equipment	
,	e. Facilities equipment	
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☐ DIAGRAM ☐ DRAWING		⊐ LIST ⊐ LOG		Military Sa		es.	
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VOYAGER DATA REQUIREMENT DESCRIPTION - 2ND SHEET	
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SPECIAL DISTRIBUTION: (IF DISTRIBUTION IS NOT COVERED BY AN EXISTING DDL WRITE IN DISTRIBUTION BELOW)	
OUTLINE OF CONTENTS:	
Report, Ordnance Accountability	
1. Introduction and scope	
2. Summary of accountable items	
3. Applicable documents4. Quantitative listing	
5. Authorization for withdrawal list	
(CONTINUE ON THIRD SHEET, IF NECESSARY, AND AFFIX TO THIS DRD.)	

-2-

DOCUMENTATION RELATIONSHIP TREES

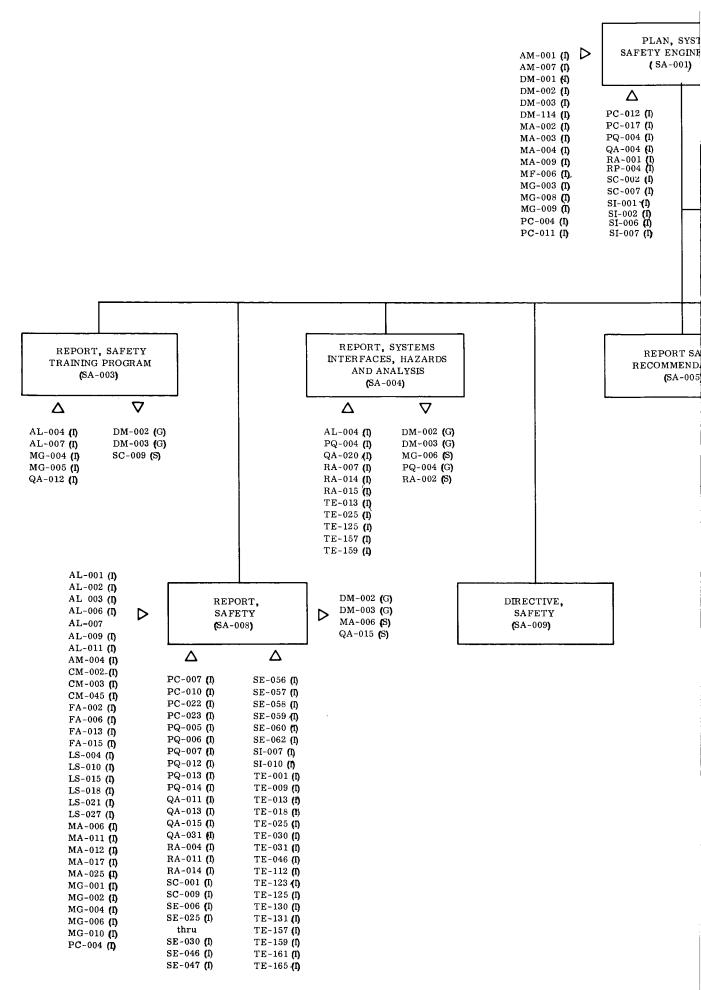
A documentation relationship tree has been prepared to further develop the data base interrelationships by identifying and presenting pictorially the relationships of all Voyager contractor data items within each functional category and by showing their relationships across categories.

Relationships within the 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) 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. (1)
- b. Data items 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 on, data items appearing in other categories, and is included in the diagrams.



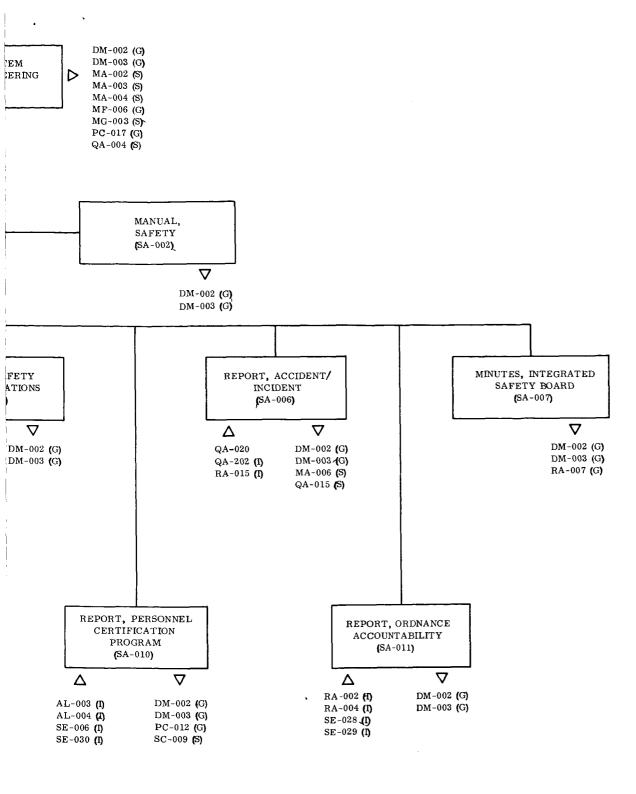


Figure M-4. Safety Documentation Relationship Tree (SA)

DATA ITEM PHASING, FREQUENCY

The Data Item Frequency and Phasing chart shows the requirements for contractor data item preparation by major project review periods. It is concerned with the phasing and frequency of preparation of each individual data item and not the total number of copies required for reproduction and distribution.

The following legend and/or abbreviations have been used:

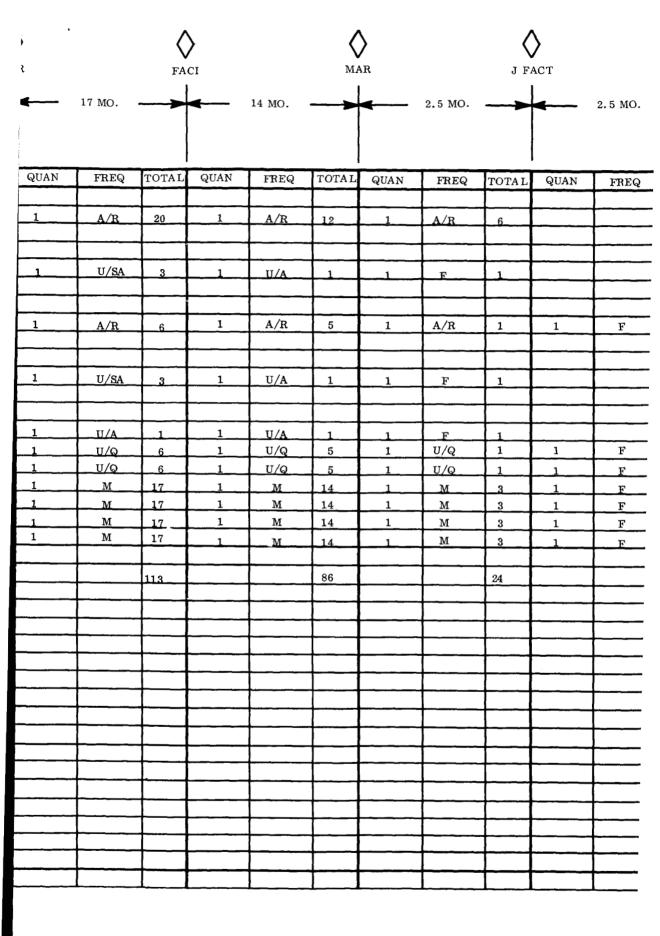
A	Annual
S/A	Semi Annual
WK	Weekly
MO	Monthly
B/W	Biweekly
B/M	Bimonthly
O/T	One time
A/R	As required
U	Update
I/U	One update
DA	Daily
Q	Quarterly
I	Initial
F	Final
N/R	New and revised
SDR	System design review
PDR	Preliminary design review
HDR	Hard design review
CDR	Critical design review
FACI	First article configuration inspection
MAR	Mission acceptance review
J FACT	Joint flight acceptance composite testing

DATA ITEM TITLE

SAFETY

		QUAN
DIRECTIVE	S	
SA-009	Directive, Safety	
MANUALS		
SA-002	Manual, Safety	
MINUTES		
SA-007	Minutes, Integrated Safety Board Meetings	
PLANS		
SA-001	Plan. System Safety Engineering	
REPORTS		
SA-003	Report, Safety Training Program	
SA-004	Report, Systems Interfaces, Hazards, and Analysis	
SA-005	Report, Safety Recommendations	
SA-006	Report, Accident/Incident	
SA-008	Report, Safety	
SA-010	Report, Personnel Certification Program	
SA-011	Report, Ordnance Accountability	
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Figure M-5. Safety Data Item
Phasing and Frequency Matrix