

11. TITLE - continued:
Requirements", (APJ 966-254).

18. SUBJECT TERMS - continued:
ENTITIES, PROCEDURES, VENTURE EVALUATION REVIEW TECHNIQUE, VERT,
PROCESS FLOWS, OVERALL SYSTEMS DEVELOPMENT PROCESS, AND TRADE-OFF
BETWEEN SYSTEM/EQUIPMENT ALTERNATIVES AND TRANSPORTABILITY
REQUIREMENTS.

STRUCTURED ANALYSIS/DESIGN

LSA TASK 303 EVALUATION OF ALTERNATIVES AND TRADE-OFF ANALYSIS

SUBTASK 303.2.12
TRADE-OFF BETWEEN SYSTEM/EQUIPMENT
ALTERNATIVES & TRANSPORTABILITY REQUIREMENTS
APJ 966-254

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STRUCTURED ANALYSIS/DESIGN



**LSA TASK 303
EVALUATION OF ALTERNATIVES
AND TRADE-OFF ANALYSIS**

SUBTASK 303.2.12

**TRADE-OFF BETWEEN SYSTEM/EQUIPMENT ALTERNATIVES
AND TRANSPORTABILITY REQUIREMENTS**

under

CONTRACT DAAA21-86-D-0025

for

**HQ US AMCCOM
INTEGRATED LOGISTIC SUPPORT OFFICE
AMSMC-LSP
ROCK ISLAND, IL**

by

AMERICAN POWER JET COMPANY

RIDGEFIELD, NJ

FALLS CHURCH, VA

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ST. LOUIS, MO

November 1989

FOREWORD

APJ, under contract to HQs, AMCCOM, has initiated the automation of the LSA Tasks (MIL-STD-1388-1) and the assessment of the ILS elements (AR 700-127). A major goal is to unify military and contractor approach to the performance of ILS and LSA.

Detailed to meet all requirements of ILS and LSA, the automated process will continue to provide the flexibility in selecting tasks and elements to be addressed at each life cycle stage. A major advantage of this approach is to insure that the application of each task is consistent with prescribed Army policies and procedures.

This report consolidates the Structured Analysis and Structured Design under one cover for the respective LSA Task. Structured Analysis provides a logical model of the method to perform an LSA Task. This logical model facilitates the development of a Structured Design that provides the detailed procedures to perform the analysis. Both the logical model and detailed procedures are used to develop the application software programs which will be provided to Government and contractor personnel to assist in the performance of the LSA Task.

Included in this report are the Data Flow Diagrams (DFDs) for LSA Subtask 303.2.12, "Trade-Off Between System/Equipment Alternatives and Transportability Requirements" and the corresponding descriptions of the processes, data flows, data stores, and external entities identified on each DFD (Annex B). In addition the DFDs are further developed into step-by-step procedures (Annex C) which identifies how to use the data to carry out the processes which ultimately leads to accomplishing the LSA Subtask.

To assist managers in planning and controlling this task, Venture Evaluation Review Technique (VERT) Batch Input files are provided (Annex D). These VERT tools provide government agencies with complete packages, to give contractors, that cover both technical and managerial aspects of a task. This approach establishes a standardized form of communication and management between contractors performing the task and government personnel reviewing the task.

To view this work in context, Annex E of this report also presents a brief overview of Structured Analysis and its place in the overall systems development process. The overview and certain portions of the introductory text are repeated verbatim in every report in this series so that each report is free standing.

TABLE OF CONTENTS

<u>TITLE</u>	<u>PAGE</u>
Purpose.....	1
Background.....	1
Scope.....	1
LSA Subtask 303.2.12 Description.....	2
Approach.....	2
Structured Analysis for LSA Subtask 303.2.12- Trade-Off Between System/Equipment Alternatives & Transportability Requirements.....	3
VERT Diagrams.....	5
 ANNEX A:	
LSA Task 303 Description - Evaluation of Alternatives and Trade-Off Analysis.....	A-1
 ANNEX B:	
LSA Subtask 303.2.12 - Trade-Off Between System/Equipment Alternatives & Transportability Requirements, Data Flow Diagrams and Data Dictionary.....	B-1
 ANNEX C:	
LSA Subtask 303.2.12 - Trade-Off Between System/Equipment Alternatives & Transportability Requirements, Structured Design & Response Sheets.....	C-1
 ANNEX D:	
LSA Subtask 303.2.12 - Trade-Off Between System/Equipment Alternatives & Transportability Requirements, VERT Batch Input Files.....	D-1
 ANNEX E:	
Structured Systems Analysis - Fundamentals.....	E-1

LIST OF FIGURES

FIGURE NO.	TITLE	PAGE
1	Structured Analysis and Structured Systems Design Organization.....	E-5
2	Standard DFD Symbol Definitions.....	E-6

INTRODUCTION

PURPOSE

The purpose of this report series is to present the results of the APJ Structured Analysis/Design under Contract DAAA21-86-D-0025 for coordination with the AMCCOM Program Manager prior to in-depth programming of ILS and LSA functions and processes. LSA Task 303 "Evaluation of Alternatives & Trade-Off Analysis", ("LSA Subtask 303.2.12, "Trade-Off Between System/Equipment Alternatives and Transportability Requirements" is addressed in this report.

BACKGROUND

The Department of the Army has a requirement for management control over contractor and Government agency response to the requirements of AR 700-127, "Integrated Logistic Support", and MIL-STD-1388-1, "Logistic Support Analysis". HQs AMCCOM has initiated action to structure each of the LSA tasks, the assessment of each ILS element, the form of the results, and the detailed processes to insure consistency with current Army policies, procedures, and techniques.

This approach (undertaken by AMCCOM and APJ) will insure uniformity in efforts and products, reproducibility of analyses, and a well-defined structure which can be coordinated among all participants in the logistic process to arrive at common understanding and procedures.

SCOPE

This report summarizes the results of the Structured Analysis of the identification of LSA Task 303 "Evaluation of Alternatives & Trade-Off Analysis", LSA Subtask 303.2.12 "Trade-Off Between System/Equipment Alternatives and Transportability Requirements", and presents the associated Data Flow Diagrams (DFDs) developed from the Structured Analysis and the corresponding procedures developed in the Structured Design. The portions of the Data Dictionary relating to the DFDs for this LSA Subtask includes the labels, names, descriptions, processes, data flows, data stores, and external entities. (The Data Dictionary is a "living document" that evolves through the analysis and design process).

The Structured Design portion of this report develops the processes and data flows developed in the DFDs into procedures which are used to accomplish the LSA Tasks. The DFDs provide the method and the Design implements it, by formulating a guide for programmers to write software applications.

This report presents a brief overview of Structured Analysis and its place in the overall systems design process to assist the reader who may not be fully briefed on the symbols and conventions used. It is supported by Annex E, which defines each element in Structured Analysis.

LSA SUBTASK 303.2.12 - DESCRIPTION

The "Trade-Off Between System/Equipment Alternatives and Transportability Requirements" provides a methodology for selecting a system/equipment alternative that meets the mission mobility requirements within design constraints at the lowest cost. The analysis begins by examining the system requirements document to identify mission profiles and operational mode summaries as well as system transportability requirements. Next the alternative system/equipments are examined to identify transportability criteria and characteristics, oversized items, sensitive items, and dangerous cargo items. Final this data is fed into the trade-off portion of the analysis where each alternative system/equipment is compared against the Army's Transportability requirements in order to select those alternatives meeting the selection criteria.

The LSA Task Description with associated task inputs and outputs is extracted from MIL-STD-1388-1A and is included as Annex A.

APPROACH

The APJ approach to Structured Analysis and Structure Design of an LSA Subtask is:

1. Scope the Subtask defined in MIL-STD-1388-1A with the overall task and determine its relationship with other LSA Tasks.
2. Review all pertinent documentation (e.g., AR's, MIL-STDs, etc.) applicable to the specific topic.
3. Prepare the Top Level DFDs in context of the Subtask, and develop lower level DFDs to further quantify any complex process identified in the top level DFD.

4. Complete the Data Dictionary portion of the Analysis by describing all processes, data flows, data stores and external entities.

5. Apply staff experience in logistic support analysis to assure that the topic has been exhaustively addressed.

6. From the completed DFDs prepare the step by step procedures that form the structured design.

7. Review Data Item Description and other applicable material to develop output reports.

8. If required revise DFDs and Data Dictionary based on preparation of detailed procedures.

9. Validate results in discussions with Army activities and personnel directly involved in the applicable or related LSA tasks.

NOTE: Structured Analysis and preparation of Data Flow Diagrams (DFDs) was further assisted by the application of Structured Analysis software. Licensed by Index Technology Corporation, Excelerator provides for automated tracking of names, labels, descriptions, multiple levels of detail in the data flow diagrams, and industry standards in symbols and diagramming practices.

STRUCTURED ANALYSIS FOR LSA SUBTASK 303.2.12

-TRADE-OFF BETWEEN SYSTEM/EQUIPMENT ALTERNATIVES AND TRANSPORTABILITY REQUIREMENTS

The Data Flow Diagram is a tool that shows the flow of data, (i.e., data flows from sources) and is processed by activities to produce intermediate or final products.

The DFD provides a useful and meaningful partitioning of a system from the viewpoint of identification and separation of all functions, actions, or processes so that each can be introduced, changed, added, or deleted with minimal disruption of the overall program, i.e., it emphasizes the underlying concept of modularity and identifiable transformations of data into actionable products.

A series of three (3) DFDs have been developed to structure the LSA subtask relative to operations and other support functions:

1. 303.2.12 Top Level
2. 303.2.12.8 Relationship Models
3. 303.2.12.9A Transportation Trade-Off

Each DFD is keyed to the specific task through the identification number assigned in the lower right hand box. The Alpha codes indicate the level of indenture or explosion below the top level, i.e.,:

Top Level.....LSA DFD 303.2.12
First Indenture.....LSA DFD 303.2.12.8A

Each DFD makes reference to the basic LSA task it addresses, as well as the level of indenture (explosion) of the DFD. For example, the first or top level DFD, "303.2.12", refers to the section in MIL-STD-1388-1A which describes the review items. One of the processes (bubbles) on the top level diagram (303.2.12.8) is expanded and identified as "303.2.12.8A", a second level of "303.2.12.8" (Alpha "A" indicates the second level).

Four standard symbols are used in the drawing of a DFD (see Annex E - Figure 1).

A copy of each DFD is presented in Annex B, accompanied by the Data Dictionary process elements. Each entry made in the DFDs has a corresponding entry in the Data Dictionary.

This presents only those Data Dictionary entries necessary for the coordination of the overall concept and details of the processes. To facilitate review of the diagrams, data flow identifications, process, an data store descriptions are provided.

As noted above, they will continue to evolve and be expanded in the System Design phase.

VERT DIAGRAMS

The Venture Evaluation Review Technique (VERT) was developed as a network analysis technique to facilitate management decision making. It allows systematic planning and control of the program and enables managers to find solutions to real life managerial problems. The VERT Diagrams and Batch Input Files for this task can be found in Annex D. In order to understand how these Input Files were developed, a brief discussion of the methodology used is provided. The same explanation is repeated verbatim in every report.

ANNEX A

**LSA TASK 402
EARLY FIELDING ALTERNATIVES**

ANNEX A
LSA TASK 303
EVALUATION OF ALTERNATIVES AND TRADE-OFF ANALYSIS 1/

The following Task Description is extracted verbatim from MIL-STD-1388-1A dated April 1983:

303.1 - PURPOSE To determine the preferred support system alternative(s) for each system/equipment alternatives and to participate in alternative system trade-offs to determine the best approach (support, design, and operation) which satisfies the need with the best balance between cost, schedule, performance, readiness, and supportability.

303.2 - TASK DESCRIPTION

303.2.12 - Conduct evaluations and trade-offs between system/equipment alternatives and transportability requirements. Identify the transportability requirements for each alternative under consideration and the limiting constraints, characteristics, and environments on each of the modes of transportation.

TASK INPUT

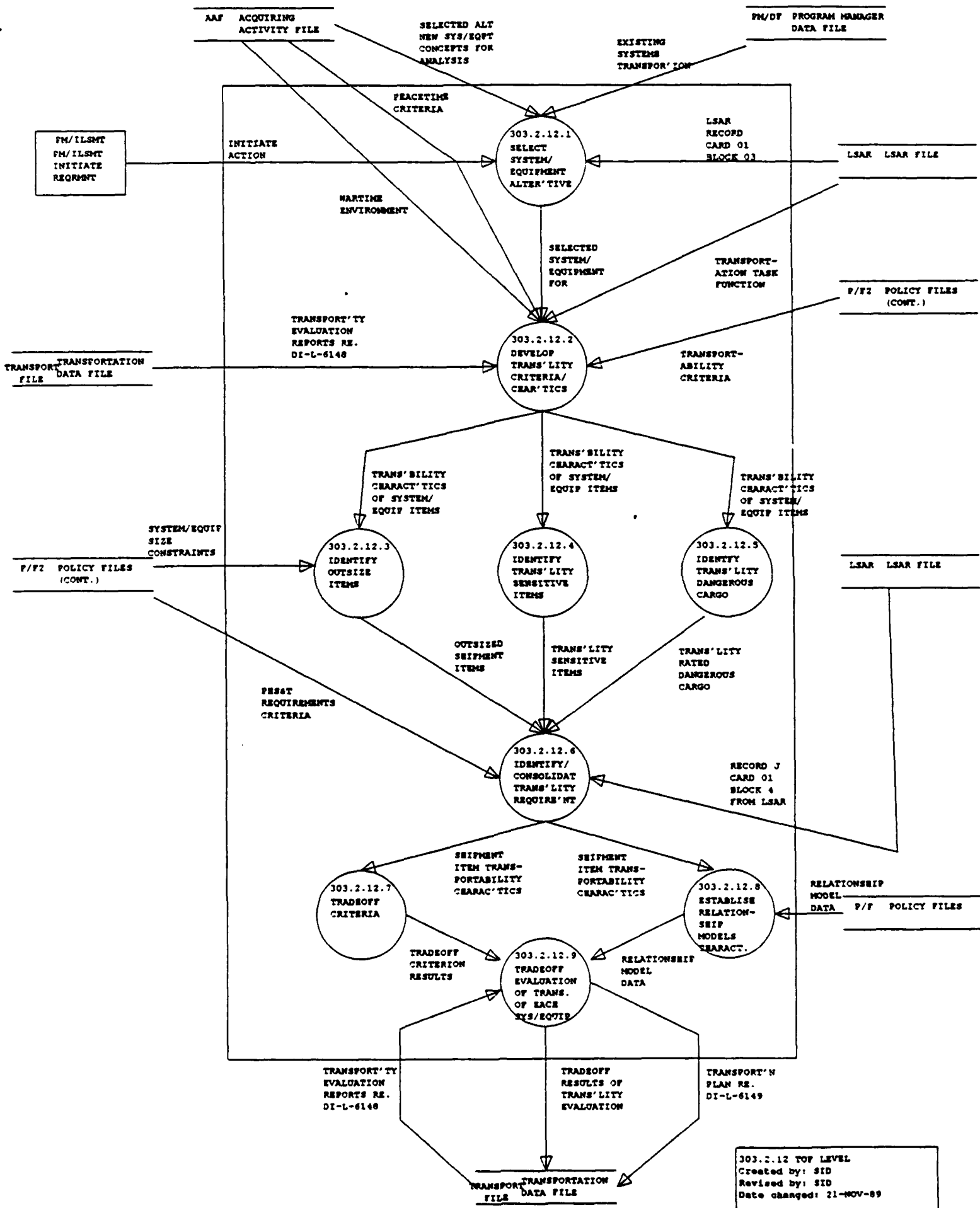
TASK OUTPUT - 303.4.12 Trade-Off results between system/equipment alternatives and transportability requirements. (303.2.12)

1/ Abstracted verbatim from MIL-STD-1388-1A, April 11, 1983,

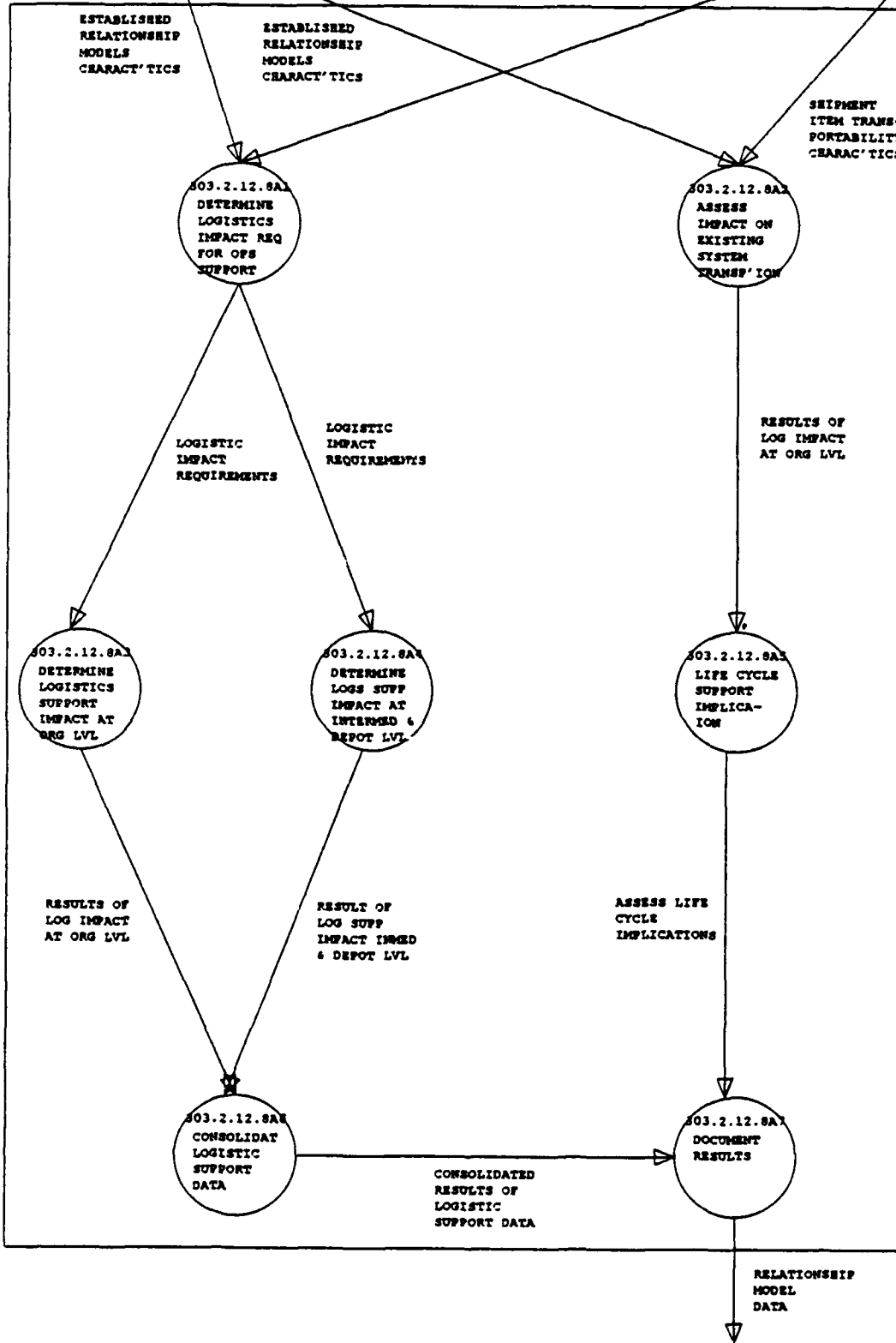
ANNEX B

SUBTASK 303.2.12 -

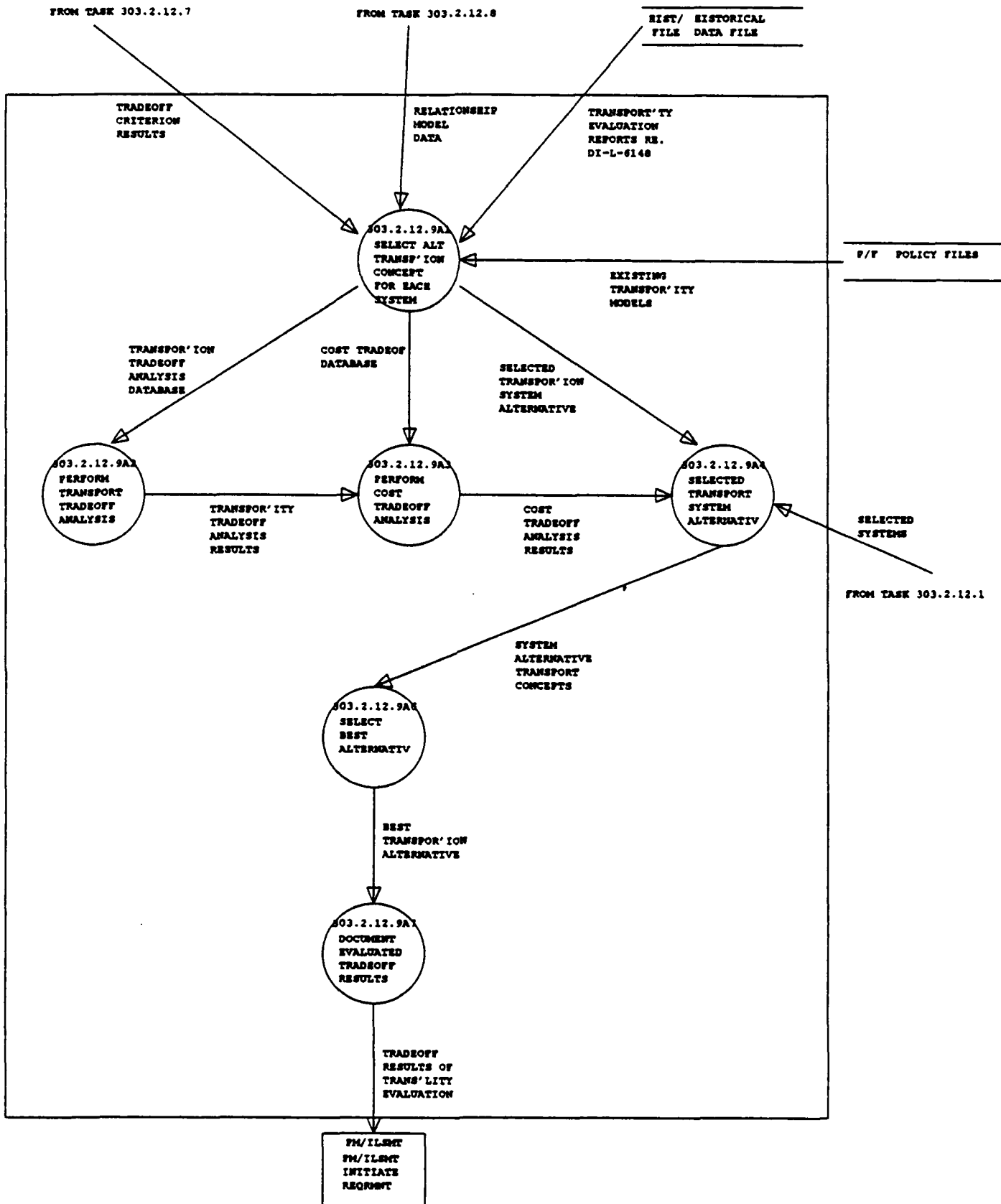
**IMPACT OF RESOURCE SHORTFALLS,
DATA FLOW DIAGRAMS AND PROCESS DATA DICTIONARY**



SHIPMENT
ITEM TRANS-
PORTABILITY
CHARAC'TICS



303.2.12.8A RELATIONSHIP MODELS
 Created by: SID
 Revised by: SID
 Date changed: 21-NOV-89



303.2.12.9A TRANSPORT'N TRADEOFF
 Created by: SID
 Revised by: SID
 Date changed: 21-NOV-99

Name	Label	Description
303.2.12.1	SELECT SYSTEM/ EQUIPMENT ALTER' TIVE	Several alternative system/equipment have been selected as potential candidates to overcome a deficiency in meeting a specific threat. In this process, a selection is made of the alternatives, one at a time, for indepth evaluation of the relative transportability of each, with a resulting tradeoff evaluation to assist in the selection of the optimum system/equipment to meet the requirements of the Operational and Organizational(O&O) plan, Material New Start(MNS), or other requirement documents.
303.2.12.2	DEVELOP TRANS' LITY CRITERIA/ CHAR' TICS	Develop the transportability criteria and/or characteristics of each of the systems/equipment under consideration, to include any and all major components of each system/equipment which may be transported/shipped as separate items. The transportation information will include, but not be limited to: 1. Unit pack 2. Dimensions 3. Weight 4. Cube 5. National motor freight classification 6. Uniform freight classification 7. Less than truckload/carload 8. LTL/LCL ratings 9. DOD water community code 10.DOD air community code 11.DOD air dimension code 12.Freight description (Noun) 13.Milstamp special handling code 14.Dangerous material code 15.Transportation control code 16.DOT shipping class for ammunition items. 17.DOT designation for ammunition items.
303.2.12.3	IDENTIFY OUTSIZE ITEMS	Based on transportation characteristics of the separate items of each potential system/equipment under consideration, identify those items which may be considered as outsized relative to the military transportation system: Exceeds 8 feet in height or Exceeds 8 feet in width or Exceeds 32 feet in length or Exceeds 11,200 pounds in shipment weight. For outsized items: 1. Supply comments on the feasibility if disassembly and assembly 2. Number of packages into which the item can be disassembled for shipment 3. Dimensions and weight of the components exceeding the criteria above.

Name	Label	Description
303.2.12.4	IDENTIFY TRANS'LITY SENSITIVE ITEMS	Identify those shipment items of each system/equipment under consideration which may be considered as "sensitive" from a military transportability viewpoint: Limited to the use of a single mode of delivery or Requires unique packaging or shock mitigating devices/techniques or Requires monitoring by technical escorts or Requires unique materials handling devices or techniques or Requires the furtherance of the state-of-the-art in transportation equipment, materials handling equipment design, or packaging technology before safe delivery of a usable item could be accomplished.
303.2.12.5	IDENTIFY TRANS'LITY DANGEROUS CARGO	Identify those shipment items of the alternative system/equipment concepts which may be considered as dangerous cargo: Require technical escorts Requires environmental control Requires special permits to move over standard commercial transportation media Requires the identification of dangerous procedures to be avoided or provided for in the transport of the shipment item.
303.2.12.6	IDENTIFY/ CONSOLIDAT TRANS'LITY REQUIRE'NT	Consolidate those transportability characteristics of the shipment items for each system/equipment alternative relative to outsize, sensitive, and/or dangerous cargo ratings so that a tradeoff evaluation can be accomplished in the process - 303.2.12.9.
303.2.12.7	TRADEOFF CRITERIA	Develop the tradeoff criteria to be used in the trade-off evaluation of the shipment items of the system/equipment alternatives.
303.2.12.8	ESTABLISH RELATION- SHIP MODELS CHARACT.	Construct the analytical relationships concerning transportation logistic elements, types of transportation of each concept. Using historical data bases from logistically similar system/equipments. Develop the modeling predictions for each transportation concept identified at 303.2.12.2.
303.2.12.8A1	DETERMINE LOGISTICS IMPACT REQ FOR OPS SUPPORT	Identify current transportability requirements used with existing weapons systems that might be impacted by the requirements of the new alternate system equipment and assess Logistic requirements for operation and support.
303.2.12.8A2	ASSESS IMPACT ON EXISTING SYSTEM TRANSP'ION	Identify and assess Logistic transportability used with existing systems that might be impacted by the requirements.

Name	Label	Description
303.2.12.8A3	DETERMINE LOGISTICS SUPPORT IMPACT AT ORG LVL	Determine the logistic support potential impact at Organizational level of maintenance for the alternative transportation system/equipment.
303.2.12.8A4	DETERMINE LOGS SUPP IMPACT AT INTERMED & DEPOT LVL	Determine the logistic support potential impact at intermediate and depot level of maintenance for the alternative transportation system/equipment.
303.2.12.8A5	LIFE CYCLE SUPPORT IMPLICATION	Identify all transportability resources for operation and maintenance tasks required and identify all resulting evaluations and conditions toward supporting the alternative system/equipment throughout the intended life cycle.
303.2.12.8A6	CONSOLIDAT LOGISTIC SUPPORT DATA	Consolidate all logistic support data for operation and all levels of maintenance for the alternative transportation concept.
303.2.12.8A7	DOCUMENT RESULTS	Document the data identifying all potential impact for operation and support associated with the selected alternate transportation concept as well as conditions supporting the alternative selection throughout the intended life cycle.
303.2.12.9	TRADEOFF EVALUATION OF TRANS. OF EACH SYS/EQUIP	Consolidate tradeoff results and document data identifying all items associated with the selected transportation concept and modes while having the best balance among cost, schedules, performance and readiness of transportation.
303.2.12.9A1	SELECT ALT TRANSP'ION CONCEPT FOR EACH SYSTEM	For each system/equipment alternative under analysis, evaluate each alternative transportability concept selected and determine the best alternative that meets the transportation readiness requirements while having the best balance among cost schedule, performance and transportability.
303.2.12.9A2	PERFORM TRANSPORT TRADEOFF ANALYSIS	Determine the alternative transportability concept whose elements have the best influence on reliability, maintainability, safety, transportation, handling, storage, preservation and packaging, funding data management and maintenance engineering.
303.2.12.9A3	PERFORM COST TRADEOFF ANALYSIS	Establish a relationship matrix of the cost for each transportability element versus the transport elements and their components for each of the transportability system concept under analysis. Determine the transportability system concept having the best dollar value of resources expended.

Name	Label	Description
303.2.12.9A4	SELECTED TRANSPORT SYSTEM ALTERNATIV	Select the alternative transportation items developed for each system/equipment identified in 303.2.12.1. These results addresses each aspect of transportation for the system/equipment covering all operations.
303.2.12.9A6	SELECT BEST ALTERNATIV	Identify the recommended alternative transportation system concept and list all associated Qualitative and Quantative parameters.
303.2.12.9A7	DOCUMENT EVALUATED TRADEOFF RESULTS	Document in narrative format results of each of the trade-off studies and recommended transportation systems selected for final report. This should include the transportation effectiveness data, cost, schedule, performance, readiness and supportability.

Name	Label	Description
ALTERN/RESULTS	SYSTEM ALTERNATIVE TRANSPORT CONCEPTS	Purpose: The selected transportation system alternative data will be used in conjunction with trade-off results to select the optimum alternative transportation system for each system/equipment alternative.
CON/RSTS	CONSOLIDATED RESULTS OF LOGISTIC SUPPORT DATA	Purpose: Data contains consolidated results of the logistic support impact at all levels of maintenance.
COST/TO	COST TRADEOFF DATABASE	Purpose: Data containing accurate cost data associated with each transportability element and their resource implications. The cost of adopting a new piece of equipment (Transporter) would include not only a procurement cost, operating and maintaining the equipment, parts, spares, etc.
COST/TO/RES	COST TRADEOFF ANALYSIS RESULTS	Purpose: This data contains the transportability system concepts having the best dollar value of all resource implications required to transport the system/equipment throughout its intended life cycle.
DANGEROUS/CARGO	TRANS'LITY RATED DANGEROUS CARGO	Those shipment items of each alternative system/equipment which may be rated as "dangerous cargo".
DI-L-6148 REQNTS	TRANSPORT' TY EVALUATION REPORTS RE. DI-L-6148	ACRONYMS: PM - PROGRAM MANAGEMENT FILE ILSMT - INTEGRATED LOGISTIC SYSTEM MANAGEMENT PURPOSE: The transportability evaluation plan/report prepared in accordance with the requirements of DI-L6148 for presentation to the PM or ILSMT.
EST/REL/MOD/CHAR	ESTABLISHED RELATIONSHIP MODELS CHARACT' TICS	Purpose: Used to construct analytical relationships of transportability using data from the policy file on logistically similar systems.
EVAL/PARAM	EVALUATION PARAMETERS	Purpose: Historical data for a logistically similar system/equipment pertaining restrictions/limitations, (i.e. existing personnel, unique personnel, manpower, cost etc.)
EXIS/TRANS/MODELS	EXISTING TRANSPOR' ITY MODELS	Purpose: Applicable models are selected from PM/DF and used for tradeoff analysis in determining the most feasible transportability system.
EXIS/TRANS/SYS	EXISTING SYSTEMS TRANSPOR' ION	Purpose: Data contains existing models that can be tailored to the transportability system or equipment that is being evaluated for cost and effectiveness.

Name	Label	Description
I & D/LOG/RSTS	RESULT OF LOG SUPP IMPACT INMED & DEPOT LVL	Purpose: Determined results of logistic support impact at intermediate and depot level of maintenance.
ID/CON/TRANS/REQ	IDENTIFY CONSOLIDATE TRANSPOR'LITY REQUIREMENT	Purpose: Data that identifies exactly what transportability requirements must be accomplished, consolidated and contain the predicted frequency to be performed and the time required.
INIT/ACT	INITIATE ACTION	PM/ILSM Team will initiate the action for ILS assessment to a specific system/equipment development program.
J/01/03 RECORD	LSAR RECORD CARD 01 BLOCK 03	This record provide transportability information for the item under development. Record J card 01 Block 3 is defined by DED 505 transportation in appendix F of Mil-STD-1388-2A.
J/01/04	RECORD J CARD 01 BLOCK 4 FROM LSAR	This record identifies the FSCM. This requirement is defined by DED 506 transportability interoperability requirements in appendix F of Mil-STD-1388-2A. 8-2A.
LIFE/IMPL	ASSESS LIFE CYCLE IMPLICATIONS	Purpose: The support resources for operation and maintenance task implication required and identified results required toward supporting the alternative system/equipment transportation throughout the intended life cycle.
LOG/REQ	LOGISTIC IMPACT REQUIREMENTS	Purpose: To determine the logistic impact requirements for operation, maintenance supply and support for the transportation alternatives.
LOG/RSTS	RESULTS OF LOGISTICS SUPP IMPACT ORGANIZATION LEVEL	Purpose: Determined results of logistic support impact at organizational level of maintenance.
MODEL DATA	RELATIONSHIP MODEL DATA	Contains manpower and personnel data relationships relative to design changes and varied transportation modes. The results of the analytical models provide the basic inputs to the trade-off evaluation in process 303.2.12.9.
OUTSIZE/ITEMS	OUTSIZED SHIPMENT ITEMS	Those shipment items of each alternative system/equipment which may be categorized as outsized.
PEACE	PEACETIME CRITERIA	Purpose: Data identifying peacetime standards that must be applied to the selected alternative. This data contains: standards for storage (time, location, etc) readiness (preparation time to use). Source of Data: acquiring activity file.

Name	Label	Description
PHS&T REQMTS	PHS&T REQUIREMENTS CRITERIA	The packageing, handling and storage criteria from MIL-STD-1367B are provided as a consideration into the transportability tradeoff analysis.
RESULTS/EVAL	RESULTS OF LOG IMPACT AT ORG LVL	Purpose: This data flow contains characteristics established between models to assess impact on existing system transportation.
SEL/ALT/TRANS/CONPT	SELECTED TRANSPOR'ION SYSTEM ALTERNATIVE CONCEPT	Purpose: Data Contains the alternative transportation system concept selected at sub task 303.2.12.1 for the alternative system/equipment under analysis.
SEL/BEST/ALT	BEST TRANSPOR'ION ALTERNATIVE	Purpose: Data contains the selected best alternatives to be used with the Trade-offs to document the results.
SEL/SUPRT/CNCPT	SELECTED ALT NEW SYS/EQPT CONCEPTS FOR ANALYSIS	Data containing the selected system/equipment alternative that conceptually, fulfills the mission transportation requirements as defined by the ILS MT. This data includes 1) Reliability, 2) Maintainability, and availability.
SEL/SYS	SELECTED SYSTEMS	Purpose: The selected alternative system equipment selected from task 303.2.12.1 is used as input to select alternative transportability systems.
SEL/SYS/EQPT	SELECTED SYSTEM/EQUIPMENT FOR ANALYSIS	The specific system/equipment selected for indepth analysis/evaluation as part of an overall effort to analyze several system/equipment concepts leading to a tradeoff evaluation or other relational comparisons as a basis for the selection of a desirable system/equipment.
SENSITIVE/ITEMS	TRANS'LITY SENSITIVE ITEMS	Those shipment items of each alternative system/equipment which may be considered as "sensitive" relative to the transportation network.
SHIP/ITEM/TRANS	SHIPMENT ITEM TRANS-PORTABILITY CHARAC'TICS	Transportation characteristics will include at a minimum all information listed in process 303.2.12.2.
SIZE CONSTRAINTS	SYSTEM/EQUIP SIZE CONSTRAINTS	The system/equipment dimensions and weight limitations from MIL-STD-1366B are provided as selection criteria for tradeoff analysis.
TO/ANAL/DATA BASE	TRANSPOR'ION TRADEOFF ANALYSIS DATABASE	Purpose: This data flow contains a vast bank of stored quantitative data including the cost associated with each of the transportability elements.

Name	Label	Description
TO/CRIT/RESULTS	TRADEOFF CRITERION RESULTS	Purpose: This tradeoff criteria result is developed to select the best transportation concept alternatives and the tradeoff evaluations.
TRADEOFF	TRADEOFF RESULTS OF TRANS'LITY EVALUATION	This data flow contains a vast bank of stored quantitative data containing the cost associated with each of the transportation elements identified in the transportation concept. Source of data subtask 303.2.12.2.
TRANS/CHARACT	TRANS'BILITY CHARACT' TICS OF SYSTEM/ EQUIP ITEMS	Transportability criteria/characteristics of the system/equipment items subject to shipment as separate items.
TRANS/CRITERIA	TRANSPORT- ABILITY CRITERIA	Air, water, rail, truck, etc. Transportability criteria and test information for design, development and procurement of material for engineering transportation studies associated with the system under development. Reference MIL-HOBK-157 for basic transportability criteria for all modes.
TRANS/PLAN	TRANSPORT'N PLAN RE. DI-L-6149	The transportation plan prepared in accordance with DI-L-6149 for presentation to the PM or ILSMT as required.
TRANS/TASK	TRANSPORT- ATION TASK FUNCTION	The transportation task function identified in data record J are used to develop transportability characteristics of the system. Reference DED 467 of MIL-STD-1388-2A for further definition of this data.
TRANS/TO/ANAL/RES	TRANSPOR'ITY TRADEOFF ANALYSIS RESULTS	Purpose: This data flow contains the transportability concept having the best influence on numerous data items i.e. reliability, maintainability, safety, packaging, shipment and storage.
WAR	WARTIME ENVIRONMENT	Purpose: Data identifies wartime environments in which the selected alternative must operate in order to accomplish its intended mission(s). Data includes climatic conditions as described in MIL-STDD-210C. Source of data: acquiring activity file.

DATE: 22-NOV-89
TIME: 12:31

APJ 966-254
DATA STORES

PAGE 1
EXCELERATOR 1.84

Locked By	Name	Label	Description
AAF	ACQUIRING ACTIVITY FILE		Contains those records, documents, decision papers, schedules that were prepared as part of the acquisition initiation, justification, and planning prior to the assignment of a program manager. The items in this data store include: <ul style="list-style-type: none">A. Threat Analysis DataB. O&O PlanC. Readiness Objectives DataD. Functional requirements DataE. Projected Schedule DataF. Logistics Resources DataG. Desired R & M ParametersH. TOAI. TODJ. Cost & Operational Effectiveness Analysis (COEA) DataK. Projected Cost DataL. Justification Of Major System New Start (JMSNS) DataM. Required Operational Characteristics
HIST/FILE	HISTORICAL DATA FILE		This file contains data previously acquired on the item under investigation or some similar system and may address the following areas (to be treated separately): <ul style="list-style-type: none">1. Reliability data2. Failure rate data3. Spares and spare funding data.
LSAR	LSAR FILE		LOGISTICS SUPPORT ANALYSIS RECORD FILE: PURPOSE OF DATA STORE: This file or records holding area contains LSA Task reports on their equivalent; LSAR master records sheet information; LSAR reports when system is automated. It contains logistics data which can be used to assess various ILS elements. MIL-TSD 1388-1A and 1388-2A should be looked at for complete outputs available.

Locked By	Name	Label	Description
	P/F	POLICY FILES	<p>Contains those military publications, decision papers, missions & functions, etc, which are needed to establish the logistical support and review requirements of the item/equipment development program. This data store includes:</p> <ol style="list-style-type: none">1. AR 700-127 ILS2. MIL-STD 881A (FB)3. MIL-STD 1388-1 LSA4. MIL-STD 1388-2 LSAR5. MIL-STD 152 TECH REVIEW GUIDELINES6. DA PAM 700-28 ILS REVIEW GUIDELINES7. MIL-STD 810 ENVIRONMENTAL TEST METHODS8. MIL-STD 781 RELIABILITY DESIGN GUIDED9. MIL-STD 2108 CLIMATIC EXTREMES FOR MIL EQUIPMENT10. AR 70-38 ILS PREPARATION11. MIL-STD 470, 471 MAINTAINABILITY STANDARDS12. AMC PAM 700-4 LOGISTICS TECHNIQUES (WITH PALMAN)13. DA PAM 700-28, "INTEGRATED SUPPORT PROGRAM ASSESSMENT ISSUES AND CRITERIA"14. MIL-STD-780, CODING SYSTEM15. MIL-STD-882,16. MIL-STD-1629, PROCEDURES FOR FMECA17. MIL-STD-756, RELIABILITY MODELING & PREDICTIONS18. DI-S-3604, FUNCTIONAL FLOW DIAGRAM19. MIL-M-24100E, FOMM20. AR 725-50, REQUISITIONING, RECEIPT AND ISSUE SYSTEM21. DI-R-7112, MAINTAINABILITY DEMONSTRATION TEST PLAN22. DI-R-7129, MAINTAINABILITY DEMONSTRATION PLAN23. DI-R-7113, MAINTAINABILITY DEMONSTRATION REPORT24. DI-R-7109, MAINTAINABILITY ANALYSIS REPORT25. DI-R-7105, DATA COLLECTION, ANALYSIS AND CORRECTIVE ACTION SYSTEM REPORTS26. DI-R-7085, FAILURE MODE, EFFECTS AND CRITICALITY ANALYSIS REPORT27. DI-R-7110, MAINTAINABILITY DESIGN CRITERIA PLAN28. DI-R-7107, MAINTAINABILITY ALLOCATIONS REPORT29. DI-R-7106, MAINTAINABILITY MODELLING REPORT30. DI-R-7108, MAINTAINABILITY PREDICTIONS REPORT31. MIL-HDBK-472, MAINTAINABILITY PREDICTION32. DI-R-7111, INPUTS TO THE DETAILED MAINTENANCE PLAN AND LOGISTICS SUPPORT ANALYSIS33. DI-R-2130A, MAINTAINABILITY DEMONSTRATION REPORT34. MIL-STD-785B, RELIABILITY PROGRAM FOR SYSTEMS AND EQUIPMENT35. DI-R-7079, RELIABILITY PROGRAM PLAN36. DI-R-7080, RELIABILITY STATUS REPORT37. DI-R-7041, FAILURE SUMMARY AND ANALYSIS REPORT38. DI-R-7081, RELIABILITY MATHEMATICAL MODEL(S)39. DI-R-2114, RELIABILITY ALLOCATION REPORT40. DI-R-7082, RELIABILITY PREDICTIONS REPORT41. DI-R-1734, FAILURE MODES, EFFECTS, AND CRITICALITY REPORT42. DI-R-2115A, FAILURE MODE AND EFFECT ANALYSIS REPORT43. DI-R-7083, SNEAK CIRCUIT ANALYSIS REPORT44. DI-R-7084, ELECTRONIC PARTS/CIRCUITS TOLERANCE ANALYSIS REPORT45. DI-R-35011, CRITICAL ITEM CONTROL PLAN46. DI-R-7040, BURN-IN TEST REPORT47. DI-R-7033, RELIABILITY TEST PLAN

Locked By	Name	Label	Description
			48.DI-R-7035, RELIABILITY TEST AND DEMONSTRATION PROCEDURES 49.DI-R-7034, RELIABILITY TEST AND DEMONSTRATION REPORTS 50.MIL-STD-965, PARTS CONTROL PROGRAM 51.MIL-STD-1366B MATERIEL TRANSPORT. SYS DIMENSIONAL AND WEIGHT CONSTRAINTS, DEFINITION OF
P/F2	POLICY FILES (CONT.)		This data store is a continuation of the policy files. The following is included: 1. MIL-STD-1366B MATERIAL TRANSPORTATION SYS DIMENSIONAL AND WEIGHT CONSTRAINTS, DEFINITION OF 2. MIL-STD-1367 PACKAGING, HANDLING, STORAGE AND TRANSPORTABILITY PROGRAM REQUIREMENTS. 3. MIL-HDBK-157 MILITARY HANDBOOK TRANSPORTABILITY CRITERIA.
PM/DF	PROGRAM MANAGER DATA FILE		Contains those files and data which are normally developed by and/or retained by the program manager for proper management of the development program. These files include: 1. ENGINEERING DRAWINGS 2. ENGINEERING CHARACTERISTICS 3. DT/OT RESULTS 4. CONCEPT FORMULATION PACKAGE (CFP) 5. DESIGN CONCEPT PAPER (DCP) 6. TYPE TECHNICAL REVIEWS REQUIRED 7. MILESTONE SCHEDULES 8. FUNDING PROFILES 9. REQUIRED OPERATIONAL CAPABILITIES (ROC) 10. ITEM/EQUIPMENT SPECIFICATIONS 11. ITEM/EQUIPMENT MISSIONS & FUNCTIONS 12. EQUIPMENT, MANPOWER, AND TECHNICAL RISK ASSESSMENTS (FROM LSA TASK 301.2.3) 13. TRADE OFF DETERMINATION ANALYSIS (BTA) 14. TRADE OFF ANALYSIS (TOA) 15. BEST TECHNICAL APPROACH ANALYSIS (BTA) 16. COST AND OPERATIONAL-EFFECTIVENESS ANALYSIS (COEA)
TRANSPORT FILE	TRANSPORTATION DATA FILE		Purpose: contains those files and data which are normally developed during analysis of the system for transportability factors. These files include: 1. TRANSPORTATION PLAN 2. TRANSPORTATION EVALUATION PLAN REPORT

DATE: 22-NOV-89
TIME: 12:32

APJ 966-254
EXTERNAL ENTITY

PAGE 1
EXCELERATOR 1.84

Name	Label	Description
PM/ILSMT	PM/ILSMT INITIATE REQRMNT	The program manager or those activities, agencies, or authorities that are responsible for the initiation of the requirement for an ILS element assessment during a development program for a system and/or equipment in accordance with AR 700-127. The key action (output) required of this external entity is the directive authority, or other documentation the initiates the requirement for the application of this ILS assessment to a specific system/equipment development program at a specified point in its life cycle.

ANNEX C

LSA SUBTASK 303.2.12

**TRADE-OFF BETWEEN SYSTEM/EQUIPMENT
ALTERNATIVES AND TRANSPORTABILITY REQUIREMENTS**

ANNEX C

LSA SUBTASK 303.2.12 Trade-off Between System/Equipment Alternatives & Transportability Requirements

PROCESS 303.2.12.1 - Select System/Equipment Alternatives

PURPOSE

To select new system/equipment alternatives, one at a time, for in-depth evaluation of the relative transportability of each, with a resulting trade-off evaluation to select the optimum transportation system for the selected new system.

PROCEDURES:

1. Identify the systems/equipment to be analyzed.
2. Identify transportability modes, i.e., air transportation, air drop, sea, rail, truck, etc.
3. Review project manager data files for:
 - a. Program documentation
 - b. Policy documents
 - c. Design specifications that establish transportability associated with the program.
4. Review existing similar systems transportation data from the program manager file and obtain the existing baseline comparison system documents representing these systems. If a similar transportation system is non-existent, obtain from actual point of contact (POC) the Baseline Comparison System (BSC) documentation representing a composite of elements from various dissimilar systems that can be assembled to most closely resemble the new transportation system.
5. Review and obtain copies of the following:
 - a. Contract requirements
 - b. Drawings, specs and QAPs
 - c. O&O Plan
 - d. ROC and other transportability data.
6. Review LSAR File Record J (if available) for:
 - a. Item name
 - b. LSA control number.

**Select System/Equipment Alternative
(Process 303.2.12.1)**

End Item Name:

Nomenclature:

Part Number:

Identify the alternative System/Equipment to be analyzed.

- a.
- b.
- c.
- d.
- e.

Identify Transportation modes required

- a. Rail
- b. Truck
- c. Ship
- d. Air cargo (plane or helicopter)
- e. Air drop (plane or helicopter)
- f.

7. Select the first alternative systems/equipment from the potential candidates. Perform all processes of this subtask for each candidate.

PROCESS 303.2.12.2 Develop Transportability Criteria/Characteristic

PURPOSE:

Develop the transportability criteria and/or characteristics of each of the systems/equipment selected.

PROCEDURES:

1. Specify the following data for the alternative system equipment selected - Physical Data:

- a. Unit Pack
- b. Dimensions
- c. Weight
- d. Cube
- e. National Motor Freight Classification
- f. Uniform Freight Classification
- g. Less than Track Load (LTL)
- h. Less than Car Load (LCL)

2. Assign description and codes for the alternative system selected:

- a. DoD Water Commodity Code
- b. DoD Air Commodity Code
- c. DoD Air Dimension Code
- d. Freight Description (Noun)
- e. MILSTAMP Special Handling Code
- f. Dangerous Material Code
- g. Transportation Control Code
- h. DOT Shipping Class
- i. Dot Designation

3. Based on peacetime and wartime operational mode summary/mission profile, determine the mobility requirements for the system under analysis.

**Develop Transportability Criteria/Characteristics
(Process 303.2.12.2-1)**

End Item Name:
Nomenclature:
Part Number:

Identification of physical data

<u>ITEM</u>	<u>CHARACTERISTIC</u>
a.	Unit Pack
b.	Dimensions
c.	Weight
d.	Cube
e.	National Motor Freight Classification
f.	Uniform Freight Classification
g.	Less than truck load (LTL)
h.	Less than car load (LCL)
i.	DOD water Community Code
j.	DOD air Community Code
k.	DOD air dimension Code
l.	Freight description (noun)
m.	Milstamp special handling code
n.	Dangerous material code
o.	Transport Control Code

Description and Codes assignment

- a. Freight Description (noun)
- b. DOD Water Commodity code
- c. DOD air commodity code
- d. DOD air dimension code
- e. Milstamp special handling code
- f. Dangerous material code
- g. Transportation control code
- h. Others if appropriate

Transportability Criteria
(Process 303.2.12.2-2)

End Item Name:

Nomenclature:

Part Number:

1. Narrative Description - Peacetime Operational Mode
Summary/Mission Profile.

2. Narrative Description - Wartime Operational Mode
Summary/Mission Profile.

4. From the Concept Formulation Package or operational data, specify:

- a. Operational requirements related to transportability
- b. Supply-related transportability requirements
- c. Support-related transportability requirements
- d. Training-related transportability requirements.

PROCESS 303.2.12.3 - Identify Outsize Items

PURPOSE:

List any known transportation/transportability constraints on weight, width or height dimensions.

PROCEDURES:

1. Policy File D/F2 System equipment size:

- a. Exceeds 8 ft. in height
- b. Exceeds 8 ft. in width
- c. Exceeds 32 ft⁵. in length
- d. Exceeds 11,200 pounds shipment weight.

2. Feasibility of disassembly and assembly of transportability items as system/equipment items were evaluated:

- a. Number of packages into which item can be disassembled for shipment
- b. Dimension and weight of components exceeding the criteria in Procedure 1.

3. If items exceed the criteria in Procedure 1, data required is as follows:

- a. Nomenclature and brief description and use
- b. Primary and alternate mode(s) of transportation contemplated.
- c. Planned item quantity
- d. Planned destination or area
- e. Disassembly and assembly time in manhours of each.

REFERENCES:

- Data Item Descriptions DI-L-6148 and 6149, and MIL-STD-1366

**Operation Requirements Related to Transportability
(Process 303.2.12.2-3)**

End Item Name:
Nomenclature:
Part Number:

Operational Requirements

<u>Item</u>	<u>Requirement</u>
Lifting & Tiedown Provisions (MIL-STD-209)	
Strategic Mobility	
Transportability Report	
Transportability Engineering Analysis	
MTMC Approval	
Unit Deployment/Assessment Analysis	
Rail car loading drawing	
Tactical mobility (to include towing/ carrying vehicles)	
Others	

Supply Requirements Related to Transportability
(Process 303.2.12.2-4)

End Item Name:
Nomenclature:
Part Number:

Supply Requirements

<u>Item</u>	<u>Requirement</u>
Prescribed load list (PLL) Storage facilities	
Authorized stockage list (ASL) Storage facilities	
Hazard classification data	
War reserves storage (theater, CONUS, POMCUS)	
Selected non-war reserves storage (GS supply base)	

**Support Requirements Related to Transportability
(Process 303.2.12.2-5)**

End Item Name:
Nomenclature:
Part Number:

Support Requirements

<u>Item</u>	<u>Requirement</u>
Maintenance facilities organizational through intermediate (TD & E)	
Depot maintenance facilities (Maintenance Support Plan)	
Integrated Logistic Support Plan	
ILSMT	
Acquisition strategy	
LSA strategy	
LSA/LSAR documentation	
Support transition Plan	
Test and evaluation master plan	
LSA Tasks (Planned, completed)	
Integrated Support Plan	
Others	

Training Requirements Related to Transportability
(Process 303.2.12.2-6)

End Item Name:
Nomenclature:
Part Number:

Training Requirements

<u>Item</u>	<u>Requirement</u>
Facilities	
-Institutional	
-Unit	
-Ranges, targets, securing equipment, safety etc.	
-classrooms	
-training facilities for transportation equipment	
Others	

Identify Outsize Items
(Process 303.2.12.3)

End Item Name:
Nomenclature:
Part Number:

<u>Required constraints</u>	<u>Physical Data</u>
a. Exceeds 8ft in height	a.
b. Exceeds 8ft in width	b.
c. Exceeds 32ft in length	c.
d. Exceeds 11,200 lbs shipping weight	d.

PROCESS 303.2.12.4 - Identify Transportability Sensitive Items

PURPOSE:

To identify those shipment items for each system/equipment under consideration which may be defined as "sensitive".

PROCEDURES:

1. Data will be obtained or developed from the following:
 - a. Based on transportability characteristics and criteria, any sensitive transportation items.
 - b. Identify sensitive items based on the need for specialized or specified modes of transportation.
 - c. General description of considerations leading to a decision to develop and employ unique equipment or techniques.
 - d. Rationale for identifying need, for and number of technical escorts required and their required skill level.
 - e. Rationale for requiring development or application of unique materials handling devices or techniques.
2. Identify an item as sensitive because:
 - a. It requires the latest state-of-the-art in transportation equipment, materials handling design and packaging technology before safe delivery can be accomplished.
 - b. The specific transportability equipment is not supported by the state-of-the-art. How, when, and by whom the solution will be accomplished must be asked.

REFERENCE:

- AR 70-44, Engineering for Transportability

PROCESS 303.2.12.5 - Identify Transportability Dangerous Cargo

PURPOSE:

To identify those shipments which may be considered as dangerous cargo.

PROCEDURES:

1. Explain rationale for identifying need for and number of technical escorts required per shipment with required skill level.
2. Describe any necessary facilities, equipment, or personnel (excluding escorts) necessary to support the environmental condition of an item.
3. Identify necessity for special permits to move over standard commercial transportation media.
4. Specify items that require identification of dangerous handling procedures to be avoided or provided for in shipment.
5. Identify venting requirements, provisions or equipment needed during transit movement or storage.
6. State the proposed emergency procedures to be followed during movement.
7. Identify EDD render safe procedure for announition items.

REFERENCE:

- Data Item Description (DID), DI-L-6148

PROCESS 303.2.12.6 Identify/Consolidate Transportability Requirements

PURPOSE:

To identify and consolidate all transportability characteristics of the shipment item for each system/equipment alternative.

PROCEDURES:

1. Utilize all the physical data identified in Process 303.2.12.2, "Development of Transportability criteria/characteristics for consolidation.

2. Utilize Packaging, Handling, Storage and Transportation developed in Process 303.2.12-3 and outsized shipment from the same proces for consolidation.

3. Utilize transportability-sensitive data from Process 303.2.12.4 for consolidation.

4. Review those shipment items of each alternative system/equipment which were rated as "Dangerous Cargo" in Process 303.2.12.5 for consolidation of requirements.

5. Utilize system/equipment size as well as Transportation and Transportability requirements specified in Appendix E-11 of AR 700-127 to determine the following information:

- a. Transportability T&E/Verification
- b. Corrective Action Plans/Status
- c. Transportability Report
- d. Transportability Engineering Analysis
- e. Military Traffic Management Command (MTMC)
Transportability Approval
- f. Transportation Guidance Technical Manual
- g. Railcar Loading Drawing
- h. Rail Impact Test
- i. Strategic Mobility
- j. Unit Deployment Assessment/Analysis
- k. Tactical Mobility (to include Towing/Carrying vehicles)
- l. Lifting and Tiedown Provisions (MIL-STD-209)
- m. Highway, Rail, Marine, and Air (Fixed Wing and Rotary)
- n. Airdrop Requirements
- o. Air Cargo Handling System Compatibility
- p. Sectionalization/Disassembly.

REFERENCES:

- ARs 700-127 & 700-15
- MIL-STDs-209 & 13670

PROCESS 303.2.12.7 - Trade-Off Criteria

PURPOSE:

To develop the trade-off criteria to be used in the trade-off evaluation of the shipment items of the system/equipment alternatives in order to select the best transportation concept alternative.

PROCEDURE:

1. Utilize all transportation characteristics developed in Process 302.2.12.2 to establish the transportability trade-off criteria:
 - a. Consider all fifteen (15) items listed in the above process and any other information pertinent to the trade-off criteria.
 - b. Consider all transportation and transportability requirements items a. through p. listed in Step 6 of Process 302.2.12.6.

REFERENCES:

- Transportation Files
- LSAR File
- MIL-HDBK-157, Transportability Criteria

PROCESS 303.2.12.8 - Establish Relationship Model Characteristics

PURPOSE:

To develop an analytical relationship concerning transportation logistic elements and types of transportation for each alternative system/equipment.

PROCEDURE:

1. From the Historical (LSAR) and Policy files, establish the relationship of the existing models to the shipment item transportability characteristics utilizing all information listed in Process 303.2.12.2.

RELATIONSHIP MODELS CHARACTERISTICS COMPARISON FORM
PROCESS 303.2.12.8

System/Equipment Name:

Nomenclature:

Part Number:

1. System/Equipment Transportability characteristics of each of the systems/equipment under consideration.
2. Historical data bases from logistically similar existing Transportability systems.

TRANSPORTABILITY CHARACTERISTICS

	NEW	EXISTING
a.	Unit Pack	
b.	Dimensions	
c.	Weight	
d.	Cube	
e.	National Motor Freight Classification.	
f.	Uniform Motor Freight Classification	
g.	Less than Track Load/Car Load	
h.	LTL/LCL Ratings	
i.	DoD Water Commodity Code	
j.	DoD Air Commodity Code	
k.	DoD Air Dimension Code	
l.	Freight Description (Noun)	
m.	MILSTAMP Special Handling Code	
n.	Dangerous Materiel Code	
o.	Transportation Control Code	
p.	Outsize Items	

303.2.12.8A1 - Determine Logistics Impacts Required for Operation and Support

PURPOSE:

To identify and assess new system/equipment transportability requirements that are either common with existing weapon systems or that are unique to the new system/equipment.

PROCEDURES:

1. Determine if new operation and maintenance procedures have to be developed in order to transport the new system/equipment by reviewing Transportability engineering data. Where existing procedures can be used, identify the logistics resources required.
2. Review the spare and repair parts requirement of transportability items used with the new system/equipment To identify additional quantities required for items used on other weapon systems. For new parts, assess the number of line items that need to be added to the inventory and the associated quantities.
3. Determine if personnel, training and support requirements associated with the new Transportability items can be fulfilled with existing resources. Identify additional resources that are required. For new resource requirements, specify MOS specialties, training requirement and support, to include technical documentation, support equipment, and facilities.
4. Review all other logistic considerations listed on LSAR Record B, Card 06, Block 3, and identify the types and quantities of new or additional logistic resources required for the Transportability considerations.

REFERENCES:

- MIL-STD-1388-2A, Appendix F

PROCESS 303.2.12.8A2 - Assess Impact on Existing System
Transportation

PURPOSE:

To identify and assess logistic Transportability impacts caused by the new system/equipment requirements to existing systems.

PROCEDURE:

1. Identify a Weapons System that may be impacted due to Transportability resource requirement for the new system which were found in Process 303.2.12.8A1. Discuss what the impacts are and how they affect the existing weapon systems.

PROCESS 303.2.12.8A3 - Determine Logistic Support Impact at
Organizational Level

PURPOSE:

To determine the Transportability impact at the organizational maintenance level for the alternative system/equipment.

PROCEDURES:

1. Review the Maintenance Allocation Chart (MAC) to determine the maintenance functions performed at organizational maintenance and tools (if any) that are required for the functions.
2. Review the Repair Parts & Special Tools Lists (RPSTL) for parts authorized at organizational level.
3. Determine the Transportability requirements to support the organizational level of maintenance for the alternative system/equipment.
4. Determine if new transportability items place and additional operational or maintenance burden on the support system. Specify any additional resources required to provide this support.

REFERENCES:

- TMs and RPSTLs on existing items selected.

PROCESS 303.2.12.8A4

Determine Logistic Support Impact at
Intermediate and Depot Maintenance
Level

PURPOSE:

To determine the Transportability impact at Intermediate (DS & GS) and Depot maintenance levels for the alternative system/equipment under consideration.

PROCEDURES:

1. Review the MAC or the PMAC for the alternative system/equipment, if available, to determine the maintenance functions to be performed at intermediate and depot levels of maintenance.
2. Determine the Transportability requirements at these two levels of maintenance for the alternative system/equipment under consideration.
3. Review the Repair Parts & Special Tools List (RPSTL) for parts and tools authorized for intermediate and depot level on the alternate system/equipment.
4. Consider if additional maintenance requirements exist for any new transportability items being developed for the alternative system/equipment. Specify any additional resources required to provide this support. Consider manpower, personnel, training, tools, support equipment and spare parts.

REFERENCES:

- TMs, RPSTLs and DMWR's (or Depot Maint Support Plan) on existing items selected
- ARs 750-1 and 710-1

PROCESS 303.2.23.8A5

Life Cycle Support Implications

PURPOSE:

To identify all Transportability resources (including new transportability items) for operation and maintenance tasks to support the alternative system/ equipment throughout the intended life cycle.

PROCEDURES:

1. Provide qualitative and quantitative reliability requirements if the item is new and specify the minimal acceptable reliability values. Use AR 702-3 for guidance.
2. Provide qualitative and quantitative maintainability goals for each identifiable task and the maintenance level where it is

Life Cycle Support Implication
(Process 303.2.12.8A5)

<u>Transport Resources For Operation</u>	<u>Acceptable Reliability Requirements</u>	<u>Maintainability Requirements and Level</u>	<u>Supportability factors</u>
1.	1.	1.	1.
2.	2.	2.	2.
3.	3.	3.	3.
4.	4.	4.	4.

3. Assess all life cycle implications by reviewing program documentation, policy documents, design characteristics to establish supportability factors. Utilize data from previous Processes 303.2.12.2 and 303.2.12.6.

REFERENCES:

- AR 702-3
- AR 700-127, Maintenance Planning
- Depot Maintenance Work Requirements (DMWRs)
- MIL-STD-470, Maintainability Program
- Technical Manuals (TMs), Operator, Organizational, and Intermediate.

PROCESS 303.2.12.8A6 - Consolidate Transportability Data for the Alternative System/Equipment

PURPOSE:

To consolidate all Transportability data for operation and all levels of maintenance for the alternative system/equipment.

PROCEDURES:

1. Consolidate Transportability data at organizational level of maintenance from Processes 303.2.12.8A3 with data from intermediate (DS & GS) and depot level generated in Processes 303.2.12.8A4.
2. List consolidated results for all levels of maintenance.

**Consolidated Results of Impact on all levels of Maintenance
(Process 303.2.12.8A6)**

End of Item Name:

Nomenclature:

Part Number:

List Results of Impact on:

1. Organizational Level

a.

b.

c.

2. Intermediate Level

a.

b.

c.

3. Depot Level

a.

b.

c.

PROCESS 303.2.12.8A7 - Document Results

PURPOSE:

Documentation of the life cycle implications and all consolidated results of logistic support data to be utilized in the next Process 303.2.12.9.

PROCEDURES:

1. Document results of Transportability requirement from Process 303.2.12.8A6.
2. Document assessed life cycle implications from Process 303.2.12.8A5.
3. Combine the two lists from Processes 303.2.12.8A6 and 303.2.12.8A5.

PROCESS 303.2.12.9 - Trade-Off Evaluation of Transportation of each System/Equipment

PURPOSE:

To consolidate Transportation requirements trade-off criteria results, logistic support data and life cycle data with the selected Transportation concept to have the best balance in cost, schedules, performance, and readiness of Transportation.

PROCEDURES:

1. Use Relationship Model data from Process 303.2.12.8 for start of consolidation.
2. Use trade-off criteria results from Process 303.2.12.7 for consolidation.
3. Use Transportability evaluation reports for consolidation.

REFERENCES:

- DI-L-6148 and DI-L-6149.

**Consolidate Logistic Support Data
(Process 303.2.12.8A7)**

<u>Results of Impact all Levels of Maintenance</u>	<u>Transportation Resources I/Operation & Maintenance</u>	<u>Reliability Requirements</u>	<u>Maintainability Requirements and Level to be Performed</u>	<u>Supportability Factor</u>
1.	1.	1.	1.	1.
2.	2.	2.	2.	2.
3.	3.	3.	3.	3.

PROCESS 303.2.12.9A1 - Select Alternative Transportation Concepts for Each System/Equipment

PURPOSE:

To select system/equipment Transportation concepts that meet mission mobility requirements and the established Transportability design criteria and characteristics.

PROCEDURES:

1. Select an existing Transportability Model to perform the trade-off. For guidance, use AMC-PAM 700-4.
2. Determine applicable variables that have to be input based on the system Transportability requirements generated in Process 303.2.12.6.
3. Select trade-off criteria based on the results of Process 303.2.12.7.
4. Use historical data files to obtain additional evaluation parameters as required.

REFERENCES:

PROCESS 303.2.12.9A2 - Perform Transportation Trade-off Analysis

PURPOSE:

To determine the alternative Transportability concept whose elements have the best influence on Reliability, Safety, Maintainability, Transportation, Handling, Storage, Preservation and Packaging, Funding, Data Management and Maintenance Engineering.

PROCEDURES:

1. Use Transportation trade-off analysis data base from Process 303.2.12.9A1 to perform trade-off.
2. Use trade-off criteria results from Process 303.2.12.7 through 303.2.12.9A1 to perform trade-off.

3. Perform trade-off analysis using the specified model on each Transportability alternative for each system/equipment alternative under analysis. Utilize all pertinent data, i.e., reliability, maintainability, safety, packaging, shipment, and storage for the analysis.

REFERENCES:

- MIL-STD-1367

PROCESS 303.2.12.9A3 - Perform Cost Trade-off Analysis

PURPOSE:

To determine the Transportability alternative having the best dollar value for the resources expended.

PROCEDURES:

1. Construct a relationship matrix of the cost for each Transportation element and/or component versus its cost for each of the Transportability design alternatives under analysis for the system/equipment.
2. Evaluate each Transportability system to determine the system concept having the best dollar value for the resources expended.

REFERENCES:

PROCESS 303.2.12.9A4 - Selected Transportation Concept Alternative

PURPOSE:

To select the best alternative Transportation concept developed for each system/equipment alternative.

PROCEDURES:

1. Use the list of selected systems from Task 303.2.12.1 for Transportation concepts.

Matrix Form Cost Tradeoff Analysis
(Process 303.2.12.9A3)

Transportation
Alternative 1

Transportation
Alternative 2

Transportation
Alternative 3

Cost

Schedule/Resource
Expanded

2. Use the results of Processes 303.2.12.9A2 and 303.2.12.9A3 to identify the feasible Transportation concepts for the alternative system/equipments under consideration.

3. Select each alternative transportation concept that meets the system mobility requirements with the specified Transportability criteria and characteristics.

PROCESS 303.2.12.9A5- Optimum Transportation System
Alternative Trade-off for each
System/Equipment

PURPOSE:

To select the alternative Transportation items developed for each system/equipment.

PROCEDURES:

1. Use the Transportability trade-off analysis results from Process 303.2.12.9A2 for part of the trade-off data.

2. Use the Cost trade-off analysis results from Process 303.2.12.9A3 for part of the trade-off data.

3. Use system alternative Transportation concepts selected in Process 303.2.12.9A4 for part of the trade-off data.

4. Integrate the data gathered in Steps 1 through 3 above and select from modeling, analysis, mathematical programming, statistics and simulation, the best alternative Transportation Concept for each system/equipment alternative.

REFERENCES:

PROCESS 303.2.12.9A6- Select the Best Alternative
Transportation System

PURPOSE:

To select the optimum alternative Transportability Model.

PROCEDURES:

1. List the results of the Transportation trade-off analysis developed in Process 303.2.12.9A5.
2. Evaluate each result listed in procedure 1 and select the most effective, least cost, best schedule, best performance, earliest readiness and cheapest supportability Transportability Model.

PROCESS 303.1.23.9A7 - Document Evaluated Trade-off Results

PURPOSE:

Documentation of evaluated trade-off results and recommended Transportation systems is required for final report to PM/ILST who initiated the requirement.

PROCEDURES:

1. Document, in narrative format, the results of each of the trade-off analyses accomplished in Process 303.2.12.9A5.
2. Document the selected best Transportation alternative accomplished in Process 303.2.12.9A6.
3. Prepare final report for PM/ILSMT on all evaluated Transportation Trade-off results.

Document Trade-off Results
(Process 303.2.12.9A7)

End Item Name:
Nomenclature:
Part Number:

Related Information

Document Title:
Date:
Prepared by:
Prepared for:
Command/Office/Sym:
Location:
Version:

ANNEX D

—
LSA SUBTASK 303.2.12
VERT APPLICATION METHODOLOGY

VERT APPLICATION METHODOLOGY

BACKGROUND:

Venture Evaluation and Review Technique (VERT) was developed as a network analysis technique to facilitate management decision making. It allows a systematic planning and control of programs and enables managers to find solutions to real life managerial problems.

The terms of the APJ contract require the provision of batch files for each of the VERT networks associated with the various Data Flow Diagrams in the APJ 966 projects.

APJ has been successful in adopting a method for the creation of these networks using the existing EXCELERATOR software package and establishing a naming convention compatible with that used in the Data Flow Diagrams. To do this APJ has made use of the PC model of VERT. A Structured Analysis project was used for this purpose. The prototype VERT network structure was made for one top level and one lower level data flow diagram.

The PC model of VERT has certain limitations built into it. To overcome some of these limitations, certain conventions were used to create the input files. To maintain full generality a set of "dummy" default values were established. The model allows the user to alter the default values of time, cost, and performance to satisfy their specific requirements.

METHODOLOGY:

The basic symbols used to structure the network are:

(i) **SQUARES** - to indicate **NODES**. These are decision points in the project, or points beyond which the project cannot proceed unless certain criteria are met. There are two type of nodes, one which supports input operations and, the second type which supports output operations.

(ii) **LINES** - to indicate **ARCS** which are activities that have time, cost, and performance criteria associated with them.

In practice, however, both the arcs and nodes are similar, in that both have time, cost, and performance criteria associated with them. The arcs have a primary and a cumulative set of time, cost, and performance criteria whereas the nodes have only a single cumulative set.

(iii) **NAMING CONVENTIONS** - Efforts have been made to keep the naming convention as compatible as possible to the Data Flow Diagrams. The naming convention used is displayed below.

NODES - All nodes are prefixed with the letter N. The individual Nodes are identified by a number and a letter. The number refers to the number of the node within the diagram and the letter refers to the diagram number in the project. In the event that a node has been referenced in an earlier diagram they also carry the number of the node in the earlier diagram as a prefix to the individual node number.

N2.4A

- N** - All nodes are prefixed with the letter N
- 2** - Gives the number of the node it relates to in a higher level diagram or an earlier data flow diagram within the project. In this case it refers to node N2 of the top level diagram.
- 4** - Gives the number of the node it relates to in a higher level diagram or an earlier data flow diagram within the project. In this case it refers to node N2 of the top level diagram.
- A** - The nodes in each subsequent explosion are allotted an alphabetical suffix indication the number of the explosion diagram in the particular project. In this case it is the first lower level diagram within the project.

ARCS - All arcs are prefixed with either the letter C or E. The individual Arcs are identified by two numbers. The first number refers to the number of the arc within the diagram and the second number refers to the number of the diagram within the project. In the event that an arc has been referenced in an earlier diagram they also carry the number of the arc in the earlier diagram as a prefix to the individual arc number. The arcs which are identified by the letter E have direct reference to a process in the corresponding data flow diagram and as such are named the same as the process itself.

- C - All arcs are prefixed with the letter C. In some cases, however, arcs carry a prefix of E. These particular arcs correspond to a process within the data flow diagram and are thus named the same as the process itself.
- 3.3- Gives the number of the arc it relates to in a higher level diagram or an earlier data flow diagram within the project. In this case it refers to arc number 3 in lower level diagram #3 within the project.
- 8.4- Indicates that this particular arc is the #8 arc in the #4 lower level diagram of the project.

BATCH FILES

- INPUT FILES - The input file names are given the extension *.IN.
- OUTPUT FILES - The simulation output files are given the extension *OU.
- PRINT FILES - The print files have been given the extension *.PR.

(This would allow subsequent updates of the input files to be numbered as IN1..., OU1..., PR1... etc.)

DEFAULT SETTINGS:

Control Record:

- (i) The output option selected is "0" which provides a detailed listing, and high level of summary information.
- (ii) The input record listing option selected is "0" which prints all input records.
- (iii) The composite terminal node output option selected is "16" which assumes family mode and intrafamily transfer of histogram data.
- (iv) The number of interactions used are "10" in the demonstration model to facilitate operation in the debug mode if required.
- (v) The composite node name and the network name are left as blanks.

- (vi) In the run identification the name of the corresponding Data Flow Diagram is used as identification for the network description.

Arc Records:

- (i) For each of the arcs the following records are provided:
 - (a) Master Arc Record
 - (b) Time Distribution Satellite
 - (c) Cost Distribution Satellite
 - (d) Performance Distribution Satellite
- (ii) The Distribution Satellite Records are created to provide a uniform statistical distribution.
- (iii) The default values used for the minimum and maximum in each criteria are:

TIME	10.0	10.0
COST	10.0	100.0
PERFORMANCE	10.0	50.0

Node Records:

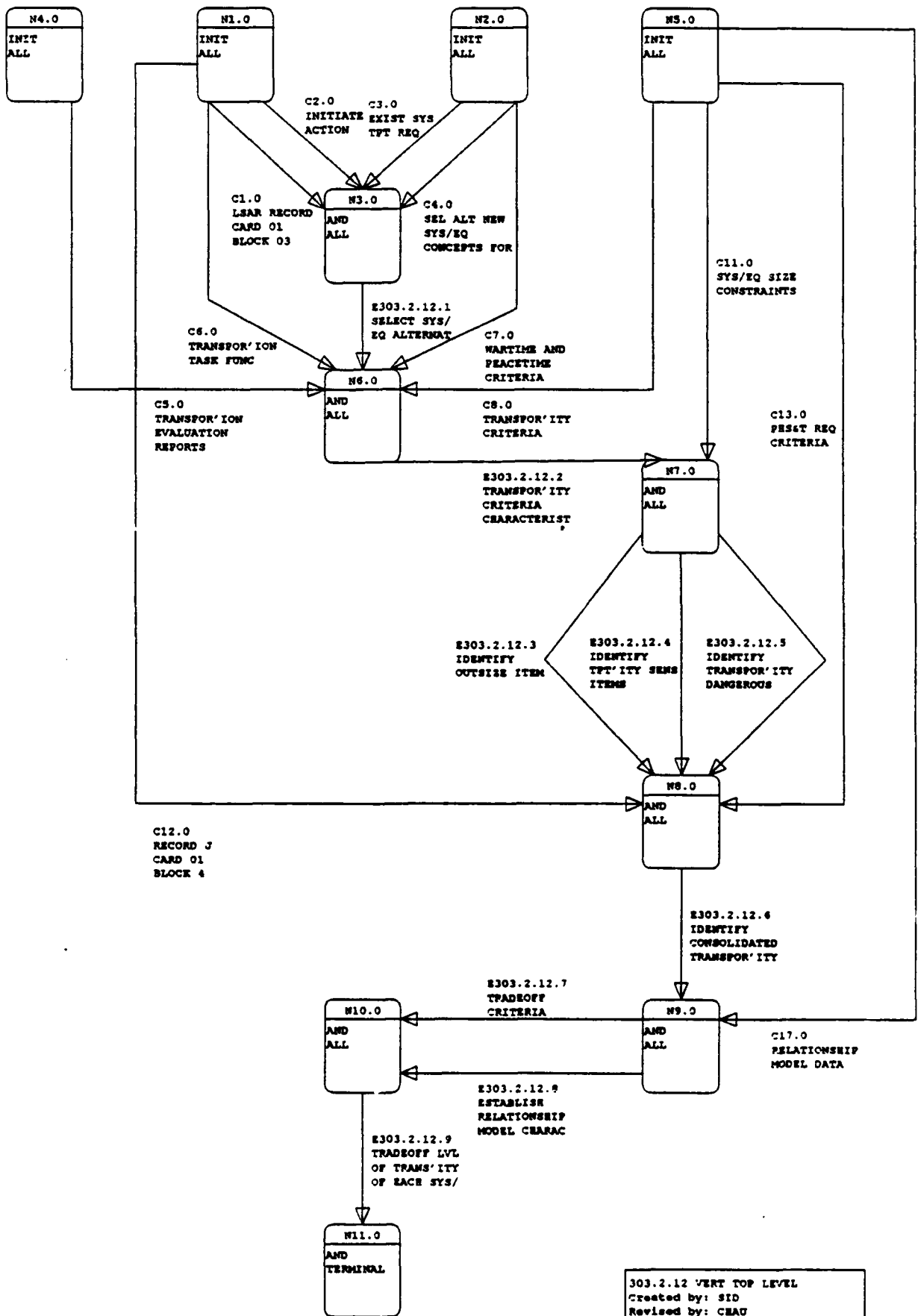
- (i) Input Logic - The input logic for the nodes are either "INITIAL" or "AND".
- (ii) Output Logic - The output logic has been defaulted to "AND" or "TERMINAL".
- (iii) The output option indicator and the storage option indicator are defaulted to read "0".
- (iv) The node description has also been left blank.

(It is again noted that the user can change the default values to desired values as identified by the particular requirement and applications.)

DOCUMENTATION:

With every project report APJ will be providing the following documents relating to the VERT:

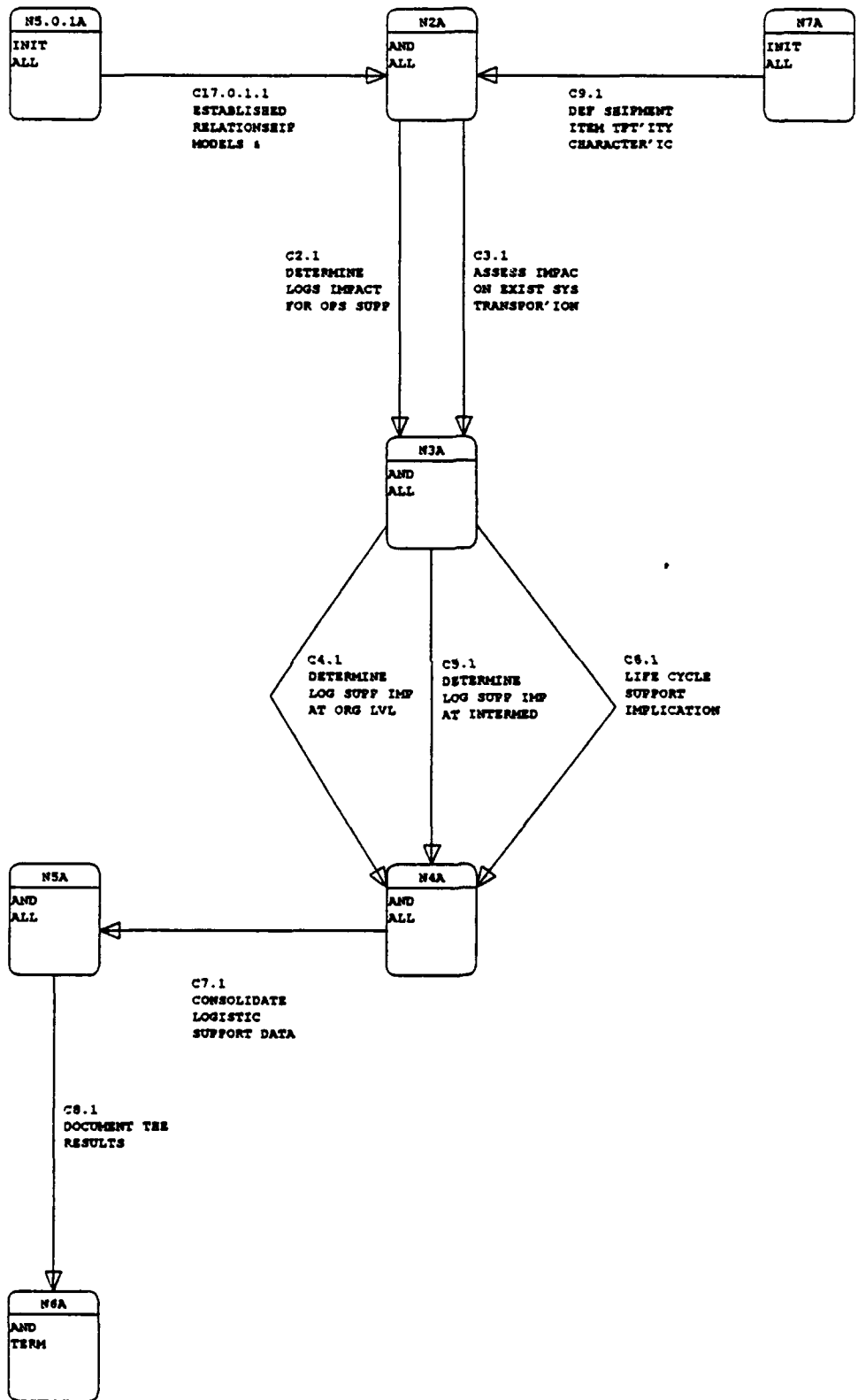
- (i) A VERT network diagram corresponding to a particular data flow diagram.
- (ii) A print out of the VERT network inputs for the particular data flow diagrams.
- (iii) A floppy disc containing the sample input, print and the simulation output files for the default VERT network.



	1	2	3	4	5	6	7
	1234567890123456789012345678901234567890123456789012345678901234567890123456789012						
1.	0016	10					
2.	C1.0	N1.0	N3.0	1.0	LSAR RECORD CARD 01, BLOCK 03		
3.	C1.0	DTIME	1	2	10.0	20.0	
4.	C1.0	DCOST	1	2	10.0	100.0	
5.	C1.0	DPERF	1	2	10.0	50.0	
6.	C2.0	N1.0	N3.0	1.0	INITIATE ACTION		
7.	C2.0	DTIME	1	2	10.0	20.0	
8.	C2.0	DCOST	1	2	10.0	100.0	
9.	C2.0	DPERF	1	2	10.0	50.0	
10.	C3.0	N2.0	N3.0	1.0	EXISTING SYSTEM TRANSPORTATION REQUIREMENTS		
11.	C3.0	DTIME	1	2	10.0	20.0	
12.	C3.0	DCOST	1	2	10.0	100.0	
13.	C3.0	DPERF	1	2	10.0	50.0	
14.	C4.0	N2.0	N3.0	1.0	SELECT ALT. NEW SYS/EQUIP CONCEPTS FOR ANAL		
15.	C4.0	DTIME	1	2	10.0	20.0	
16.	C4.0	DCOST	1	2	10.0	100.0	
17.	C4.0	DPERF	1	2	10.0	50.0	
18.	C5.0	N4.0	N6.0	1.0	TRANSPORTATION EVALUATION REPORTS		
19.	C5.0	DTIME	1	2	10.0	20.0	
20.	C5.0	DCOST	1	2	10.0	100.0	
21.	C5.0	DPERF	1	2	10.0	50.0	
22.	C6.0	N1.0	N6.0	1.0	TRANSPORTATION TASK FUNCTIONS		
23.	C6.0	DTIME	1	2	10.0	20.0	
24.	C6.0	DCOST	1	2	10.0	100.0	
25.	C6.0	DPERF	1	2	10.0	50.0	
26.	C7.0	N2.0	N6.0	1.0	WARTIME AND PEACETIME CRITERIA		
27.	C7.0	DTIME	1	2	10.0	20.0	
28.	C7.0	DCOST	1	2	10.0	100.0	
29.	C7.0	DPERF	1	2	10.0	50.0	
30.	C8.0	N5.0	N6.0	1.0	TRANSPORTABILITY CRITERIA		
31.	C8.0	DTIME	1	2	10.0	20.0	
32.	C8.0	DCOST	1	2	10.0	100.0	
33.	C8.0	DPERF	1	2	10.0	50.0	
34.	C11.0	N5.0	N7.0	1.0	SYSTEM/EQUIPMENT SIZE CONSTRAINTS		
35.	C11.0	DTIME	1	2	10.0	20.0	
36.	C11.0	DCOST	1	2	10.0	100.0	
37.	C11.0	DPERF	1	2	10.0	50.0	
38.	C12.0	N1.0	N8.0	1.0	RECORD J, CARD 01, BLOCK 4		
39.	C12.0	DTIME	1	2	10.0	20.0	
40.	C12.0	DCOST	1	2	10.0	100.0	
41.	C12.0	DPERF	1	2	10.0	50.0	
42.	C17.0	N5.0	N9.0	1.0	RELATIONSHIP MODEL DATA		
43.	C17.0	DTIME	1	2	10.0	20.0	
44.	C17.0	DCOST	1	2	10.0	100.0	
45.	C17.0	DPERF	1	2	10.0	50.0	

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46.	C13.0	N5.0	N8.0	1.0	PKG/HNDLG/STRG/TRANS'Y	PROGRAM REQUIREMENTS	
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48.	C13.0	DCOST	1	2	10.0	100.0	
49.	C13.0	DPERF	1	2	10.0	50.0	
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50.	E3032121N3.0	N6.0		1.0	SELECT SYSTEM/EQUIPMENT	ALTERNATIVES	
51.	E3032121D	DTIME	1	2	10.0	20.0	
52.	E3032121D	DCOST	1	2	10.0	100.0	
53.	E3032121D	DPERF	1	2	10.0	50.0	
	+	+		+	+	+	+
54.	E3032122N6.0	N7.0		1.0	TRANSPORTABILITY CRITERIA	CHARACTERISTICS	
55.	E3032122D	DTIME	1	2	10.0	20.0	
56.	E3032122D	DCOST	1	2	10.0	100.0	
57.	E3032122D	DPERF	1	2	10.0	50.0	
	+	+		+	+	+	+
58.	E3032123N7.0	N8.0		1.0	IDENTIFY OUTSIZE	ITEMS	
59.	E3032123D	DTIME	1	2	10.0	20.0	
60.	E3032123D	DCOST	1	2	10.0	100.0	
61.	E3032123D	DPERF	1	2	10.0	50.0	
	+	+		+	+	+	+
62.	E3032124N7.0	N8.0		1.0	IDENTIFY TRANSPORTABILITY	SENSITIVE ITEMS	
63.	E3032124D	DTIME	1	2	10.0	20.0	
64.	E3032124D	DCOST	1	2	10.0	100.0	
65.	E3032124D	DPERF	1	2	10.0	50.0	
	+	+		+	+	+	+
66.	E3032125N7.0	N8.0		1.0	IDENTIFY TRANSPORTABILITY	DANGEROUS ITEMS	
67.	E3032125D	DTIME	1	2	10.0	20.0	
68.	E3032125D	DCOST	1	2	10.0	100.0	
69.	E3032125D	DPERF	1	2	10.0	50.0	
	+	+		+	+	+	+
70.	E3032126N8.0	N9.0		1.0	IDENTIFY CONSOLIDATED	TRANSPORTABILITY REQU	
71.	E3032126D	DTIME	1	2	10.0	20.0	
72.	E3032126D	DCOST	1	2	10.0	100.0	
73.	E3032126D	DPERF	1	2	10.0	50.0	
	+	+		+	+	+	+
74.	E3032127N9.0	N10.0		1.0	TRADE-OFF	CRITERIA	
75.	E3032127D	DTIME	1	2	10.0	20.0	
76.	E3032127D	DCOST	1	2	10.0	100.0	
77.	E3032127D	DPERF	1	2	10.0	50.0	
	+	+		+	+	+	+
78.	E3032128N9.0	N10.0		1.0	ESTABLISH RELATIONSHIP	MODEL CHARACTERISTIC	
79.	E3032128D	DTIME	1	2	10.0	20.0	
80.	E3032128D	DCOST	1	2	10.0	100.0	
81.	E3032128D	DPERF	1	2	10.0	50.0	
	+	+		+	+	+	+
82.	E3032129N10.0	N11.0		1.0	TRADE-OFF LEVEL OF	TRANSPORTABILITY FOR EAC	
83.	E3032129D	DTIME	1	2	10.0	20.0	
84.	E3032129D	DCOST	1	2	10.0	100.0	
85.	E3032129D	DPERF	1	2	10.0	50.0	
	+	+		+	+	+	+
86.	ENDARC						
	+	+		+	+	+	+
87.	N1.0	1 2 0 0					
	+	+		+	+	+	+
88.	N6.0	2 2 0 0					

	+	+	+	+	+	+	+
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	+	+	+	+	+	+	+
90. N2.0	1 2 0 0						
	+	+	+	+	+	+	+
91. N4.0	1 2 0 0						
	+	+	+	+	+	+	+
92. N5.0	1 2 0 0						
	+	+	+	+	+	+	+
93. N7.0	2 2 0 0						
	+	+	+	+	+	+	+
94. N8.0	2 2 0 0						
	+	+	+	+	+	+	+
95. N9.0	2 2 0 0						
	+	+	+	+	+	+	+
96. N10.0	2 2 0 0						
	+	+	+	+	+	+	+
97. N11.0	2 1 0 0						
	+	+	+	+	+	+	+
98. ENDNODE							
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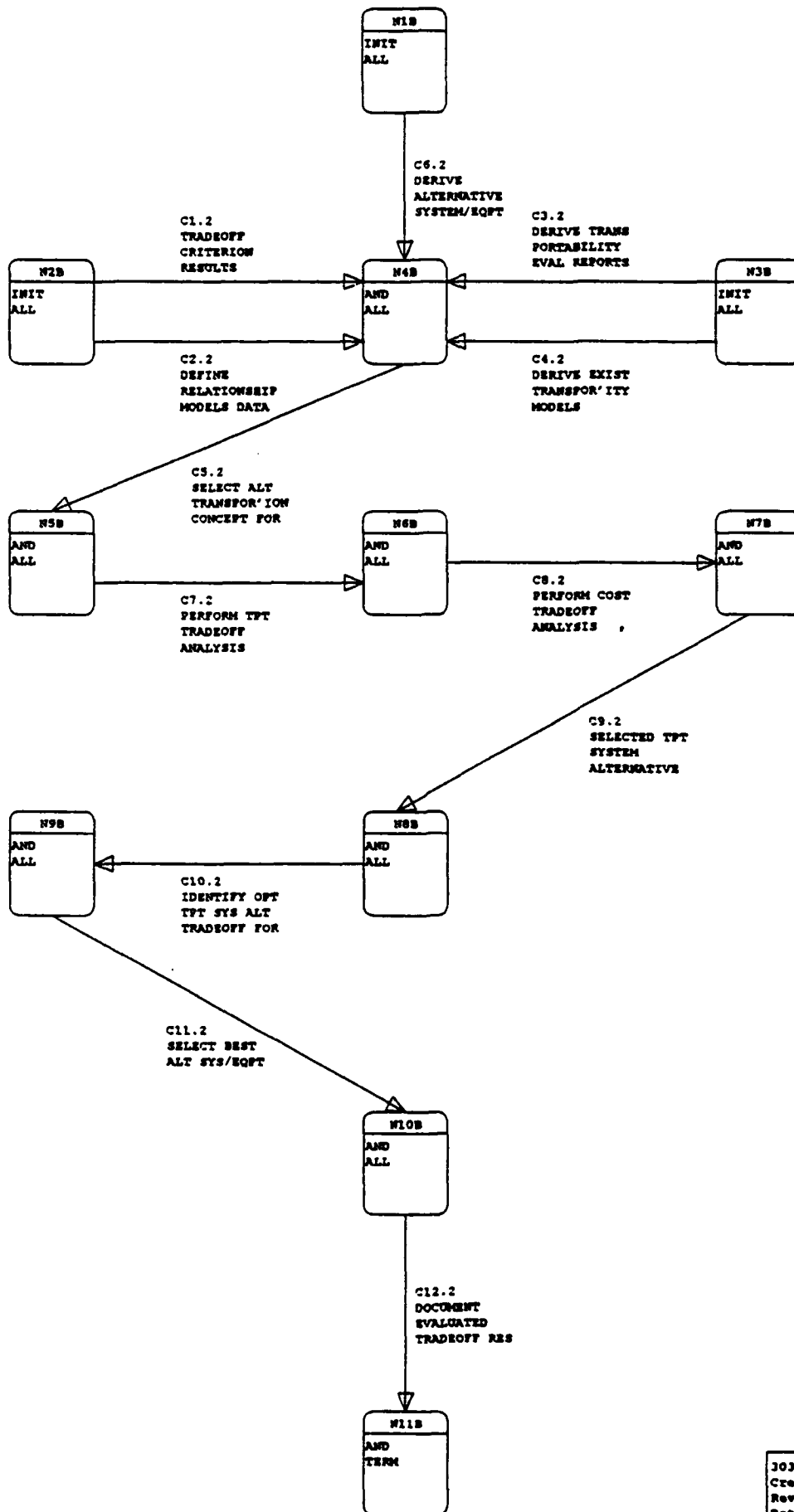
303.2.12.8A VERT
 Created by: SID
 Revised by: CRAU
 Date changed: 21-NOV-89

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1.	0016	10					
				TRANSPORTATION/TRANSPORTABILITY RELATIONSHIP MOD			
2.	C9.1	N7A	N2A	1.0	DEFINE SHIPMENT ITEM TRANSPORT'Y CHARACTERI		
3.	C9.1	DTIME	1	2	10.0	20.0	
4.	C9.1	DCOST	1	2	10.0	100.0	
5.	C9.1	DPERF	1	2	10.0	50.0	
6.	C17.011	N5.0.1A	N2A	1.0	ESTABLISH RELATIONSHIP MODELS		
7.	C17.011	DTIME	1	2	10.0	20.0	
8.	C17.011	DCOST	1	2	10.0	100.0	
9.	C17.011	DPERF	1	2	10.0	50.0	
10.	C2.1	N2A	N3A	1.0	DETERMINE LOGISTIC IMPACT FOR OPERATIONS SU		
11.	C2.1	DTIME	1	2	10.0	20.0	
12.	C2.1	DCOST	1	2	10.0	100.0	
13.	C2.1	DPERF	1	2	10.0	50.0	
14.	C3.1	N2A	N3A	1.0	ASSESS IMPACT ON EXISTING SYSTEM TRANSPORTA		
15.	C3.1	DTIME	1	2	10.0	20.0	
16.	C3.1	DCOST	1	2	10.0	100.0	
17.	C3.1	DPERF	1	2	10.0	50.0	
18.	C4.1	N3A	N4A	1.0	DETERMINE LOGISTIC SUPPORT IMPACT AT ORGANI		
19.	C4.1	DTIME	1	2	10.0	20.0	
20.	C4.1	DCOST	1	2	10.0	100.0	
21.	C4.1	DPERF	1	2	10.0	50.0	
22.	C5.1	N3A	N4A	1.0	DETERMINE LOGISTIC SUPPORT IMPACT AT INTERM		
23.	C5.1	DTIME	1	2	10.0	20.0	
24.	C5.1	DCOST	1	2	10.0	100.0	
25.	C5.1	DPERF	1	2	10.0	50.0	
26.	C6.1	N3A	N4A	1.0	DETERMINE LIFE CYCLE SUPPORT IMPLICATIONS		
27.	C6.1	DTIME	1	2	10.0	20.0	
28.	C6.1	DCOST	1	2	10.0	100.0	
29.	C6.1	DPERF	1	2	10.0	50.0	
30.	C7.1	N4A	N5A	1.0	CONSOLIDATE LOGISTIC SUPPORT DATA		
31.	C7.1	DTIME	1	2	10.0	20.0	
32.	C7.1	DCOST	1	2	10.0	100.0	
33.	C7.1	DPERF	1	2	10.0	50.0	
34.	C8.1	N5A	N6A	1.0	DOCUMENT THE RESULTS		
35.	C8.1	DTIME	1	2	10.0	20.0	
36.	C8.1	DCOST	1	2	10.0	100.0	
37.	C8.1	DPERF	1	2	10.0	50.0	
38.	ENDARC						
39.	N7A	1	2	0	0		
40.	N2A	2	2	0	0		
41.	N5.0.1A	1	2	0	0		
42.	N3A	2	2	0	0		


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1
123456789012345678901234567890123456789012345678901234567890123456789012
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43. N4A 2 2 0 0 + + + + + +
44. N5A 2 2 0 0 + + + + + +
45. N6A 2 1 0 0 + + + + + +
46. ENDNODE
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303.2.12.9A
 Created by: CRAO
 Revised by: CRAO
 Date changed: 21-NOV-89


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1
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NEW NETWORK PAGE 2
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46. C12.2 N10B N11B 1.0 DOCUMENT EVALUATED TRADE-OFF RESULTS
47. C12.2 DTIME 1 2 10.0 20.0
48. C12.2 DCOST 1 2 10.0 100.0
49. C12.2 DPERF 1 2 10.0 50.0
50. ENDARC
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52. N4B 2 2 0 0
53. N3B 1 2 0 0
54. N5B 2 2 0 0
55. N1B 1 2 0 0
56. N6B 2 2 0 0
57. N7B 2 2 0 0
58. N8B 2 2 0 0
59. N9B 2 2 0 0
60. N10B 2 2 0 0
61. N11B 2 1 0 0
62. ENDNODE
1234567890123456789012345678901234567890123456789012345678901234567890123456789012

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ANNEX E

STRUCTURED SYSTEMS ANALYSIS

Fundamentals

ANNEX E
STRUCTURED SYSTEMS ANALYSIS

Fundamentals

Structured Systems Analysis (SSA) has recently become an industry standard for generating Data Flow Diagrams (replacing "logic diagrams" or "flow charts") to aid in coordinating the functions to be performed by a computer program and its associated Inputs/Outputs (I/O). During the SSA, each set of "flow charts" can be checked by the potential user to assure that there is complete agreement on what is to be done by the program, and how it is to be accomplished. It also provides considerable flexibility for updating or changing the program.

Six basic elements (see figure 1) are used in SSA:

1. Process (PRC)
2. Data Flow (DAF)
3. Data Store (DAS)
4. External Entity (EXT)
5. Data Flow Diagram (DFD)
6. Data Dictionary (DCT)

PROCESS (Represented by a Circle):

A function or operation to be performed which can be explained by a set of instructions representing a single task, e.g., "calculate interest on a loan", "prepare a draft report". If the Process description is too complex to describe in a few steps, it may be necessary to develop a lower level description (see below).

DATA FLOW (Lines interconnecting Processes or I/Os):

Each function or Process cannot be a stand-alone in a complex network. To have any meaning in a program, each process must be initiated by a previous action and/or provided information on which to act. Furthermore, a Process must result in an output which is the input to the next logical Process. These inputs, outputs, or initiating actions are identified as Data Flows, and are represented by the Data Flow lines indicating its point of origin and the process to which it provides data.

DATA STORE (Represented by two parallel lines):

Although some Processes generate data used as input to a succeeding Process, there is often a need to "gather or collect" information from files in which it is stored. This information may come from an external source (such as a MIL-STD, Army regulation, historical experience files, etc.), or an internal source or file in which data is temporarily stored for use by succeeding processes. These Data Stores can be visualized as a "file cabinet", in which the data are stored for later retrieval).

EXTERNAL ENTITY (Represented by a Rectangle):

Each program or logical process must have an initiating action, a "point" of disposition of the results, and possible input guidance or instructions. Each of these have authorities, functions, or applications which are independent of the program Process (although required by the program Process). Thus, these activities, agencies, or facilities are considered "External Entities" to the program.

DATA FLOW DIAGRAM:

The general arrangement of the above can be readily seen. First, the circle or Process describes what has to be done; the interconnecting lines represent the Data Flows, together with the specific description of all I/Os. The Data Stores identify the source and/or file designation of a data base, and the External Entities represent those activities remote from the Process, which are the source of guidance or the recipients of the program. This combination of Processes, Data Flows, Data Stores, and External Entities constitutes a "Data Flow Diagram". The unique feature of the Data Flow Diagram (DFD) is that each process can be considered independently, permitting a change to be made in one Process without a major change in the overall program.

DATA DICTIONARY:

The Data Dictionary consists of a complete description of each of the basic elements. For the Process, it contains a step-by-step description of what has to be performed. The description of the Data Flow identifies the nomenclature of the data, a detailed description of its content, and its source. The Data Stores and External Entities are described, including possible location.

The Data Dictionary (a living document) begins with a description of the first Process and is continually built-up as the Data Flow Diagrams are expanded, detailed, and eventually completed.

APPROACH TO PERFORMING STRUCTURED SYSTEM ANALYSIS:

The best approach to Structured Systems Analysis is to assume that the program consists of a series of processes, each of which are to be assigned to an inexperienced analyst. Each analyst is to be walked through the assigned process of the Program, explaining step-by-step what functions have to be performed or what actions have to be taken to accomplish the process. The analyst is also informed where the information is coming from (input Data Flow), what is to be generated by each process (output Data Flow), where the data base may to be found (Data Stores), and who to contact for guidance (External Entities).

The best way to initiate a SSA is to set down the point of origin of a program, its final goal(s), and the intermediate functions or actions needed to get from beginning to goal. Each step should be considered as a Process - some may be sequential and others parallel. Then, the steps needed to accomplish the Process should be described. If the description is complex and needs intermediate steps, the Process is then a candidate for an "explosion". That is, the top (or upper) level Process is considered as a "project" and its own Data Flow Diagram is prepared.

When writing the step-by-step procedures in the Process, certain elements of data (or information) must be made available for the procedure. Each element of data is considered as an input Data Flow, which is identified and described. The product (or result) of a Process is an output Data Flow element.

Each Data Flow to the Process must originate from:

1. an earlier Process
2. a Data Store (or file)
3. an External Entity.

These sources are also identified, described and put into the Data Dictionary. As soon as the last portion of the Data Flow Diagram has been described, the SSA is complete.

The Structured Analysis phase is followed by Structured Design, then by programming and finally, software test and validation. The organization of Structured Analysis and its relationship to Structured System Design is shown on Figure 2.

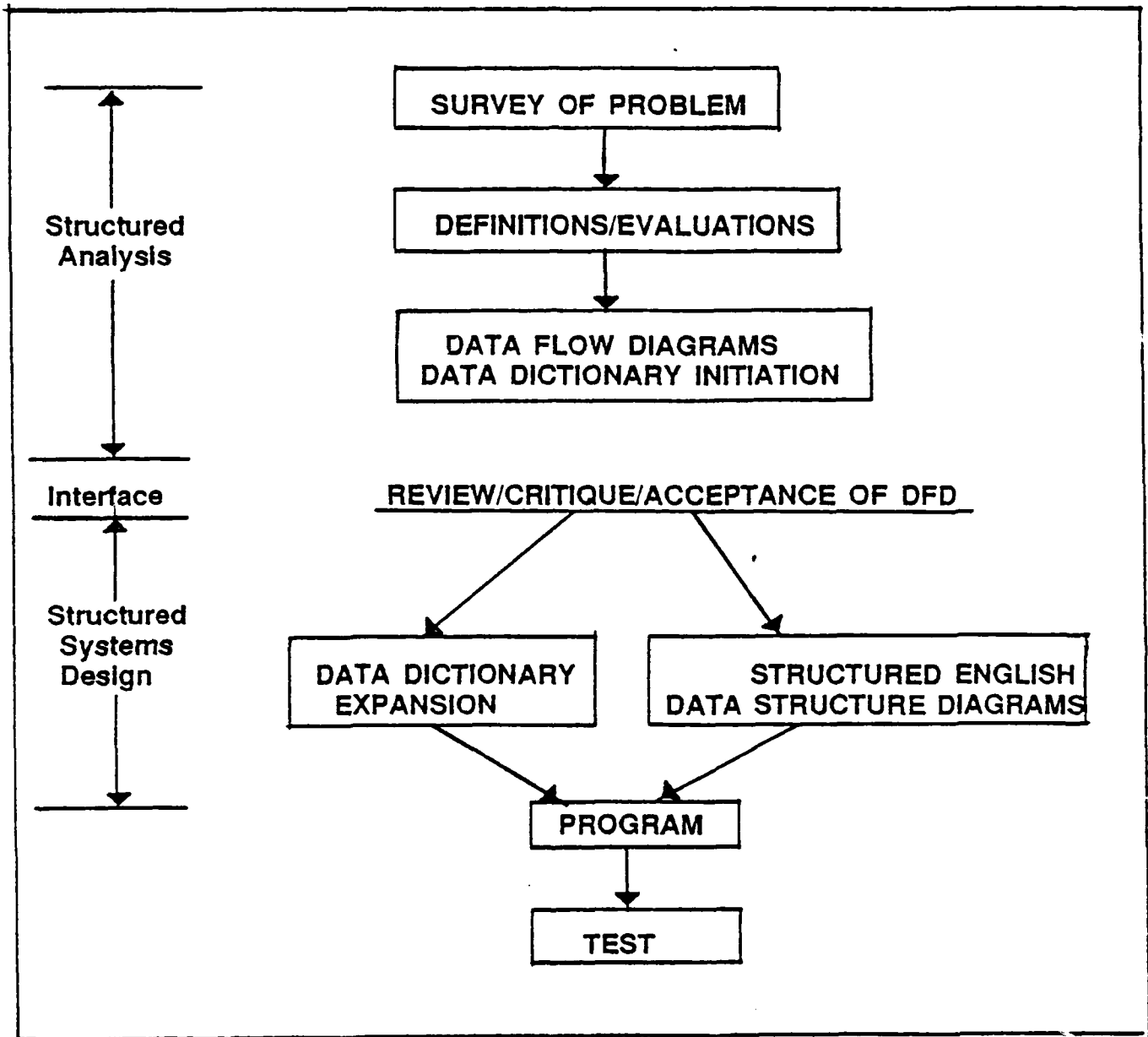


Figure 1. Structured Analysis & Structured Systems Design Organization

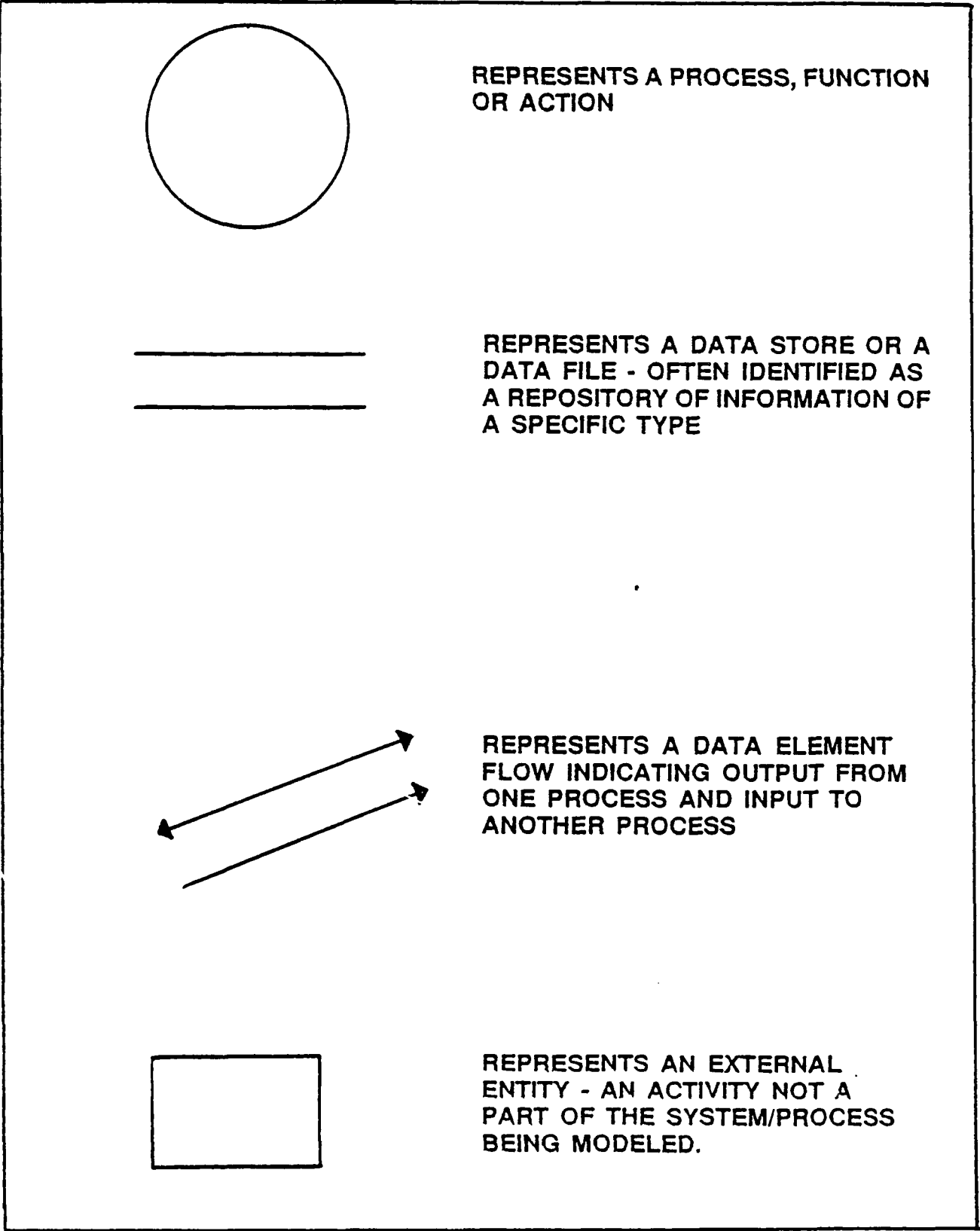


Figure 2. Standard DFD Symbol Definitions