

PRELIMINARY

**K-SMO-12.01
August, 1983**

(NASA-TM-85410) SPACE SHUTTLE OPERATIONAL
LOGISTICS PLAN (NASA) 19 p HC A02/MF A01
CSCI 22A

N83-32837

Unclas
G3/16 13825

Operational Logistics Plan



National Aeronautics and
Space Administration

John F. Kennedy Space Center



SPACE SHUTTLE OPERATIONAL LOGISTICS PLAN

Prepared by:

JESSE W. BOTTS, CHIEF
PLANS & POLICY STAFF, SL-LOG-1

Approved:

ROGER D. ENLOW, CHIEF
OPERATIONAL LOGISTICS DIVISION

Concurrence:

JACK H. WILLIAMS, DIRECTOR
LAUNCH SUPPORT SERVICES

TABLE OF CONTENTS

<u>TITLE</u>	<u>PAGE</u>
Table of Contents	i
Introduction	1-1
OFFLINE MAINTENANCE	2-1
MATERIAL MANAGEMENT	3-1
TRANSPORTATION	4-1
LOGISTICS TRAINING	5-1
OPERATIONS AND MAINTENANCE DOCUMENTATION	6-1
SPARES AND PROVISIONING AND REPLENISHMENT	7-1
PRIORITY SPARES	8-1
MAINTAINABILITY	9-1
LOGISTICS FACILITIES, SYSTEMS, AND EQUIPMENT	10-1
PRODUCT SUPPORT	11-1
LOGISTICS MANAGEMENT RESPONSIBILITY TRANSFER	12-1
LOGISTICS ANALYSIS	13-1
LOGISTICS MANAGEMENT	14-1

SECTION ONE INTRODUCTION

1.1 PURPOSE

The purpose of this document is to describe the Kennedy Space Center plan for logistics to support Space Shuttle Operations, and to establish the related policies, requirements, and responsibilities. This plan implements the Directorate of Shuttle Management and Operations logistics responsibilities required by the Kennedy Organizational Manual, and the self-sufficiency contracting concept. This plan also implements the Space Shuttle Program Level I and Level II logistics policies and requirements applicable to KSC that are prescribed in HQ NASA and Johnson Space Center directives.

1.2 APPLICABILITY AND SCOPE

This plan is applicable to the Operational Logistics Division (SL-LOG), Directorate of Launch Support Services (SL), Directorate of Shuttle Management and Operations (SM) and to its contractors to the extent specified in the contract. It pertains to all the ground facilities, systems and equipment, and flight elements for which the Directorate has user, operator, and/or maintainer responsibilities at the Kennedy Space Center, Vandenberg Air Force Base, and other locations. Organizational maintenance is not a function of, but is supported by, the KSC Space Shuttle Operational Logistics System. Organizational maintenance, therefore, is not included in this plan.

1.3 PLAN STRUCTURE AND REFERENCES

This plan addresses all the KSC Space Shuttle operational logistic functions and incorporates applicable concepts, policies, requirements, guidance, responsibilities, data, and procedures by reference to other documents. Implementation of this plan shall at all times be in compliance with the latest issue of these references; therefore, they are identified in this plan by only their basic number and title-not revision or change designators and dates. If there is conflict among any of these references and the explicit content of this plan, the conflict shall be resolved by changing the reference document or obtaining an official waiver or deviation.*

* A periodic report showing the current status of these references is contained in K-SMO-12.02, Space Shuttle Operational Logistics Documentation Index and Status Report.

1.4 RESPONSIBILITIES

The Operational Logistics Division is responsible for implementing this plan by:

a. Publishing guidelines, schedules, and logistics resource allocations.

b. Interfacing with other KSC organizations to establish arrangements for all the logistics to support Space Shuttle operations.

c. Interfacing with NASA Centers and other agencies including USAF on Space Shuttle operations logistics matters.

d. Monitoring and assessing the effectiveness of KSC's Space Shuttle operational logistics activities.

1.5 LOGISTICS FUNCTIONS

The logistics functions covered by this plan are addressed in the following sections:

2. Offline Maintenance
3. Material Management
4. Transportation
5. Logistics Training
6. Operations and Maintenance Documentation
7. Spares Provisioning and Replenishment
8. Priority Spares
9. Maintainability
10. Logistics Facilities, Systems, and Equipment
11. Product Support
12. Logistics Management Responsibility Transfer
13. Logistics Analysis
14. Logistics Management

SECTION TWO
OFFLINE MAINTENANCE

2.1 INTRODUCTION

Offline maintenance is the term that encompasses a designated portion of all the maintenance tasks required to support Space Shuttle Operations. The designated tasks are those allocated to intermediate and depot maintenance. The primary purpose of offline maintenance is the on-site and off-site work to repair, modify, clean, fabricate, assemble, test, calibrate, and package items for stockage as spares. The secondary purpose is to assist organizational maintenance in performing tasks that must be performed in place, but so infrequently that it is not cost effective to equip the operations and maintenance organizations to perform them.

2.2 POLICY

The total offline maintenance requirement shall be accomplished in the overall operations and maintenance most cost effective manner. This shall be determined by performing and updating level of repair and method of performance analyses. The procedure and results of these analyses, the related data; and the work flow time, labor, and materials costs data from the offline maintenance activities (both on-site and off-site) shall be maintained in or accessible from an automated maintenance management and control data and analysis system. This system shall have the capability to efficiently schedule all work into and through the shops and laboratories consistent with changes in priority requirements; and, at any random time, to readily display the status of work in process, reverify the method of performance decisions, and provide cost effectiveness assessments of individual task methods and the overall offline maintenance activity. This maintenance management and control capability shall be established and maintained using the most cost effective available data base, data collection, and analysis systems and methods.

2.3 REQUIREMENTS

Offline maintenance shall be managed as follows:

a. Requirements for offline maintenance shall be determined by level of repair analysis using analysis methods applicable to the various kinds (mechanical, electrical, electronic, etc) of items.

b. The method of performance (on-site or off-site) for each item or group of items having similar maintenance procedures shall be determined by economic analysis in accordance with KMI 7410.1 and applicable related procedures and policies.

c. The technical procedures for offline maintenance shall be specified, approved, documented and changed in accordance with the

OMD (Operations and Maintenance Documentation) system. The basic procedure document for an item is the IDMM (Intermediate and Depot Maintenance Manual). It contains the procedures unique to an item and references the standard processes that are also applicable to the item. These IDMM's shall be prepared in accordance with KSC document S00U008 Intermediate and Depot Maintenance Manual Handbook.

d. The quality of offline maintenance work shall be prescribed, monitored, certified, accepted, recorded, trend analyzed, and reported in accordance with KPD 5310.4B.

e. The scheduling, shop routing, status surveillance, and cost effectiveness assessment of offline maintenance work shall be performed by use of the maintenance management and control system.

f. Modifications accomplished in conjunction with offline maintenance shall be authorized by the Configuration Management System, performed in accordance with released OMD, accepted by Quality Assurance, and scheduled and reported by the maintenance management and control system.

g. Problems encountered during offline maintenance and modification shall be documented, statused, resolved, and reported in accordance with KMI 5310.11, Nonconformance/Problem Reporting and Corrective Action System (PRACA).

h. Facilities, systems, and equipment required for offline maintenance as determined by the analysis in "a." and "b." above, shall be acquired in accordance with KMI 1200.1 Management of KSC Facilities, Systems, and Equipment and KHB 1200.1 Management of Facilities, Systems, and Equipment Handbook.

i. Parts, materials, and tools required for offline maintenance shall be and provided by Materials Management in accordance with KMI 4100.2 KSC Supply Support System and other applicable documents.

SECTION THREE MATERIAL MANAGEMENT

3.1 INTRODUCTION

Material Management is the KSC Space Shuttle Operational Logistics function that acquires, stocks, stores, and issues the parts, materials, and some of the tools that are needed for operations and maintenance. (The other tools needed are acquired and provided by the Facilities, Systems, and Equipment Management System). Material Management operates on the principle of centralized inventory management using an automated data system known as SIMS and decentralized points of use support known as Material Service Centers. Users have information access to the automated data base through terminals at the Material Service Centers. The data base also contains the auditable accounting records for the government owned personal (not real) property for which KSC is responsible.

3.2 POLICY

KSC Space Shuttle operations and maintenance requirements for material, parts, and certain tools shall be acquired, stocked, stored and issued by means of the Material Management system.

3.3 PROCEDURES

The procedures to establish requirements for and to obtain parts, material, and tools from Material Management are contained in the following documents:

- KHB 4000.1 Supply Support System Handbook
- KMI 4100.2 KSC Supply Support System
- KMI 4210.4 KSC Test Equipment Loan Pools
- KMI 6430.2 KSC Ordinance Management System
- KMI 8610.3 Propellants and Pressurants

4.1 INTRODUCTION

Transportation is the KSC Space Shuttle Operational Logistics function that provides: on-site movement, handling, packing, and unpacking of material consigned to or shipped from KSC by common carrier and government owned transportation capabilities; a Transportation Coordination Center that maintains and provides mode, location, and status information on all Space Shuttle materiel movements to and from the launch sites; government bills of lading for commercial transportation services; and operation and maintenance of all the government owned and leased facilities, systems, and equipment used to perform the preceding functions.

4.2 POLICY

The KSC Space Shuttle operations requirements for transportation and related services shall be provided in the most cost effective manner that is consistent and in compliance with all applicable federal (domestic and customs), state, and local statutes.

4.3 PROCEDURE

The procedures to forecast and establish requirements for, and to obtain transportation and related services are contained in the following documents:

KMI-6000.1 KSC Transportation Support System

KHB-6000.1 Transportation System Handbook

SECTION FIVE
LOGISTICS TRAINING

ORIGINAL PAGE IS
OF POOR QUALITY

5.1 INTRODUCTION

Logistics training is the KSC Space Shuttle logistics function that provides skills and safety training for ground operations and maintenance personnel employed by the government and the Space Shuttle operations and maintenance contractors for duty at the Kennedy Space Center, Vandenburg Air Force Base, and other locations where Space Shuttle turnaround operations and maintenance are performed.

5.2 POLICY

Logistics training for Space Shuttle operations shall be accomplished in the most cost effective manner consistent with the joint and separate capabilities of NASA, its contractors; the USAF, and its contractors.

5.3 PROCEDURE

The procedures for establishing requirements for and obtaining Space Shuttle logistics training are contained in joint NASA/USAF document K-STSM-12.5.03 STS Operations Logistics Training Plan

SECTION SIX
OPERATIONS AND MAINTENANCE DOCUMENTATION

6.1 INTRODUCTION

Operations and Maintenance Documentation (OMD) is the technical instructions and data that prescribe how to do ground operations and maintenance tasks. The hands-on hardware procedures for organizational (online, level I) operations and maintenance are called OMI's (Operations and Maintenance Instructions). The hands-on hardware procedures for intermediate and depot (offline, level II and level III) maintenance are called IDMM's (Intermediate and Depot Maintenance Manuals). These procedure level documents, which are prepared and released by operations and logistics engineering, are based on requirements called OMRSD's (Operations and Maintenance Requirements Specification Documents) that are prepared and released by design and/or sustaining engineering. The procedure level documents are supplemented by reference to design drawings, logistics data, computer instructions, etc as needed.

6.2 POLICY

The preparation, release, publication, change and distribution of OMD shall be accomplished by means of the OMD management system wherein all OMD products are prepared in accordance with controlled specifications, released by formal release procedures, updated for consistency with controlled configuration data and operations requirements, and used in accordance with released work authorizations.

6.3 PROCEDURE

The procedures for the preparation and release of OMD are contained in K-SM-12.8 STS and Cargo OMD Plan.
The specification for offline maintenance manuals is S000008 Intermediate and Depot Maintenance Manual Handbook.

SECTION SEVEN
SPARES PROVISIONING AND REPLENISHMENT

7.1 INTRODUCTION

Initial spares provisioning is the process by which decisions are made and implemented to stock (or not) items for use as spares to support the initial (up to 18 months of) operation and maintenance of higher level assemblies. This process uses a mixture of actual and estimated data about the item and usage of the higher assemblies. Replenishment is the process by which the initial spares decisions and implementing actions are changed, or not, for the containing operation and maintenance of the higher level assemblies. Iterations of the replenishment process use increasing amounts of actual and decreasing amounts of estimated data about the spare items and the usage of its higher level assemblies. Spares stockage is replenished by repair of unserviceable items, reclamation of useable items from unusable higher assemblies, and procurement of new items.

The importance and difficulty of these processes and the decisions made are indicated by the facts that: the real value of a spare in a warehouse that is never needed is zero and the money spent to put it there and keep it ready to use was wasted; and the cost of an item that is needed as spare but is not available is of no consequence at the moment of need, and the money not previously spent for it was really not saved.

7.2 POLICY

Spares requirements to support operation and maintenance of the Space Shuttle and its ground facilities, systems, and equipment shall be determined by using the best available data and analysis methods. The objective is to provide support at the lowest possible cost that is consistent with the highest acceptable risk of non-support.

7.3 PROCEDURES

The procedures for provisioning and replenishment of spares are contained in the following documents:

- X-SM-12.6 Provisioning Plan
- KMI-4100.2 KSC Supply Support System
- KHB 4000.1 Supply Support System Handbook

SECTION EIGHT
PRIORITY SPARES

8.1 INTRODUCTION

Priority spares are items that have been determined to be so critical to mission success including on-time launch that their non-availability when and where needed constitutes an unacceptable risk.

8.2 POLICY

At least one of each item selected as a priority spare shall be maintained in ready to use condition as close as practicable to the place where it will be used if needed. This status shall be determined and dispositioned as a part of each Flight Readiness Review.

8.3 PROCEDURE

The procedure for the selection, data systems identification, prepositioning, status reporting, readiness maintainance, and dispositioning of priority spares is contained in KPD (TBD). Note: It is planned that a new KPD will be developed for Space Shuttle Operations that formalize the criteria, procedures, data elements, etc. that have been developed and used by the Priority Spares Working Group to establish the Priority Spares system.

SECTION NINE MAINTAINABILITY

9.1 INTRODUCTION

Maintainability is the physical and functional characteristics that are designed into an item and/or system to minimize maintenance requirements and to facilitate doing the maintenance that cannot be cost effectively avoided. Formal procedures to establish maintainability are usually performed during the DDT&E phase of major systems.

9.2 POLICY

Formal maintainability procedures shall be selectively applied to only major new items and major modifications of existing systems during Space Shuttle operations.

9.3 PROCEDURE

The decision to apply formal maintainability procedures during Space Shuttle operations shall be determined during the formal review of only the changes that propose to add major new items or make major modifications of existing systems.

SECTION TEN
LOGISTICS FACILITIES, SYSTEMS, AND EQUIPMENT

10.1 INTRODUCTION

The acquisition, operation, and maintenance of facilities, systems, and equipment to perform logistics functions constitute a significant portion of all the costs to operate and maintain the primary systems that logistics support. There are usually several options for performing most logistics functions, and there can be significant costs differences, both near term and long range, among these options. There is a natural inclination to establish the capability to perform a logistic function as close as practicable to where the requirement exists- i.e. on site at KSC and VAFB for Space Shuttle operations - and frequently this intuition is correct when the intangible (not readily costable) benefits are taken into consideration.

10.2 POLICY

The continued operation of existing Space Shuttle Operational Logistics facilities, systems, and equipment shall be periodically analyzed to assure that such continuation is the most cost effective and/or intangibly beneficial method to satisfy the requirement. All new logistics requirements for Space Shuttle Operations shall be analyzed to determine the most cost effective method of performance.

10.3 PROCEDURE

The procedures for determining the most cost effective method for performing logistics tasks are contained in many standard publications and KMI 7410.1, Acquisition of Commercial or Industrial Products and Services for KSC Use (OMB Circular A-76). The best available method shall be used for the analysis of each requirement. For those requirements determined to be most cost effectively accomplished on-site at KSC, the facilities, systems, and equipment shall be acquired in accordance with KMI 1200.1, Management of KSC Facilities, Systems, and Equipment, and when established, this on-site logistics capability shall be documented in (TBD) (a formal logistics capability documentation system is being established).

SECTION ELEVEN PRODUCT SUPPORT

11.1 INTRODUCTION

Product Support is the name given to the composite of discipline processes that have as their objective to provide to the user, operator, maintainer, the products and their support needed to satisfy operational requirements. This term coined for the Space Shuttle is akin to the term Item Management used by the Department of Defense and other general terms such as customer service, customer support, field service, etc. - i.e. it is what sellers of costly capital products do to assure sustained satisfactory performance of the product and rapid restoration of performance when the user encounters problems.

11.2 POLICY

The logistics element of users organizations shall maintain surveillance of user requirements for and the performance of products for Space Shuttle operations and maintenance, and maintain interfaces with the suppliers to assure adequate product support.

11.3 PROCEDURE

The procedures for product support are contained in JSC 07700 Vol IX, Space Shuttle Program Ground Systems and Operations Integration.

SECTION TWELVE
LOGISTICS MANAGEMENT RESPONSIBILITY TRANSFER

12.1 INTRODUCTION

Logistics management responsibility transfer is the implementation of the concept that the long term support of continuing operational requirements for an item can be more cost effectively accomplished by operational logistics organizations than by developmental organizations.

12.2 POLICY

Logistics management responsibility shall be transferred from the development organization to the operational logistics organization when an item, sub-system, or system has reached design maturity and production stability.

12.3 PROCEDURE

The procedures for accomplishing the transfer of logistics management responsibility are contained in JSC 08151, Space Shuttle Program Maintenance Baseline Requirements.

SECTION: THIRTEEN LOGISTICS ANALYSIS

13.1 INTRODUCTION

Logistics analysis is the process by which the logistics requirements to support operations and maintenance are systematically identified and quantified and the cost optimum methods for providing these requirements are determined.

13.2 POLICY

All logistics requirements for Space Shuttle operation and maintenance shall be identified, quantified, and cost optimum method of performance determined by systematic logistics analyses using the best available data and analysis methods. Each established method of performance shall be redetermined whenever there is a significant change in any parameter that drove the original determination.

13.3 PROCEDURES

The procedures for logistics analyses are contained in many professional journals, textbooks, and government and industry handbooks, and specifications. These analyses should be conducted in conjunction with operations analyses to determine the overall costs optimum mix of operating processes and support processes. The method to be used in each case shall be determined on the basis of its applicability to the specific problem and availability of needed data.

SECTION FOURTEEN
LOGISTICS MANAGEMENT

14.1 INTRODUCTION:

Logistics management like the management of most industrial processes is accomplished by people using information and data about the process. This is of many kinds such as: the technical activities required and the manpower, facilities, systems, equipment and input materials and parts required to perform them; the schedule when these processes must be performed to provide the product or service required; changes in any of the preceding; sources and lead time for acquiring all of the preceding; and costs.

14.2 POLICY

Information required for logistics management shall be obtained, maintained, stored, retrieved, used, and discarded or retired (official government records) when no longer needed using the most cost effective methods available.

14.3 PROCEDURES

(To be provided - it is planned to expand this paragraph by adding sub-paragraphs and referencing other documentation that describes the data systems to be used for Space Shuttle operational logistics management.)