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Launch Site Accommodations Handbook For Payloads

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LAUNCH SITE ACCOMMODATIONS HANDBOOK FOR PAYLOADS

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LIST OF ABBREVIATIONS AND ACRONYMS

The following abbreviations and acronyms are used in this handbook. A more comprehensive listing is contained in NASA Reference Publication 1059 Revised, *Space Transportation and Associated Payloads: Glossary, Acronyms, and Abbreviations*.

45 SW	45th Space Wing
ABCL	as-built configuration list
AIT	Analysis and Integration Teams
ASE	airborne support equipment
ATE	automated test equipment
BDCF	Baseline Data Collection Facility
BOC	Base Operations Contractor
CCAS	Cape Canaveral Air Station
CCMS	Checkout, Control, and Monitor Subsystem
CDS	Central Data Subsystem
CITE	cargo integration test equipment
CM	Payload Management and Operations Directorate
CONUS	Continental United States
CRF	Canister Rotation Facility
CWA	clean work area
DOD	Department of Defense
EAFB	Edwards Air Force Base
ECL	engineering configuration list
ECS	Environmental Control System
EGSE	electrical ground support equipment
ELV	expendable launch vehicle
EPS	Electrical Power Subsystem
ESS	Electronic Security System
F&G	fluid and gas
F&GS	F&G Subsystem
FM	frequency modulation
GAS	get-away special (payload)
GN_2	gaseous nitrogen
GOAL	Ground Operations Aerospace Language

LIST OF ABBREVIATIONS AND ACRONYMS (continued)

GSA	General Services Administration
GSE	ground support equipment
HITS	high rate multiplexer input/output test system
HPF	hazardous processing facility
I&C	instrumentation and communication
I&CS	Instrumentation and Communication Subsystem
ICD	Interface Control Document
IM	Installation Management Operations
IPT	Integrated Product Teams
ISSA	International Space Station Alpha
IUS	Inertial Upper Stage
IVT	interface verification test
JSC	Lyndon B. Johnson Space Center
KHB	Kennedy Handbook
KICS	Kennedy Integrated Control Schedule
KMI	Kennedy Management Instruction
KSC	John F. Kennedy Space Center
KSCAP	KSC Area Permit
kVA	kilovolt ampere
lb/in^2	pound(s) per square inch
LCC	Launch Control Center
LDB	Launch Data Bus
LH_2	liquid hydrogen
LHe	liquid helium
LN_2	liquid nitrogen
LO_2	liquid oxygen
LPS	Launch Processing System
LSSE	Launch Site Support Engineer
LSSF	Life Sciences Support Facility
LSSM	Launch Site Support Manager
LSSP	launch site support plan
LSST	launch site support team
MD	Biomedical Operations and Research Office
MLP	mobile launch platform
MMH	monomethyl hydrazine
MMPSE	multi-use mission payload support equipment
MMSE	multi-use mission support equipment

LIST OF ABBREVIATIONS AND ACRONYMS (continued)

MPE	mission peculiar equipment
MPESS	mission peculiar experiment support structure
MPT	mission processing team
MSFC	George C. Marshall Space Flight Center
N_2O_4	nitrogen tetroxide
NAC	National Agency Check
NASA	National Aeronautics and Space Administration
NDE	nondestructive evaluation
NHB	NASA Handbook
NMI	NASA Management Instruction
NRP	National Resource Protection
O&C	Operations and Checkout (Building)
OD	Operational Directive
OI	operational instrumentation
OIA	Office of International Affairs
OIS	Operational Intercommunication System
OMD	Operations and Maintenance Documentation
OMI	Operations and Maintenance Instruction
OMRS	Operations and Maintenance Requirements and Specifications
OMRSD	Operations and Maintenance Requirements and Specification Document
OPF	Orbiter Processing Facility
OR	operations requirement
OSB	Operations Support Building
OSHA	Occupational Safety & Health Adminstration
OTS	orbiter transportation system
OTV	operational television
PA	public address Public Affairs
PACS	payload access control system
PCM	pulse code modulation
PCR	payload changeout room
PCU	payload checkout unit
PDMS	payload data management system
PETS	Payload Environmental Transportation System
PGHM	payload ground handling mechanism
PGOC	Payload Ground Operations Contractor
PHF	payload handling fixture
PHSF	Payload Hazardous Servicing Facility
PI	principal investigator

LIST OF ABBREVIATIONS AND ACRONYMS (continued)

PICS	Payload Integrated Control Schedule
PIP	Payload Integration Plan
PLECC	payload environmental control cover
POCC	Payload Operations Control Center
PON	Payloads Operation Network
PPCU	partial payload checkout unit
PPF	payload processing facility
ppm	part(s) per million
PRACA	problem reporting and corrective action
PRD	program requirements document
PRP	Personnel Reliability Program
PSP	program support plan
PSTF-R	Payload Spin Test Facility-Replacement
QSR	Quality Surveillance Record
RF	radio frequency
RH	relative humidity
RPS	record and playback subsystem
RQ	Safety, Reliability, and Quality Assurance Directorate
R&QA	Reliability and Quality Assurance
RSS	rotating service structure
RTG	radioisotope thermoelectric generator
RTG-F	Radioisotope Thermoelectric Generator - Facility
SAA	satellite accumulation area
SAEF-2	Spacecraft Assembly and Encapsulation Facility - 2
SCA	shuttle carrier aircraft
SE	science experiment
SID	standard interface document
SLF	Shuttle Landing Facility
SPC	Shuttle Processing Contractor
SPDMS	Shuttle Processing Data Management System
SPRD	single payload rotation device
SR&QA	safety, reliability, and quality assurance
SSP	Space Shuttle Program
SSPF	Space Station Processing Facility
TAA	temporary area authorization
TBD	to be determined or developed
TM	Shuttle Management and Operations Directorate
TOP	technical operating procedure
TV	television

LIST OF ABBREVIATIONS AND ACRONYMS (continued)

TWX	teletype wire transmission
UA	unescorted access
V	volt
VAB	Vehicle Assembly Building
Vac	volts, alternating current
VPF	Vertical Processing Facility
VAFB	Vandenberg Air Force Base
VPHD	vertical payload handling device
WSMC	Western Space and Missile Center

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FOREWORD

Launch site payload processing facilities are described in three levels of documentation. These levels and their purposes are:

a. K-STSM-14.1, *Launch Site Accommodations Handbook for Payloads* - This document provides a brief summary of each facility and a general description of John F. Kennedy Space Center (KSC) launch and landing site operations.

b. Facility Handbooks - Each handbook provides a narrative description of the facility and its systems. Also, general operating rules, regulations, and safety systems are discussed in these handbooks. Handbooks available are:

K-STSM-14.1.1	*Facilities Handbook for Building AE*
K-STSM-14.1.2	*Facilities Handbook for Building AO*
K-STSM-14.1.3	***Facilities Handbook for Building AM*
K-STSM-14.1.4	***Facilities Handbook for Hangar S*
K-STSM-14.1.6	***Facilities Handbook for Explosive Safe Area 60A*
K-STSM-14.1.7	*Facilities Handbook for Spacecraft Assembly and Encapsulation Facility Number 2*
K-STSM-14.1.8	*Facilities Handbook for Radioisotope Thermoelectric Generator Facility*
K-STSM-14.1.9	*Facilities Handbook for Life Sciences Support Facility Hangar L*
K-STSM-14.1.10	* *Payload Accommodations at the Rotating Service Structure*
K-STSM-14.1.12	*Facilities Handbook for Vertical Processing Facility*
K-STSM-14.1.13	* *Orbiter Processing Facility Payload Processing and Support Capabilities*
K-STSM-14.1.14	* *O&C Building Payload Processing and Support Capabilities*
K-STSM-14.1.15	*Facilities Handbook for Payload Hazardous Servicing Facility*
K-STSM-14.1.16	*Facilities Handbook for Space Station Processing Facility*
K-STSM-14.1.17	*Facilities Handbook for Payload Spin Test Facility-Replacement*

These facility handbooks are not under configuration control; however, they will be reissued as necessary in order to maintain usefulness to customers in their planning for launch site processing of their payloads.

* These handbooks are titled differently because the facilities also serve functions other than payload support. Only the payload accommodations are described in these documents.

** These handbooks are being phased out and will not be updated. These facilities are no longer available for payload processing activities.

c. Standard Interface Documents (SID's) - These reference documents are intended to provide the payload-to-facility interface design details for these launch site payload processing facilities:

SID 79K12170	*Payload Ground Transportation Canister*
SID 79K16210	*Vertical Processing Facility*
SID 79K16211	*Horizontal Processing Facility (O&C Building)*
SID 79K17644	*Payload Strongback*
SID 79K18218	*Launch Pad 39A*
SID 79K28802	*Launch Pad 39B*
SID 79K18745	*Orbiter Processing Facility*
SID 79K24867	*Hangar L - Life Sciences Support Facility*
SID 82K00463	*Payload Environmental Transportation System Multi-use Container*
SID 82K00678	*Single Pallet Rotation Device*
SID 82K00760	*Space Station Processing Facility*
SID 82K03223	*Payload Spin Test Facility-Replacement*

SID's are not available for all launch site payload processing facilities. In these cases, the facility handbooks must be used for design interface information and customers should ask for verification of any areas of concern. When SID's are available, they should be used as the official definition of the facility interfaces. There are some SID's for which there are no handbooks; e.g., the payload strongback and the Payload Environmental Transportation System (PETS) multi-use container. In these cases, the SID's must be used.

Customers may obtain copies of any of these documents through the assigned Launch Site Support Manager (LSSM).

NOTICE

Information pertaining to the processing of elements within the Space Station Processing Facility (SSPF) has not been included in this revision. Planning in this area has not yet been finalized and will be included when it becomes available. The SSPF data in this release includes only physical descriptions of the facility and reference documents.

SECTION I

INTRODUCTION

1.1 PURPOSE

This handbook describes available launch site accommodations for the National Aeronautics and Space Administration (NASA) payloads to be launched on the Space Shuttle or any type of expendable launch vehicle (ELV) and also describes the payload facility operations at the KSC, Cape Canaveral Air Station (CCAS), Florida, and Vandenberg Air Force Base (VAFB), California. The information is oriented to the payload customer and provides an overview of launch site capabilities and processing guidelines for launch site operations.

The handbook is a guide to the customers for payload operations planning and a basis for negotiating launch site support plans (LSSP's) with launch site organizations. (This handbook should not be used for design-to information.) This handbook, the Launch Site Accommodations Handbook (LSAH) for Payloads, will enable customers to match payload requirements with launch site capabilities.

1.2 SCOPE

This handbook addresses the planning and operations necessary to process a payload at KSC, CCAS, or VAFB and describes the capabilities that could be used by customers or their payloads at the launch sites. Department of Defense (DOD) payload accommodations are not addressed in this document except when processed through integration facilities managed by the KSC NASA Payloads Management and Operations Directorate.

1.3 ORGANIZATION

This description of the contents of this handbook will aid customers in locating pertinent information for launch site payload planning activities:

a. Section II. This section introduces the KSC organizations and key personnel who coordinate with customers during the formulation of the LSSP's. It also presents an overview of the planning process leading to the commitment of launch site resources to meet the customers' payload requirements.

b. Section III. Standard ground processing flows and some of their variations are described in this section.

c. Section IV. This section presents a summary of facility capabilities and an abbreviated description of support equipment available at KSC and CCAS for use by customers. It also presents summary information to assist potential customers in the selection of viable facility candidates.

d. Section V. This section describes administrative and technical support and capabilities available to a customer.

e. Section VI. This section references the mandatory safety requirements for ground operations and design of payload-unique ground support equipment and contains information on security and radiation controls.

It also describes the constraints and guidelines to assist the customer in meeting the launch site safety requirements.

f. Section VII. This section presents quality assurance requirements along with responsibilities for payload and orbiter processing activities at the launch and landing site.

g. Section VIII. This section includes a payload processing requirements checklist (using representative functions) to assist the customer and launch site personnel in establishing the payload processing requirement. This section also discusses the required documentation to be provided by the customer and the documentation that will be provided by the launch site to the customer and describes the schedules that are used at the launch site.

h. Section IX. This section describes the policies for customer charges associated with payload processing facilities and support services at KSC.

i. Section X. This section describes the customer interface with KSC's Public Affairs Office.

j. Section XI. This section describes ELV payload processing at CCAS.

k. Section XII. This section describes ELV payload processing at VAFB.

l. Appendixes.

(1) Appendix A contains a list of all documents referenced in this handbook.

(2) Appendix B contains a glossary of terms and definitions.

1.4 AUTHORITY

This handbook is recommended by NSTS 07700, Volume XIV, Appendix 5 *System Descriptions and Design Data-Ground Operations.*

1.5 DEVIATIONS

Customers should discuss deviations from the standard operations and capabilities presented in this handbook with the launch site organization. The Launch Site Support Manager (LSSM) is the customers' single point of contact for assistance in planning payload ground processing activities. The LSSM is responsible for providing guidance and commitments for launch site accommodations.

1.6 REVISIONS

This handbook is under a configuration control system. Submit recommendations to the John F. Kennedy Space Center, Attention: CG-LSO, Kennedy Space Center, Florida 32899, Telephone (407) 867-3183. Customers requiring additional copies of this handbook should make their request, on company or Government letterhead, to this same address.

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SECTION II

MANAGEMENT AND ORGANIZATION

This section describes the management roles of the KSC organizations, the launch site host role, payload processing guidelines, and the launch site planning process required for the NASA-responsible payload operations at KSC, CCAS, and VAFB.

2.1 KSC ORGANIZATIONS

These paragraphs describe management roles of the KSC organizations directly related to payload processing and interfaces required for KSC, CCAS, and VAFB. A KSC organizational flow is shown in figure 2-1.

2.1.1 PAYLOAD MANAGEMENT AND OPERATIONS DIRECTORATE (CM). This directorate is responsible for the overall management, planning, and operations for payload-related activities and ELV activities assigned to KSC.

This directorate has the lead role in developing and validating ground support or processing requirements and planning for all assigned payloads and assigns an LSSM as the single point of contact between the launch site and CM-supported customers to accomplish these functions. The LSSM is assisted by representatives from other KSC directorates as appropriate. In addition, CM provides the points of contact for the customer after the payload arrives at KSC, CCAS, or VAFB and provides a day-to-day interface with other KSC organizations. Before the Cargo Integration Review (CIR) takes place for a Space Shuttle payload, a KSC payload manager and a mission processing team (MPT) will be assigned; they are responsible for processing of the payload through the integration facility, such as the Vertical Processing Facility (VPF), the Operations and Checkout (O&C) Building, or the Space Station Processing Facility (SSPF) and at the Orbiter Processing Facility (OPF) and pad including payload-to-orbiter integration.

2.1.2 SHUTTLE MANAGEMENT AND OPERATIONS DIRECTORATE (TM). This directorate is responsible for overall management, planning, and technical direction, and for support for preflight, launch, landing, and recovery activities for Space Shuttle vehicles at KSC. This responsibility includes integration of the payload into the orbiter as well as management and planning associated with design and development of Space Shuttle facilities (including launch, landing, and refurbishment), shuttle and ground support equipment (GSE), and Space Shuttle ground operations. This directorate assigns a Shuttle Payload Operations Manager as the single point of contact between the launch site and TM-supported customers to accomplish payload integration with the Space Shuttle.

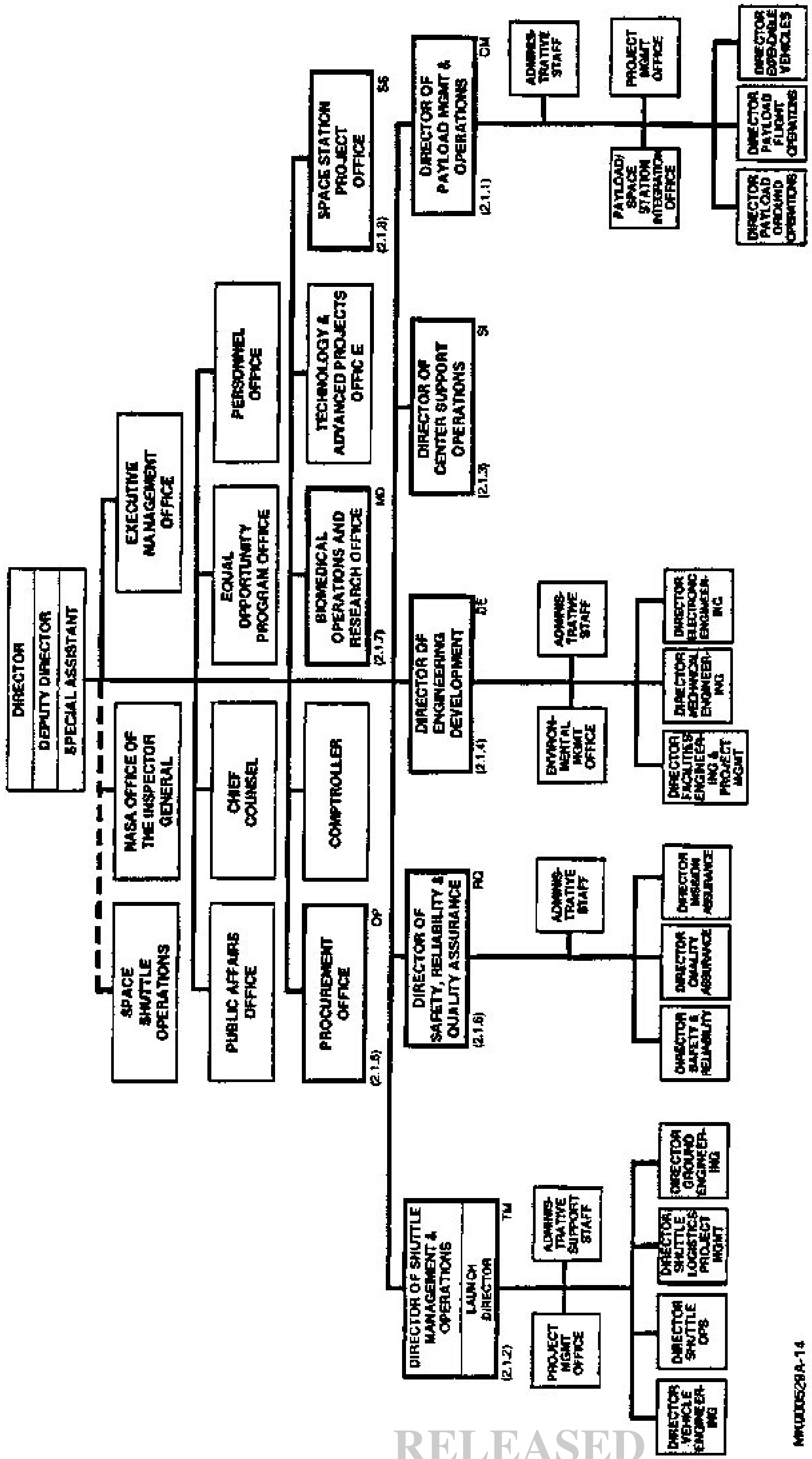

Figure 2-1. KSC Organizations

2.1.3 INSTALLATION MANAGEMENT OPERATIONS (IM). This directorate has the overall Center responsibility for administrative equipment management, energy management, emergency preparedness, and protective services. The IM directorate is also responsible for these assigned systems: propellant logistics and life support services, electrical and mechanical systems, administrative communications, administrative computers, potable water, sewage treatment, and fire protection systems. This directorate provides assigned base operations, maintenance, sustaining engineering, and Center support services for KSC and for all NASA-owned facilities at CCAS; and provides certain joint services for the 45th Space Wing (45 SW). The flight crew rescue program for the Space Shuttle and the security, law enforcement, and fire protection programs at KSC are also the responsibility of IM.

2.1.4 ENGINEERING DEVELOPMENT DIRECTORATE (DE). This directorate is responsible for the planning, development, design, and acquisition, KSC facilities, systems and equipment, as well as for their modification and rehabilitation.

2.1.5 PROCUREMENT OFFICE (OP). This office has the overall Center responsibility for procurement, acquisition management, and contract management.

2.1.6 SAFETY, RELIABILITY, AND QUALITY ASSURANCE DIRECTORATE (RQ). This directorate is responsible for the safety, reliability, and quality assurance programs for KSC, CCAS, and VAFB facilities. These programs include the independent assessment of launch and flight readiness and active participation in readiness reviews and applicable activities; the consistent applications of programs, policy, standards, and procedures; the assurance that workmanship and procedures comply with established specifications; the conduct of in-depth safety, reliability, and quality assurance analyses; and the management of the problem reporting and corrective action (PRACA) program.

2.1.7 BIOMEDICAL OPERATIONS AND RESEARCH OFFICE (MD). This office is responsible for all biomedical operations and research activities at KSC. These activities include aerospace and occupational medicine, environmental health (industrial hygiene, sanitation and pollution control, and radiological health), life sciences research programs, life sciences flight experiments science support, biomedical engineering, environmental monitoring, and biological sciences.

The MD directorate has the overall responsibility for operating the Life Sciences Support Facility (LSSF) (Hangar L) at CCAS and the Baseline Data Collection Facility (BDCF) in the O&C.

2.1.8 INTERNATIONAL SPACE STATION ALPHA MANAGEMENT TEAM (ISSA). During the redesign of Space Station Freedom, a new management structure was developed. Program participants are reorganized into Integrated Product Teams (IPT's) and Analysis and Integration Teams (AIT's). Each IPT is a multi-disciplinary team tiered to a task level. Each IPT is responsible for delivering their product within allocated budget and agreed-to schedule. An AIT is formed when particular product (system, service, or complex part) requires formation of multiple IPT's to develop constituent parts. The IPT concept is a bottoms-up approach to accountability and requirements traceability. Significant features of this approach are:

a. Program organization is product oriented rather than function oriented.

b. IPT's are responsible for analysis, design, development, test, production, delivery, and support of their product within cost goals and schedule.

c. IPT's have a charter, mission, scope of authority, budget, and schedule.

d. Product teams are delegated the authority, budget, and resources to complete assigned tasks.

e. AIT's focus on end-to-end system integration and stage integration management.

f. Program Execution Plan documents show how Space Station conducts its business.

2.2 LAUNCH SITE ROLE

Performance of prelaunch and postlaunch operations for any payload requires a wide variety of facilities and services. To eliminate duplication among customers and provide optimum use of available and required capabilities, KSC has identified a "host" concept which is applicable to many payload customers. Although deployable and ELV payload customers retain primary responsibility for the processing of their payloads in the host concept, KSC/CCAS/VAFB facilities and support services will be made available to the payloads through negotiations with the LSSM.

Fulfilling this host role requires that KSC coordinate all payload operations with regard to launch site resource commitments. This role involves negotiating cost and schedule impact of any new capability required and scheduling available facilities, support equipment, support services, and personnel.

Rapid response by launch site personnel may be required to turn around facilities, support equipment, and services from one payload operation (mission) to the next. This is significant because resource commitments may vary dependent on the mission type and frequency. In some cases, it may be necessary for payload customers on different programs to share facilities and resources such as voice systems or data circuits.

For Spacelab carrier systems, Spacelab payloads including many of the partial payloads, and International Space Station Alpha (ISSA) elements, KSC performs a hands-on role in staging, experiment integration, and testing. The customer identifies requirements which are then implemented by KSC with technical support by the customer or as needed.

2.3 LAUNCH SITE PAYLOAD PROCESSING GUIDELINES

These guidelines are presented to assist in planning an efficient and minimum cost operation without compromising requirements.

a. Space Shuttle and ELV Customers. The customer is responsible for all on-site customer processing procedures and operations affecting customer processed hardware only.

b. Launch Site. Launch site personnel manage and perform all payload-to-payload, payload-to-simulated orbiter, and payload-to-orbiter operations for all payload elements. Space Station Alpha elements are considered to be payloads. The ELV responsibilities at the launch site are addressed in sections 11 and 12.

c. Operations. Customers should plan their operations to minimize turnovers and moves from one agency or test site to another.

d. Planning. To minimize potential impact on the launch vehicle flow, customers should complete all possible operations on their payloads before payload integration.

e. Interfaces. If previously verified payload interfaces are demated for shipment, they are remated and must be reverified at the launch site. Payload interfaces not demated are not reverified by KSC.

2.4 LAUNCH SITE SUPPORT PLANNING

These paragraphs describe the payload planning process and the responsibilities of the LSSM and the launch site support team (LSST) for the preparation of the LSSP, which is required for all payloads; for Space Shuttle payloads, the LSSP is also Annex 8 of the Space Shuttle payload integration plan (PIP).

The PIP is the document that presents an overview of both the flight and ground operations requirements for a specific Space Shuttle payload. It contains schedules for customer inputs and publication of various documents. The PIP is a Lyndon B. Johnson Space Center (JSC)-prepared level II document; however, the LSSM/LSST reviews the entire PIP for ground operations requirements and prepares the launch and landing annex, Annex 8 (the LSSP).

For ELV payloads, the customer will prepare mission specific documentation (mission specifications, Interface Control Documents (ICD's), etc.) with the appropriate NASA lead Center.

LSSM's are the customer's point of contact at the launch site with special emphasis on planning for payload operations. The LSSM is assigned early in the conceptual phase of a payload development program or when a customer makes a commitment to fly on the Space Shuttle. For ELV payloads, an LSSM is assigned not less than 30 months prior to launch.

Following assignment of an LSSM, the LSST (a team of supporting KSC personnel) is established to represent the various Center directorates in the planning of specific payload accommodations. The LSST members collectively have expertise in all aspects of payload processing and launch operations and are available to the customer through the LSSM.

During initial contacts with the LSSM, the customers describe their prelaunch processing flow and requirements. The proposed facility and launch site support requirements are included in a preliminary LSSP. The customer then refines the requirements, and the LSSM updates the support commitments at the launch site. This process continues until the LSSP is approved as the baseline issue by the LSSM and the customer (or appropriate Payload, Mission, or Project Manager). When the baseline issue is signed by CM, the LSSP documents the commitments of KSC for launch site facilities, support equipment, and support services for a given payload. A ground safety assessment process, the responsibility of the KSC Safety Office and supported by the LSSM, is conducted in parallel with LSSP development.

Space Shuttle payload flight and ground safety reviews are conducted in accordance with NSTS 13830, *Implementation Procedure for STS Payload System Safety Requirements*. The ELV payload safety documentation submittal and reviews are conducted in accordance with ERR 127-1 and WRR 127-1.

For a Space Shuttle mission, an MPT, consisting of NASA and contractor Payload IPT Leads and supporting personnel with expertise in all mission-oriented aspects of payload processing, is assembled for each mission. This team controls, schedules, and monitors all activities required in the integrated processing of the payload elements at KSC, including the deintegration activities following landing. This team is directed by the NASA and the Payload Ground Operations Contractor (PGOC) Payload Managers and is comprised of designated representatives from NASA, PGOC, Shuttle Processing Contractor (SPC), and customer organizations. After payload arrival at KSC, the MPT usually meets weekly to plan integrated activities; after the payload enters the payload integration facility, the MPT usually meets daily.

NSTS-07700, Volume XIV, Appendix 5, explains the overall policy and requirements applicable to Space Shuttle payloads launch and landing operations. Figure 2-2 presents an overview and general milestone schedule for the overall shuttle payload integration process; figure 2-3 presents this information for an ELV payload.

Figure 2-4 presents an overview of the activity associated with assignment of an LSSM and LSST and the issuance of an LSSP. Some steps are not applicable to ELV payloads (e.g., assignment of JSC PIM).

2.5 RESPONSIBILITIES

The responsibilities of the launch site host, the customer, and the PGOC are:

a. Launch Site Host Responsibilities. During the planning stage, launch site host responsibilities include:

(1) identifying launch site capabilities (sections IV and V)

(2) identifying launch site processing requirements (sections II and VI)

(3) providing guidance to the customer on design and checkout operations as influenced by launch processing (section VIII)

(4) providing advice to the customer on successful techniques and procedures for launch processing (sections VI and X)

(5) providing quality assurance guidance to the customer during launch processing operations (section VII)

(6) identifying required procedures control (sections VI and VIII)

(7) planning integration of Space Shuttle or ELV and payload elements for the mission (section III)

(8) planning checkout of Space Shuttle or ELV and payload interfaces before mating (section III)

(9) planning integrated Space Shuttle or ELV and payload launch operations (sections III and VIII)

(10) defining overall payload flow through launch site (section III)

(11) identifying payload security requirements (section VI)

(12) developing LSSP (sections II and VIII)

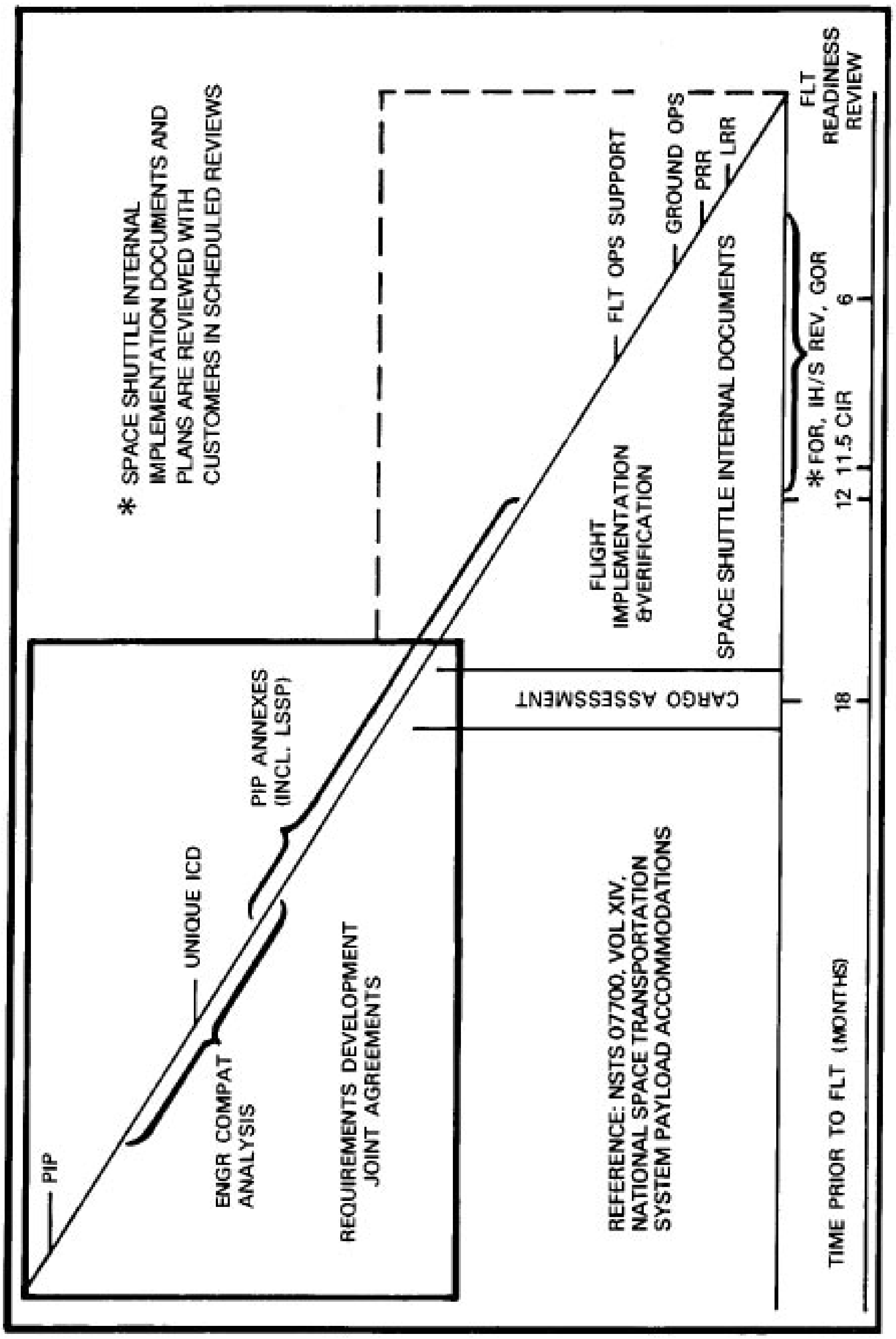

Figure 2-2. Shuttle Payload Integration Process

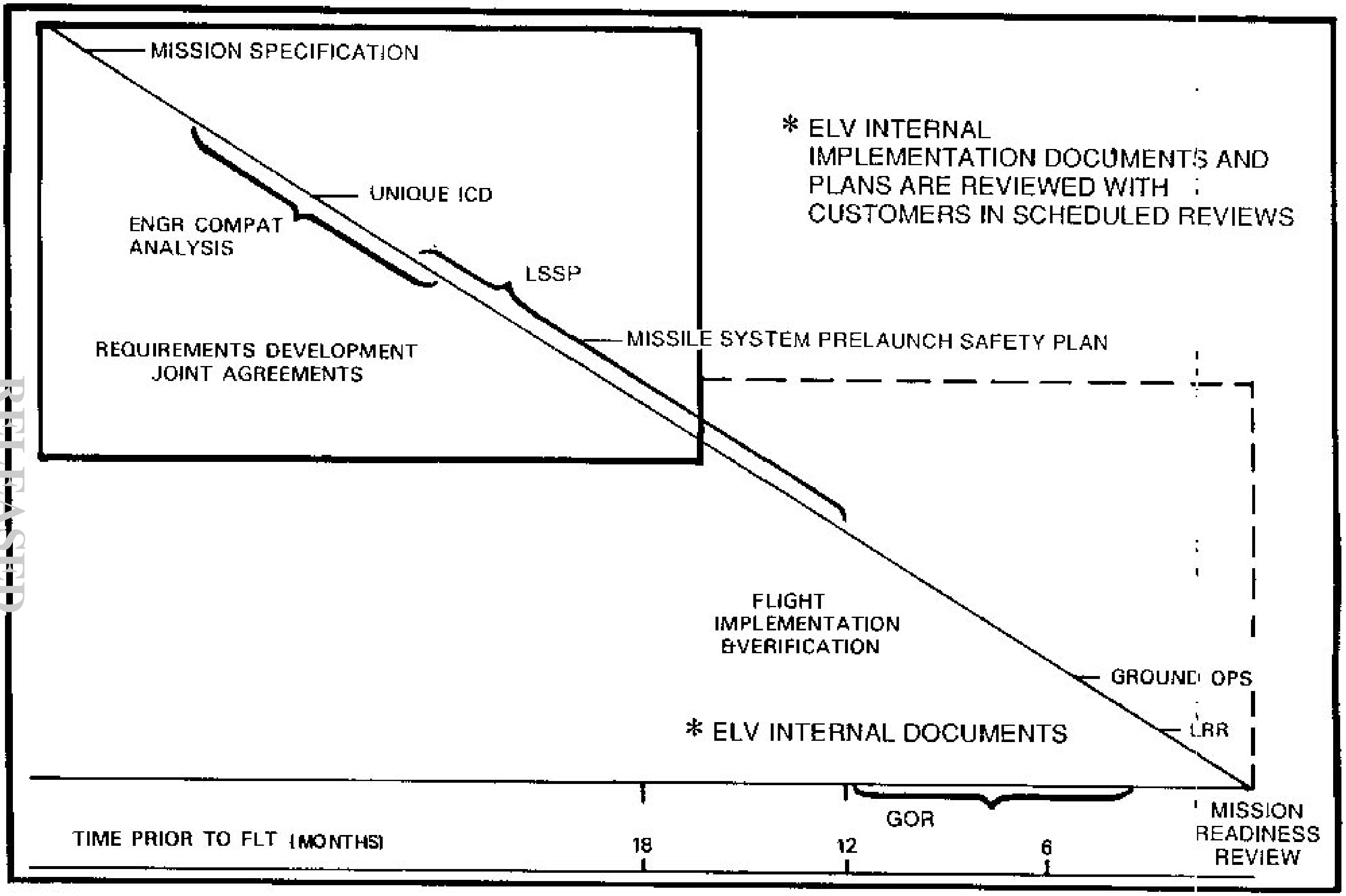

Figure 2-3. ELV Payload Integration Process

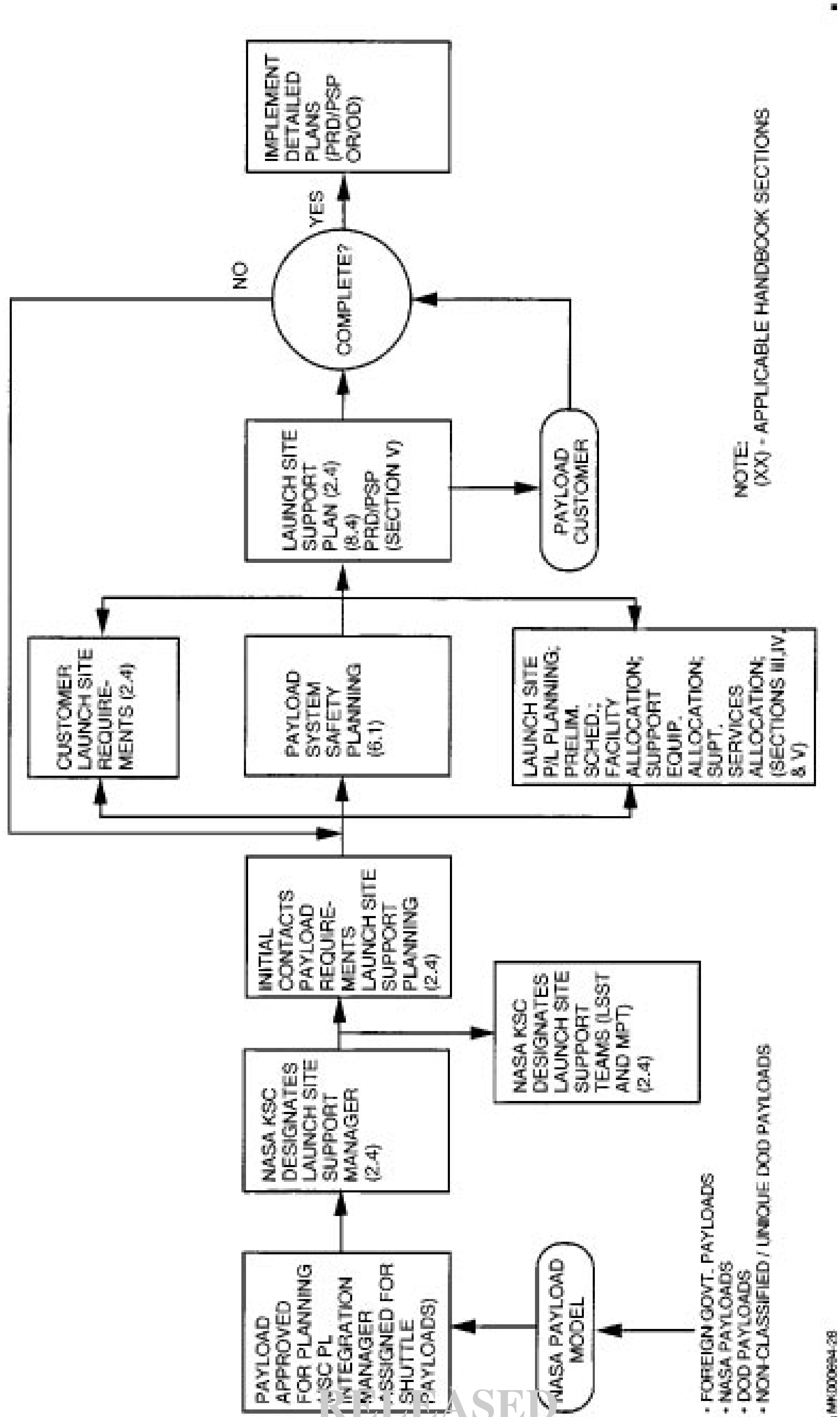

Figure 2-4. Launch Site Payload Planning Process

(13) determining facility assignments to accommodate customer requirements (section IV)

(14) identifying cost and accounting methods for payload accommodations (section X)

(15) assigning LSSM, LSST, and MPT to coordinate payload and coordinate PIP inputs (section II)

b. Customer Organization Responsibilities. The responsibilities of the customer organization during the planning phase, in support of the launch site organization, include the following:

(1) establishing specific test requirements (sections III and VIII)

(2) identifying facility requirements (section IV)

(3) identifying single point of contact for transmittal and receipt of launch site support requirements and plans (sections II and III)

(4) identifying activation and deactivation requirements associated with unique support equipment (sections III and VII)

(5) identifying support services and equipment requirements (section V)

(6) preparing procedures for customer performed operations (section VIII)

(7) providing input to and review of integrated procedures for simulated orbiter interface testing, orbiter integration and payload testing (section VIII)

(8) identifying hazardous operations and obtaining necessary approvals (section VI)

(9) performing hazard analysis and safety assessment (section VI)

(10) providing technical support for integrated procedure development and real-time problem resolution during integrated testing (section III)

(11) identifying risks (sections VI and VII)

(12) providing specific document distribution requirements (section VIII)

(13) identifying operational constraints

(14) providing security requirements for payload protection (section VI)

(15) complying with state and federal hazardous material regulations (section VI)

(16) participating in program reviews such as the Ground Operations Review (GOR), Safety reviews phase 1, 2, 3; Payload, Launch, and Flight Readiness Reviews (PRR, LRR, and FRR) as appropriate

(17) participating in MPT meetings, ground operations working group (GOWG) meetings, and technical interchange meetings (TIM's) as appropriate

c. <u>PGOC responsibilities are as to</u>:

(1) perform design and development engineering functions for assigned facilities and equipment

(2) prepare, coordinate, and publish all integrated payload operations and maintenance instructions (OMI's) *

(3) perform payload interface testing *

(a) cargo integration test equipment (CITE) and orbiter interface to payload, if required

(b) verify spacecraft and upper stage readiness

(4) provide flexibility to support KSC at whatever site required

(5) perform payload related safety, reliability, and quality assurance (SR&QA) and material functions *

(6) has operation and maintenance (O&M) responsibility for major Spacelab elements modules, pallet/ mission peculiar experiment support structure (MPESS), IGLOO, IPS *

(7) provide staging, experiment integration, and payload integration support *

(8) operate and maintain assigned payload facilities and equipment

(9) provide the Launch Site Support Engineer (LSSE) who, in conjunction with the NASA LSSM, works with the payload customer

in planning and expediting the payload processing flow through KSC, CCAS, and Space Shuttle payloads alternate landing sites

(10) provide communications planning for various testing requirements

(11) provide training for facility access, badging, operations, and applicable licensing

(12) provide expertise in various engineering disciplines as needed for payload processing

(13 provide test and documentation support as required by NASA and the payload customer

* For Space Shuttle payloads only

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SECTION III

PLANNED SPACE SHUTTLE PAYLOAD OPERATIONS

3.1 GENERAL

This section describes typical operations that must be performed to prepare a payload for launch on the Space Shuttle. (The ELV payload operations are in sections 11 and 12.) Payloads for each Space Shuttle mission are manifested into complete Space Shuttle payloads by the Flight Assignment Working Group and approved by the Director of Space Shuttle Operations at NASA Headquarters.

The resources available to the customer as identified herein provide support to all components of the mission manifest and to other missions being processed simultaneously. The customer must remain cognizant, during the design development, of the necessity to share these resources. Especially in cases where the resource will be required for days as opposed to hours or when required during major integrated tests, the customer should coordinate requirements closely with the LSSM. An example of such a case would be GSE interfaces to the facility. These resources are required for long periods of payload testing by all elements of the mission, such as spacecraft, upper stages, and experiment pallets, as well as elements of other missions being processed in close proximity.

Integration planning by KSC determines whether the payload is installed in the orbiter at the OPF or at the launch pad. Determining whether a payload is installed in the orbiter in the OPF or at the launch pad is influenced by hazards associated with the payload and hazardous operations, cleanliness requirements, payload types, access considerations and customer launch site stay-time. Payloads integrated in the O&C or SSPF may be installed into the orbiter either horizontally at the OPF or vertically at the launch pad. Payloads integrated in the VPF are installed into the orbiter vertically at the launch pad. Figures 3-1, 3-2, and 3-3 show standard flows at KSC. These three types of standard flows for CM-supported payloads are described in detail in subsequent paragraphs along with postflight operations and payload processing variations from the standard flows.

Security support at KSC and CCAS is detailed in the K-CM-05.3, Section V, *Guide for Payload Processing at KSC*. Early identification of the level of security support required is mandatory in order to budget resources for appropriate manpower and costs. Optional security support is furnished to non-NASA payloads on a cost reimbursable basis and must be budgeted for NASA payloads.

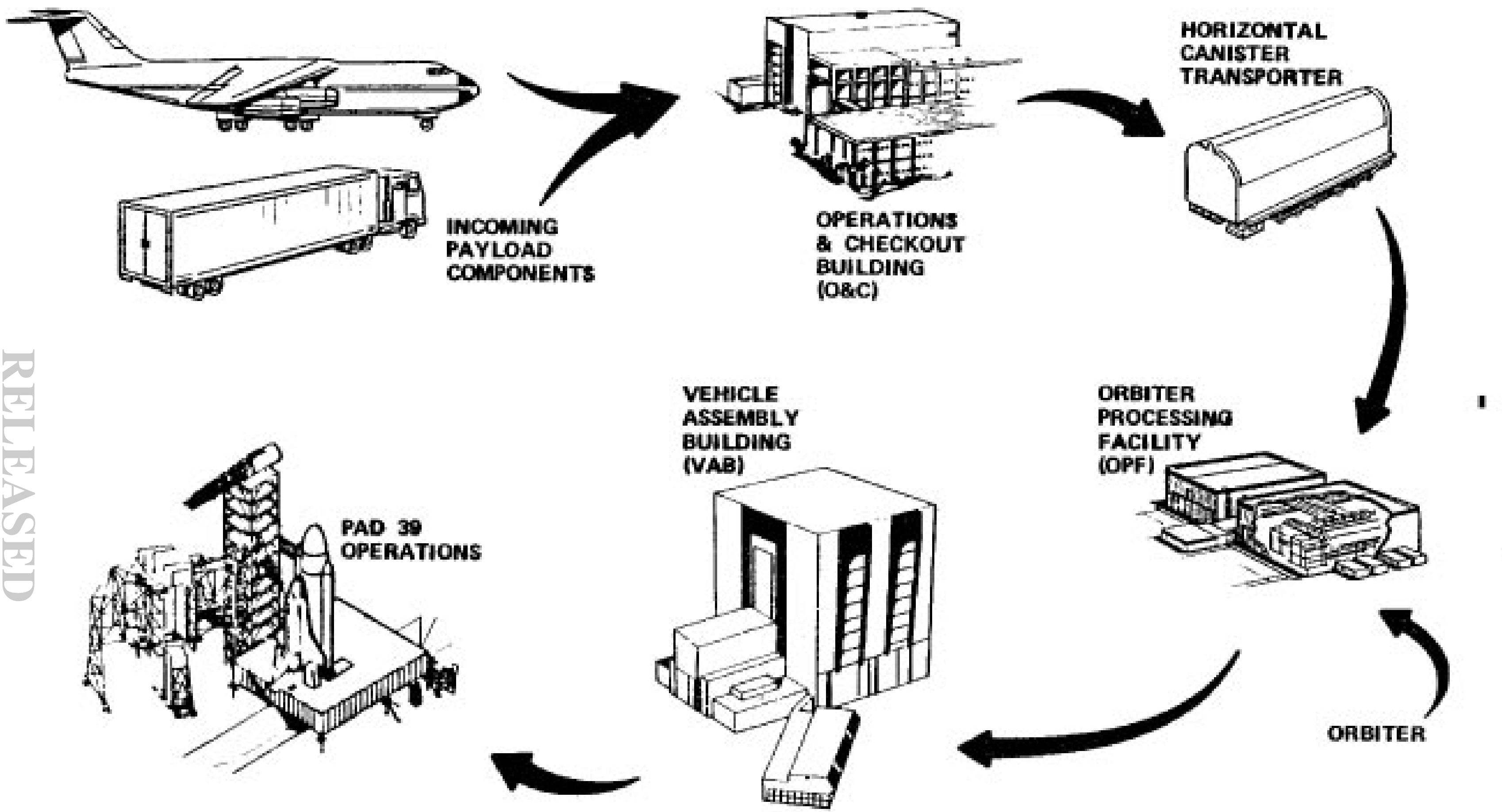


Figure 3-1. Payload Processing Flow for Horizontal Installation

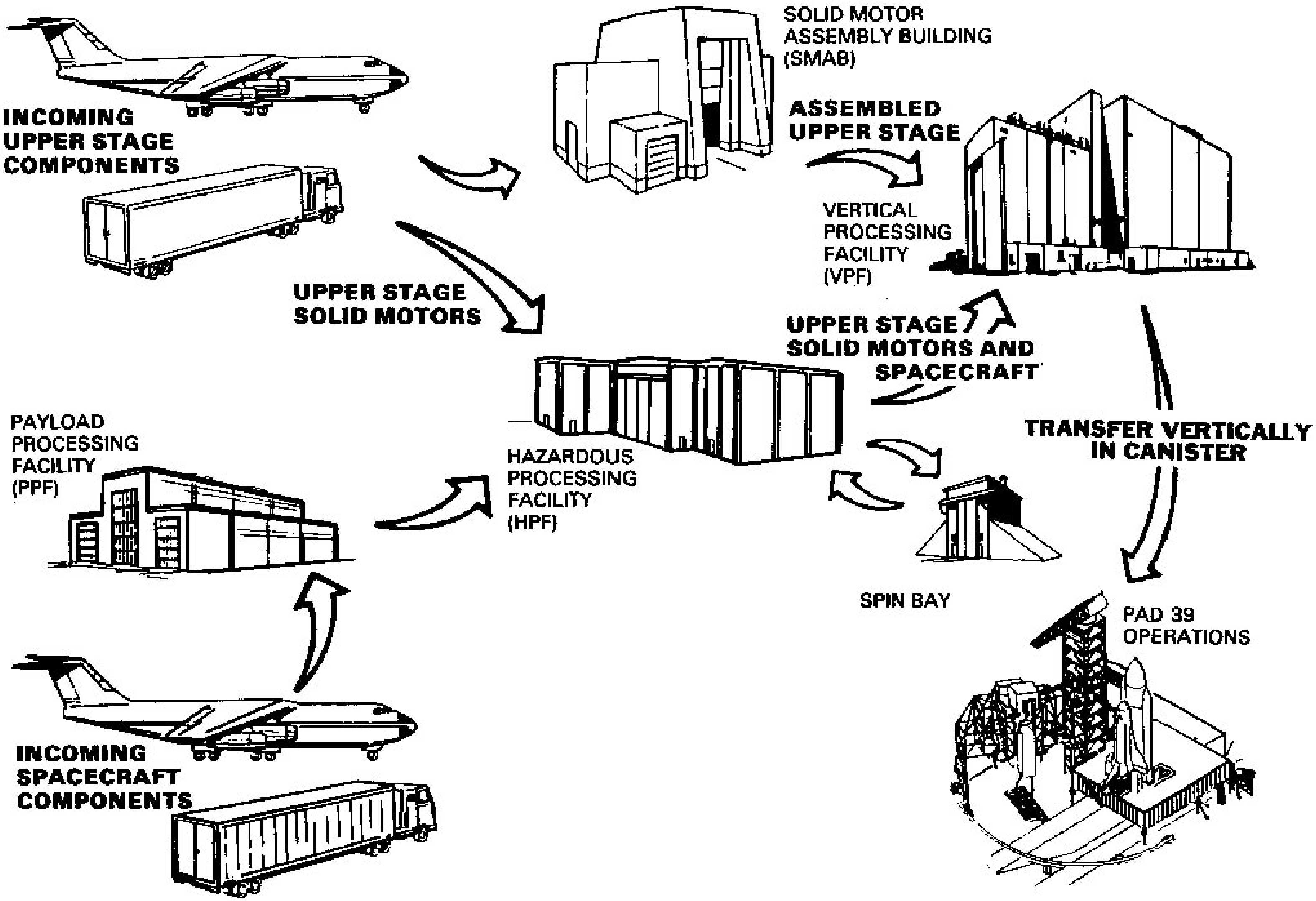


Figure 3-2. Payload Processing Flow for Vertical Installation

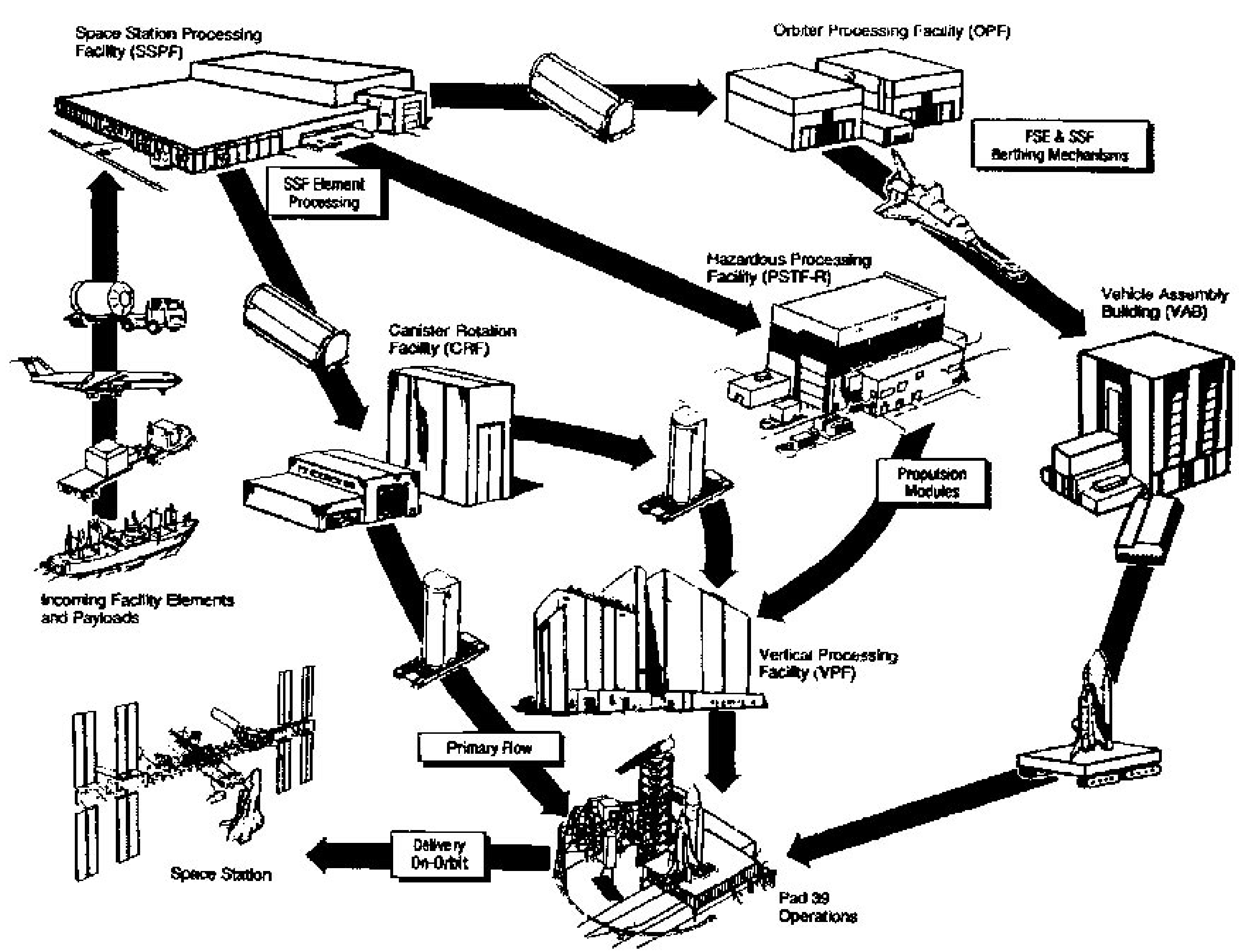


Figure 3-3. Processing Flow for Space Station Alpha Elements

To minimize impact to Space Shuttle processing and launch operations, simulated orbiter-to-payload interface verification of all payload elements is required before the payloads are installed into the orbiter (for first flow of multi-launch payloads; other flows at SSP options). KSC conducts payload integration and simulated orbiter-to-payload interface verification in the O&C, the VPF, or the SSPF using the CITE equipment.

Space Shuttle and payload facilities are environmentally controlled in order to accommodate payload environmental requirements.

The specific time lines for each Space Shuttle flight are contained in the integrated control schedule for that flight. These time lines are for orbiter integration operations. Specific shuttle ground operations (orbiter integration) time lines for each Space Shuttle flight are prepared and published periodically in the KICS. Ground operations for each payload are published periodically in the form of a Master Milestone Schedule and also in the PICS.

3.2 HORIZONTALLY INTEGRATED PAYLOADS

Payloads that are to be horizontally integrated are received in the O&C Building for assembly and checkout prior to mating with the orbiter. Typical horizontally integrated payloads include the Spacelab module, Spacelab IGLOO with pallets, various pallet and MPESS configurations, and special structures. Some pallets, MPESS, and special structures payloads are horizontally assembled and tested, then join the remainder of the payload elements for either horizontal or vertical integration and checkout. Figure 3-4 shows the mixed horizontally-vertically integrated payload flow.

3.2.1 PAYLOAD RECEIVING AT THE O&C. The customer is responsible for providing transportation to the launch site. Payload elements may be shipped by air, land, or sea. The KSC can provide support (e.g., forklift and operator) for transferring these locally arriving payloads and their equipment to the receiving facility.

Receiving functions performed by NASA and its contractors are off-loading payload elements from the carrier in the receiving area of the O&C, postshipment cleaning, removal of covers, and transfer to a work area. The customers perform their own preintegration payload activity.

3.2.2 PAYLOAD/EXPERIMENT INTEGRATION. The KSC can prepare and processes payloads according to approved plans, procedures, and schedules that include inputs supplied by the customer. These plans, procedures, and schedules are incorporated into a work control system that documents work activity authorized to be performed by the various disciplines (such as engineering, safety, reliability and quality assurance). Daily planning and scheduling meetings are held to update and modify plans and procedures as necessary, based on the status of payload processing. Customers participate in these meetings to supply payload-peculiar status and

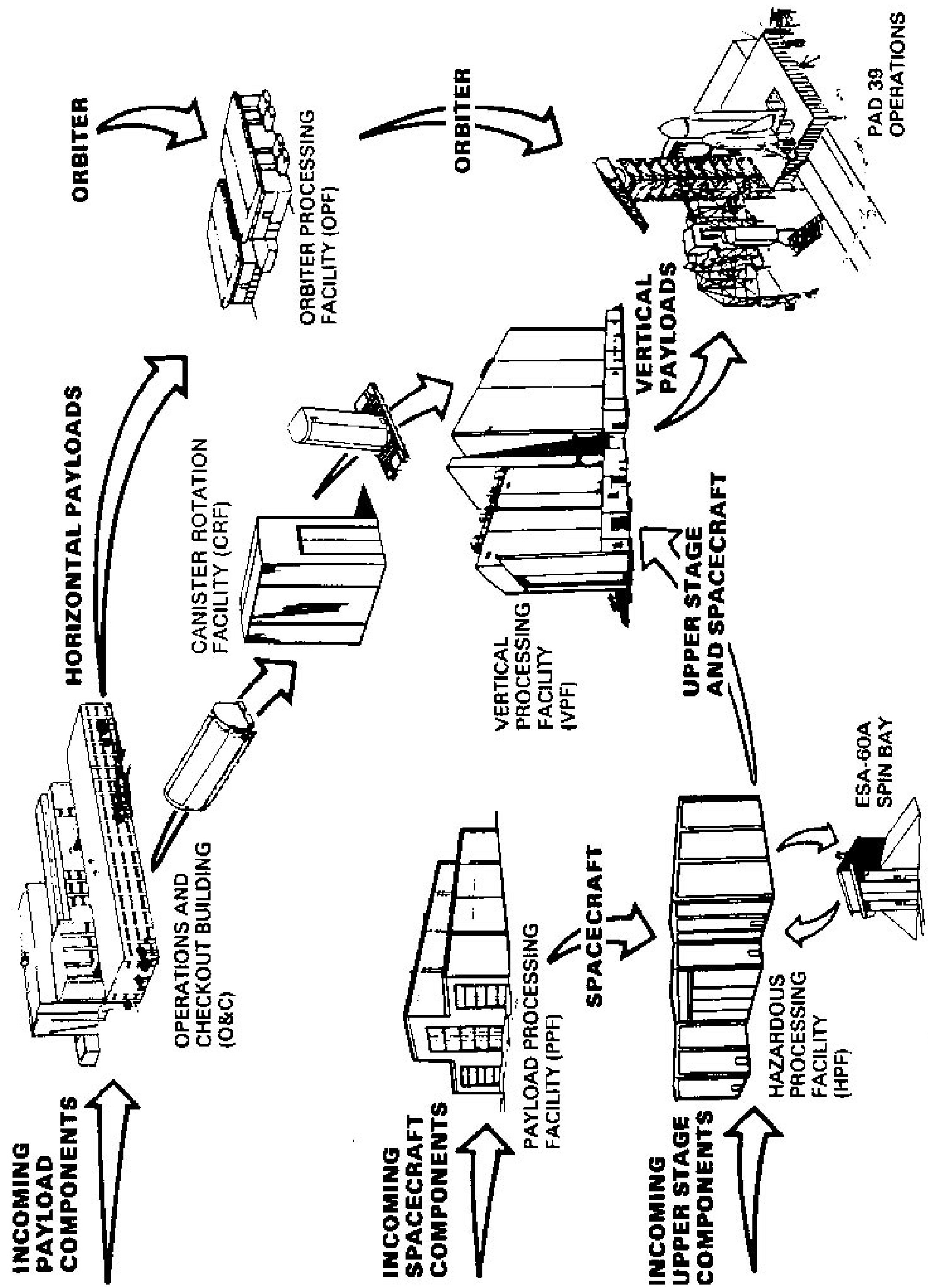


Figure 3-4. Payload Processing Flow for Mixed Payloads

updates, workarounds and problem solutions, and authorization for waivers and deviations to previously established work, plans, or schedules. It is mandatory that any payload-oriented work, problem resolutions, tests, and ship-short hardware that are deferred from off-site integration be identified as early as possible for incorporation into workaround planning and scheduling to avoid impact to KSC's processing.

3.2.2.1 Mechanical Assembly of Payloads/Experiments. Integration of experiments into or on payload carriers begins in the experiment integration area of the O&C Building. For Spacelabs, all possible staging and experiment integration work is done during this period before transfer of the payload elements to the Spacelab integration test stand. Bridge cranes, handling fixtures, and slings are available to transfer integrated elements; for example, Spacelab pallets, racks, and/or MPESS's.

The mechanical experiment integration includes:

a. staging of Spacelab equipment

b. installation of experiment instruments and mission peculiar equipment (MPE) on the carrier hardware (e.g. racks, pallet, MPESS, special structures)

c. rack air flow balance for module payloads *

d. weight and center of gravity determination (racks only for Spacelab)

e. installation of racks onto the flight floor *

f. joining pallets (or MPESS's) into trains

g. installing interconnect lines

h. coolant loop and experiment servicing (as required)

i. experiment alignment (if required)

j. installing experiment-peculiar equipment in aft flight deck simulator

k. inspecting payload for sharp edges

* Applicable to Spacelab module payloads only

3.2.2.2 Electrical Testing of Payloads/Experiments. After mechanical assembly of the payload in the experiment integration stands, electrical and electronic testing of the payloads and experiments is performed.

The payload checkout unit (PCU), together with associated equipment, is used for testing of experiments flown with the Spacelab. The PCU simulates all experiment related functions provided by the Spacelab subsystems, which permits tests and verification of each experiment before Spacelab integration.

The high rate multiplexer input/output test system (HITS) is utilized to display the experiment data to the experimenters and the KSC test team.

The partial payload checkout unit (PPCU) is used to simulate orbiter-to-payload functions for electrical and electronic testing of partial (non-Spacelab) payloads. This allows verification of all intra-payload interfaces and orbiter-to-payload interfaces.

The following electrical and electronic tests are performed for all payloads in the experiment integration area.

a. Electrical ground support equipment (EGSE) preparation-verification of the interfaces, both hardware and software, between the ground support test equipment and flight hardware and verification that the EGSE is configured according to mission requirements.

b. Meggar continuity, voltage polarity and isolation verification

c. Interface Verification Test (IVT) - of each experiment

d. Integrated Test - A test of multiple experiments working together verifying compatibility of operations (if required by experiment interaction)

e. Mission Sequence Test - Performance of time slice(s) of the mission on-orbit operations of Spacelab experiments or payloads. This test verifies communications between payload components and their ability to function together when required. This test may not be performed for all payloads, i.e., those that are reflights or those that are remotely operated.

After this testing is complete, the Spacelab payload train is moved to one of the Spacelab integration stands for assembly and integration with the Spacelab and for checkout of the Spacelab and payload train in the flight configuration. Spacelab payloads may be transferred to CITE after completion of integrated tests for simulated (flight type) orbiter interface verification. Partial payloads are transferred to the CITE stand for orbiter interface verification if they have a new orbiter interface requiring verification. If the payload does not go to CITE, it is transported to the OPF for Orbiter Integration.

3.2.3 SPACELAB INTEGRATION. This integration is accomplished in one of two Spacelab workstands (Test Stand 2 or 3). Once the integration of the payload train with the Spacelab has been completed, checkout of the integrated Spacelab configuration is accomplished using the automated test equipment (ATE). The ATE consists of control and monitor equipment as well as a simulated orbiter aft flight deck. The HITS system is used to monitor experiment data during this phase of integration. This testing will permit flight crew participation in the Spacelab integrated tests.

a. Verification of Spacelab-to-Payload interfaces and Compatibility. Spacelab workstands are designed to closely simulate both the orbiter electrical and mechanical interfaces to assure compatibility after installation in the orbiter payload bay.

b. Integrated Mission Sequence Test. This testing consists of performing time slice(s) of the mission on-orbit operations of Spacelab and the experiments. Mission on-orbit simulation tests permit crew training on the Spacelab to be accomplished using actual flight equipment.

Spacelab integration includes:

a. transfer and installation of payload carrier (pallets, MPESS, rack and floor assembly) into test stand

b. installing rack and floor assembly (module configuration)

c. installing aft end cone (module configuration)

d. mating pallet with IGLOO (IGLOO configuration)

e. coolant loop servicing

f. inspecting payload for sharp edges

g. installation of Multilayer Insulation (MLI) and associated closeout

h. verifying experiment-peculiar GSE interface

i. performing prepower bus isolation test

j. verifying Environmental Control System (ECS) with power up

k. verifying Spacelab-to-GSE interface

l. verifying Spacelab systems operation

m. loading and verifying software

n. functionally verifying interfaces with power up

o. performing data flow testing in O&C, if required

p. functionally testing and calibrating experiments, if required

q. testing Spacelab-to-simulated-orbiter interfaces, if required

r. testing compatibility

s. testing man machine interfaces

t. performing Spacelab orbiter Mission Sequence Test

u. stowing items that are not time critical (module configuration)

v. removing Mission Specialist Station and MSS Payload Specialist Station panels from Orbiter Interface Adapter (OIA) for movement to OPF

w. servicing payload as required

x. disconnecting GSE and orbiter simulator

y. performing closeout inspection

z. determining weight and center of gravity (except Spacelab modules)

Physical integration and simulated orbiter interface testing of non-Spacelab payloads may be accomplished at the CITE workstand (4). This workstand closely simulates the orbiter payload bay both mechanically and electrically. All orbiter-to-payload electrical interfaces, as well as orbiter aft flight deck panels, are functionally simulated (see paragraph 4.5.7).

Initial Spacelab and partial payload configurations are tested in the CITE workstand to verify mechanical compatibility with the orbiter bay as well as functional compatibility with the orbiter-to-payload electrical interfaces. Reverification of these interfaces may not be required for subsequent Spacelab missions using the same verified configurations.

A functional diagram (figure 4-29) for CITE is contained in section IV of this handbook.

Shuttle launch operations are also simulated through the use of the Launch Processing System (LPS) which is described in paragraph 4.7.

3.2.4 MOVE FROM O&C TO OPF. The Spacelab, or partial payload(s) and associated equipment, is hoisted by bridge cranes and a payload lifting sling, installed into the payload canister and moved to the OPF by the canister-transporter. Environmental conditioning, by air purge and system monitoring, is provided during transport to the OPF. The canister, transporter, environmental conditioning unit, transportation instrumentation set, and strongback are described in section IV of this handbook.

Operations conducted by KSC include:

a. preparing payloads for movement

b. attaching payload lifting sling

c. installing payloads in canister

d. removing payload lifting sling

e. closing canister

f. transporting to OPF

3.2.5 PAYLOAD INSTALLATION INTO ORBITER AT OPF. After canister arrival at the OPF, payload activities are considered part of orbiter integration. Payload removal from the canister and installation into the orbiter are accomplished in the OPF. The payload elements are hoisted in a horizontal attitude from the canister-transporter, positioned over the orbiter, lowered, and secured in the payload bay. The payload strongback and facility cranes support this operation. Operations in the OPF are managed by the SPC.

After payload installation, the orbiter-payload interfaces are connected and verified an Operations and Maintenance Requirements and Specification Document (OMRSD) number (requirements found in PIP Annex 9). An IVT is conducted to complete the verification of interfaces between the payload elements and the orbiter. This test includes validation of payload data transmitted by the orbiter data system, where applicable.

End-to-end tests to verify the command and telemetry communication links for the payload-to-shuttle-to-Mission Control Center (MCC) and Payload Operations Control Center (POCC), including verification of system operational software, are performed only as an optional service if required by the payload and previously scheduled.

Upon completion of testing for a Spacelab module, the Spacelab tunnel, is installed and access platforms are removed. Final closeout of the payloads includes such payload servicing as battery replacement; experiments cryogenic servicing; film, camera, tape installation; removal of any remaining environmental enclosure and covers; and closing and latching of the payload bay doors. The payload bay environment with the doors closed is maintained by providing a purge as described in section IV until OPF rollout.

OPF operations include:

a. installing flight kits including payload station consoles

b. pre-verification of Shuttle/payload interfaces

c. payload bay cleaning

d. opening canister

e. attaching payload lifting sling

f. removing payloads from transport vehicles and installing them into orbiter

g. mating payload-to-orbiter interfaces

h. IVT

i. performing end-to-end test in OPF, if required

j. installing tunnel, if required, in orbiter and verifying interfaces

k. final servicing of payloads (as required)

l. sharp edge inspection

m. crew equipment interface test (CEIT) of orbiter crew compartment payload bay, and Spacelab module

n. installation of late access GSE (if required for module mission)

o. final payload bay cleaning

p. closing out the payload bay

q. closure of payload bay doors

3.2.6 ORBITER OPERATIONS FROM OPF TO LAUNCH PAD. Upon completion of the OPF activities, the orbiter is transported by the orbiter transporter system (OTS) to the Vehicle Assembly Building (VAB) for transition from the horizontal to the vertical position and mated to the external tank and solid rocket boosters. Environmental conditioning is not provided to the payload bay during transit between the OPF and the VAB. A purge can be provided, if required, for up to 12 hours while the orbiter is on the OTS in the OPF (optional service). The mobile launch platform (MLP) provides a payload bay purge as described in section IV after the orbiter is mated to the T-0 umbilical on the MLP in the VAB and during transit to the launch pad. Shuttle power is available after the orbiter-to-MLP and orbiter-to-external tank (ET) interfaces have been connected and verified. The orbiter's payload bay is quiescent during VAB operations with no access planned.

After mating and Space Shuttle system interface verification checks with the MLP are completed, the shuttle is moved on the crawler transporter to the launch pad while maintaining the air purge to the payload bay. The orbiter is powered down during transit to the launch pad; however, power can be made available to a payload during this time through the T-0 umbilical panels as an optional service or provided by the payload GSE.

3.2.7 LAUNCH PAD SERVICING AND LAUNCH. After the MLP has been mated hard down on its launch pad mounts and the umbilicals are connected, an orbiter interface verification test is run to verify the integrity and serviceability of the launch pad and Space Shuttle system interfaces.

The orbiter supplies a payload bay purge by means of the facility ECS. At approximately L-52 hours (depending on mission) the air purge is switched to gaseous nitrogen (GN_2) for about 8 hours during hazardous orbiter operations. Also, at approximately 11 hours before liftoff, the air purge is again switched over to GN_2 in order to maintain an inert payload bay atmosphere through launch. Humidity becomes less than 1 grain per pound of dry nitrogen in the payload bay.

The capability exists from the payload changeout room (PCR) to open the orbiter payload bay doors and access the payload from the payload ground handling mechanism (PGHM) extendible platforms. Payload owners requiring payload access to the orbiter bay at the pad must pay for additional orbiter processing time, which includes opening and closing the orbiter payload bay doors and installing and removing any GSE. Payload service time is an additional cost. The module vertical access kit (MVAK) is designed to provide planned and contingency access to the inside of the Spacelab module on the launch pad for installation and changeout of non-human experiment specimens and line replaceable units (LRU's).

If payload testing and checkout activities are required while at the pad, the appropriate PIP Annexes, as listed below, will need to be provided and coordinated with the LSSM/LSST:

a. Test and checkout of specific systems and environmental conditions will be included in PIP Annex 9 (see paragraph 8.4.3 and Mission OMRSD Requirements).

b. Monitoring of specific flight critical parameters (launch mission rules) will be included in PIP Annex 3 (see paragraph 8.4.4).

Integrated operations at the launch pad are controlled from the Launch Control Center (LCC), similar to operations in the OPF. The orbiter-to-launch pad payload cabling interfaces are shown for information only in figure 3-5. Refer to SID's 79K18218 and 79K28802 for cabling details and interfaces.

Launch pad servicing and launch operations include:

a. mating MLP to launch pad

b. orbiter power on

c. flight crew equipment stowage

d. middeck payload installation

e. cabin closeout

f. launch readiness verification testing

g. payload bay closeout

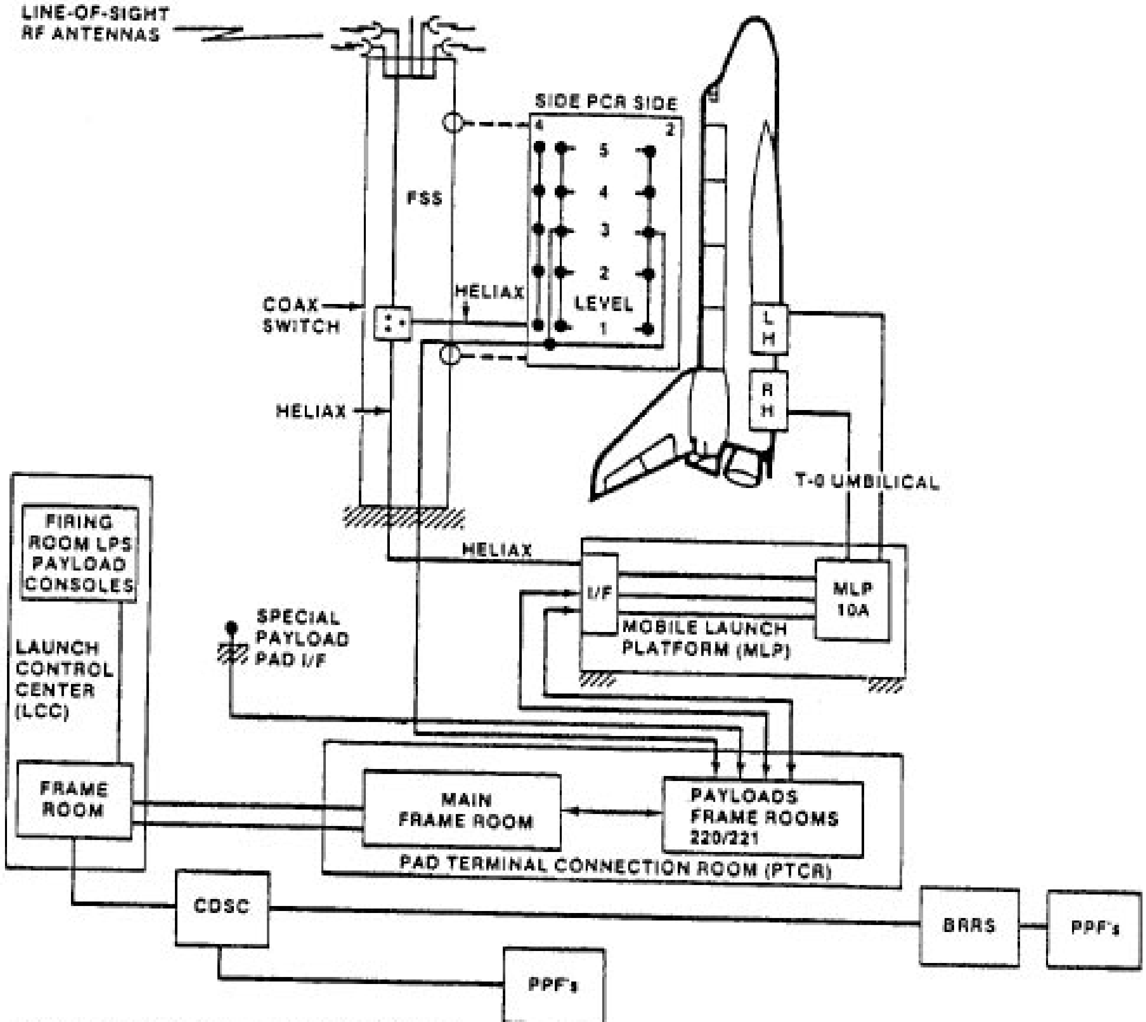
h. payload servicing (as required)

i. vehicle closeout and GSE securing

j. cryogenic loading

k. launch countdown

After launch, no planned or contingency flight activity involving the customer is expected at the launch site. One exception to this is the operation of a ground control experiment at KSC during the on-orbit mission. Should a situation arise to warrant such support, arrangements would be handled through the LSSM.



BRRS - BANANA RIVER REPEATER STATION
COSC - COMMUNICATIONS DISTRIBUTION AND SWITCHING CENTER
COAX - COAXIAL CABLE
FSS - FIXED SERVICE STRUCTURE
GA - GAUGE
HELIAX - HELIAXIAL CABLE
I/F - INTERFACE
LCC - LAUNCH CONTROL CENTER
LH - LEFT HAND
MLP - MOBILE LAUNCH PLATFORM
PCR - PAYLOAD CHANGEOUT ROOM
PPF - PAYLOAD PROCESSING FACILITY
PRD - PROGRAM REQUIREMENTS DOCUMENT
PTCR - PAD TERMINAL CONNECTION ROOM
RH - RIGHT HAND
RSS - ROTATING SERVICE STRUCTURE
W/B - WIDE BAND

NOTES:
* KSC USES COAX OR W/B FOR ALL HIGH BIT RATE DATA
* SERVICE REQUESTED VIA PRD
* FOR ADDITIONAL INFORMATION SEE KSC-DL-116

Figure 3-5. Orbiter-to-Pad Payload Cabling Interfaces

3.3 VERTICALLY INTEGRATED PAYLOADS

Vertically integrated payloads are normally received in a payload processing facility (PPF); see section IV for PPF locations. Some of these payloads are payloads involving upper stages; consequently, the terminology used to describe vertical payload integration is tailored to automated payloads with upper stages. These payloads often involve hazardous operations that are conducted in hazardous processing facilities (HPF's) located at CCAS and KSC. Vertical integration into a Space Shuttle complement of payloads is performed in the VPF located at KSC. A typical flow for a vertically integrated payload is shown in figure 3-2.

3.3.1 RECEIVING, BUILDUP, AND CUSTOMER TESTING. The customer is responsible for transportation of the payload to the launch site. KSC is capable of receiving payloads shipped by air, land, or sea; see KCS-PL-0012.0, *Payload Operational Logistics Plan*. Vertically integrated payloads are normally processed in a PPF (Buildings AE or AO, and an HPF (Spacecraft Assembly and Encapsulation Facility - 2 (SAEF-2) , or Payload Hazardous Servicing Facility (PHSF)). All except Building AE, can be shared by more than one payload customer.

Receiving and physical inspection are the responsibility of the customer. KSC will provide support (such as forklift operator and crane operator) as stated in the LSSP.

Following receiving operations, the customer is responsible to perform final assembly and buildup of the payload to its launch configuration. This process includes installation of solar panels, antennas, and other items that were shipped separately to the launch site. This assembly in the PPF does not include operations involving ordnance, cryogenic, or hypergolic propellants.

Customer payload functional testing is conducted by customers using their own payload-unique ground checkout equipment. When testing is complete and the payload is ready to move to the next checkout area, the ground checkout equipment normally remains in the PPF (which is dedicated to that particular payload until the payload is launched). Hardline, antenna, and voice communication equipment is available to connect the payload to its checkout equipment as the payload progresses through such facilities as the SAEF-2, PHSF, VPF, PCR, and launch pad.

The receiving, build-up, and customer payload testing activities of a vertically integrated payload include:

a. offloading from transportation carrier and move to PPF

b. receiving inspection

c. post-shipment cleaning

d. erecting workstands

e. building up ship-separate items

f. connecting payload-supplied GSE

g. functional testing by the customer

3.3.2 MOVEMENT FROM PPF. When hazardous operations are required after the initial functional tests are completed, the payload is moved to an HPF prior to delivery to the VPF. When the payload buildup has been completed and no hazardous operations are required, the payload goes directly to the VPF. Movement is the responsibility of the customer; however, this move may be procured from KSC as an optional service. Sometimes, an HPF may also used as the PPF.

The KSC provides forklift and crane operators as required and scheduled. Transportation containers and special carriers must be provided by the customer. Any special environmental conditioning required must also be provided by the customer.

Transportation operations to be performed by the customer include:

a. preparing payload for move

b. placing payload in special containers or on transporters

c. providing any special environmental conditioning and/or instrumentation

d. moving to HPF or VPF

3.3.3 HAZARDOUS OPERATIONS AND TESTING. Upon arrival at an HPF, the payload is removed from its transporter or container and installed in a test or assembly stand provided by the customer. The SAEF-2 or PHSF, on KSC, is used for these hazardous operations. These facilities are described in section IV of this handbook. Activities which may be conducted in the HPF's include propellant loading, such as hydrazine, monomethyl hydrazine (MMH), and nitrogen tetroxide (N_2O_4), and installation of solid propellant apogee motors, ordnance separation devices, and other potentially explosive or hazardous items.

Operations in an HPF are conducted by the customer with assistance by KSC, as planned in the LSSP. If payload-to-upper stage mating is scheduled to be performed at this point, the receiving, buildup, test, mating, and payload to upper stage interface verification is conducted by the customer.

Hazardous operations and testing include:

a. removing payload from transporter or container

b. installing in test or assembly stand

c. installing ordnance

d. servicing hydrazine, MMH, and N_2O_4

e. servicing cryogens

f. installing solid motors

g. mating with upper stage

h. testing and checkout

i. spin balancing SAEF-2

When servicing, assembly, and testing are complete in the HPF, the payload is ready for movement to the VPF.

3.3.4 MOVEMENT FROM HPF. Movement is the responsibility of the customer; however, this transportation may be procured from KSC as an optional service. Operations include:

a. preparing payload for move

b. placing payload in special container or on transporter

c. providing any special environmental conditioning and/or instrumentation

d. moving to VPF

3.3.5 VPF OPERATIONS. Upon arrival of payloads and upper stages at the VPF, their transporters, environmental covers or containers, and hoisting fixtures undergo cleaning operations on the concrete apron south of the building with final cleaning in the airlock. Processing of upper stages and payloads within the VPF may vary depending on the type of upper stage involved. Operations at the VPF are managed by the PGOC.

An upper stage with a mated payload is moved into the airlock for cleaning and then into the high bay where the environmental cover is removed. It is inspected, (rotated if necessary using a customer-provided rotation device), and hoisted into the vertical payload handling device (VPHD).

An upper stage without a mated payload is also moved into the airlock for cleaning and then into the high bay. The container lid and inner cover are removed and the upper stage hoisted into the VPHD. Access equipment, including filler plates, elevating platforms, and customer provided access kits, is installed and positioned to facilitate access to upper stage(s). The payload (if not mated to the upper stage previously in a customer processing facility) is moved into the airlock for cleaning and then into the high bay for uncanning, inspecting, hoisting into the VPHD, and mating to the upper stage. Hoisting fixtures are removed, and payload access equipment is installed. All vertically processed payload elements for one mission are eventually assembled in a single VPF test cell starting with the bottom (most aft) payload(s), then working towards the top (forward) payloads.

Following interface connector mating, KSC conducts simulated orbiter interface verification tests to verify all interfaces including redundant paths. The orbiter software flight load is used to support this test. These tests include, but are not limited to:

a. power

b. T-0 circuits

c. standard switch panel

d. caution and warning

e. radio frequency (RF) interfaces

f. Orbiter-payload retention hardware (when applicable)

g. spacecraft data and command paths, formats, and monitor checks

Next, if required, KSC conducts an end-to-end test as an optional service charge. The end-to-end test provides the opportunity to verify all command and data links among the orbiter, upper stage, payload, and the ground stations engaged in the mission. This test is supported by the POCC, Lyndon B. Johnson Space Center, Robert H. Goddard Space Flight Center, and any other centers required for the mission. If end-to-end tests are to be run at the pad, they are first run in the VPF to assure pad processing schedules are protected.

The last major test in the VPF is an ordnance systems test. Power-on and power-off stray voltage tests are conducted as at the pad. These tests may also include a safe and arm control demonstration. Following power-off stray voltage checks, certain ordnance items may be connected in accordance with the payload ordnance operations policy.

Before VPF canister operations, payload closeout activities in the VPF are accomplished. These activities may include:

a. disconnection of GSE and decabling CITE

b. removal of test batteries

c. preparations for transporting

d. sharp edge and contamination inspections

e. removal of access kit

f. removal of flight kits and separate transportation to the OPF for installation into the orbiter (orbiter schedules normally require a second set of flight kits)

In preparation for movement of the payloads to the PCR, the canister and transporter are configured, cleaned, and moved through the airlock for final cleaning, then into the high bay. The VPHD elevating platforms are moved to allow the canister and transporter to be positioned at the VPHD and all payload elements for the flight are transferred into the canister simultaneously. All facility access GSE is removed before transfer. Those payloads requiring specific services (instrumentation, monitors, fluids and gases, and electrical power) are connected to the canister supporting subsystems. Subsystems are activated, services verified, and unique access gear removed. The VPHD is retracted, trunnion access platforms removed, and workstand planks retracted. The canister is moved clear of the VPHD and the workstand, and the canister doors closed.

Operations in the VPF are conducted under environmentally controlled conditions. A more detailed description of VPF capabilities is contained in K-STSM-14.1.12, *Facilities Handbook for the Vertical Processing Facility*, and SID 79K16210.

3.3.6 MOVEMENT FROM VPF TO PCR. Road distance from the VPF to the pad 39A PCR is 16.9 km (10.5 miles). Road distance from the VPF to Pad 39B PCR is 18.9 km (11.8 miles). Approximately 4 hours of travel time are required for arrival at the launch pad and canister positioning under the PCR.

Transportation begins in the VPF high bay. The transporter cab is manned for continuous monitoring of instrument functions, services, and canister road status (acceleration, temperature, humidity, air quality, and fire and hypergol detection). Using facility power through an extension cable, the transporter-canister combination is moved through the airlock/high bay doorway into the airlock; the high bay door is closed to preserve the high bay clean work area status. The airlock external door is then opened if weather conditions are compatible with transportation time and route. The canister ECS is then activated. The actual time of day selected for transportation is during a low traffic and low wind period. The transporter-canister unit is moved outside the airlock, the auxiliary power extension disconnected, the airlock door closed, and the integral Electrical Power System and prime mover power systems activated.

KSC security, customer and PGOC integration personnel accompany the move. The transporter is driven at a speed not exceeding 8.1 km/h (5 mi/h) to launch pad 39A or 39B. The canister remains vertical on the approach up the pad ramp to the Rotating Service Structure (RSS) by use of the transporter leveling system. The canister is precisely positioned under the PCR by moving the transporter to a marked park position. Refer to the canister SID 79K12170 for further information.

3.3.7 PCR AND LAUNCH PAD OPERATIONS. Upon arrival at the pad, the payloads are considered part of orbiter integration. Operations and management of the PCR and its systems are the responsibility of NASA TM and the SPC. Management of payload operations remains the responsibility of the Payload Mission Processing Team and the Payload Manager. Integrated operations at the launch pad after arrival of the orbiter are controlled from the LCC. Orbiter-to-pad payload cabling interfaces are shown in figure 3-5.

Customer or ISSA GSE required to support PCR or launch pad payload operations will have been installed and validated before the arrival of the payload.

Installation of the payload into the PCR normally occurs before the shuttle transfer to the launch pad, and begins with the positioning of the canister below the retracted RSS/PCR. The canister is hoisted to the proper elevation, locked into position, and the environmental seals of the room inflated against the sides of the canister. The space between the closed doors of the PCR and the canister is purged with clean air to ensure the required cleanliness, and the doors of the PCR and canister are opened.

The PGHM, located in the PCR, is used to transfer the payload from the canister into the PCR. The PGHM is moved to the canister; the payload support fittings (J-hooks) of the PGHM are aligned and attached to the payload trunnions. The PGHM is retracted into the PCR carrying the payloads. The canister doors and PCR doors are then closed. The canister is lowered to the transporter and taken to the storage facility. After the shuttle is moved to the pad, the RSS/PCR is moved into position to enclose the orbiter payload bay and environmental seals are established. The space between the closed orbiter and PCR doors is purged with clean air, and the PCR and payload bay doors are opened. Planned servicing and testing of the payloads are performed, the PGHM is extended, and the payload elements installed into the orbiter.

If feasible, all payload servicing is accomplished before installation into the orbiter. Any requirements for late servicing should be by orbiter umbilicals, if possible. Servicing through open payload bay doors should be completed by L-84 hours and must be complete at L-60 hours.

During operations in the PCR and the orbiter payload bay, environmental conditioning is maintained. The payload bay clean air purge is maintained after payload bay door closure (normally 19 days before launch). At approximately L-52 hours (depending on mission) the air purge is switched to GN_2 for about 8 hours during hazardous orbiter operations. Also, at approximately 11 hours before liftoff, the air purge is switched to GN_2 to maintain an inert payload bay through launch. The humidity in the payload bay becomes less than 1 grain per pound of dry nitrogen at that time.

If payload testing and checkout activities are required while at the pad, the appropriate PIP Annexes, as listed below, will need to be provided and coordinated with the LSSM/LSST:

a. Test and checkout of specific systems and environmental conditions will be included in PIP Annex 9 (see paragraph 8.4.3 and Mission OMRSD Requirements).

b. Monitoring of specific flight critical parameters launch mission rules) will be included in PIP Annex 3 (see paragraph 8.4.4).

Payload-related PCR and launch pad operations include:

a. installing GSE into VPF, Room 104/106, test stands, PCR, Pad Terminal Connection Room (PTCR), and MLP room 10A

b. hoisting canister to PCR

c. removing payloads from canister

d. lowering canister from PCR

e. inspecting, testing, and servicing payloads before and/or after orbiter arrival

f. inserting payloads into orbiter

g. connecting payload-to-orbiter interfaces

h. conducting payload-to-orbiter interface verification

i. end-to-end test (optional service)

j. final servicing of payloads, including ordnance operations, and cryogenic servicing

k. closing out CITE/VPF/Payload

After launch, no planned or contingency flight activity is expected to involve the customer at the launch site, except for monitoring activities from an Mission Director's Center (MDC) and GSE/airborne support equipment (ASE) removal from KSC area(s). Should a situation arise to warrant customer support, arrangements can be made through the LSSM. The exception to this would be the KSC monitoring of Space Station Alpha on-orbit operations.

3.4 ISSA MISSION ELEMENTS AND PAYLOAD PROCESSING

The KSC receives ISSA flight elements and payloads for ISSA integration, and Launch Package processing in the SSPF prior to installation in the Space Shuttle orbiter.

ISSA flight elements consist of assembly elements, pressurized logistics modules, unpressurized logistics carriers, United States and International Partner pressurized laboratories and unpressurized carriers plus middeck payloads.

3.5 POSTFLIGHT OPERATIONS

Orbiter postflight operations are essentially the same for all payloads and managed by the SPC. See NSTS 07700, Vol XIV, appendix 5. Payload ground operations begin after landing and full stop of the orbiter on the runway at the Shuttle Landing Facility (SLF) or Edwards Air Force Base (EAFB). Payload bay purge is established from mobile GSE within 45 minutes after landing at the primary end-of-mission landing site, or after safety approval, and continues (for KSC landing) until switch-over to a facility system in the OPF. All orbiter pyrotechnics are safed, cooling units connected, and the crew egresses. As an optional service, time-critical science experiments (SE) (located in the middeck) can be removed before start of orbiter tow but no later than landing plus 3 hours.

For a planned EAFB landing, support similar to that provided at the SLF is available. However, payload bay purge is discontinued prior to mating the orbiter to the shuttle carrier aircraft (SCA). During the ferry flight to KSC, the SCA will maintain an altitude and flight duration to insure a minimum payload bay temperature of 1.67 °C (35 °F) or higher and a minimum pressure of 0.55 bars (8.0 lb/in^2). Payload bay temperature and humidity will be recorded during the ferry flight. At designated overnight stops, when specified by the customer, the payload bay purge may be applied as an optional service. After SCA/orbiter arrival at KSC, the services are the same as described for a KSC landing.

Normally, no access to the payload bay is planned while the orbiter is at EAFB or the SLF. An exception to this is the temperature/humidity device which is installed through the "B" hatch while the orbiter is at EAFB. Spacelab items in the pressurized module that are time-critical should be stowed in the orbiter cabin middeck while in orbit for removal by the ground crew at the landing site. However, if early access to the Spacelab module in the payload bay is required, as for life sciences missions, access can be arranged as an optional service. Time critical items will be removed from the ISSA mini-pressurized logistics module prior to removal from the payload bay. After arrival at KSC and after crew exchange and removal of carry-off payload items, the orbiter is towed to the OPF for payload removal and preparation for the next flight.

3.5.1 REMOVAL OF PAYLOADS FROM ORBITER. Upon arrival at the OPF, a series of safing tasks is performed to render the orbiter and any hazardous payload safe. All payload operations in the OPF are performed with the orbiter in the horizontal position.

After safing and deservicing, GSE is installed and the orbiter bay doors are opened. Payload bay access for removal or servicing of sensitive payload equipment is planned after the payload bay doors have been opened in the OPF. Time critical items will be removed from the ISSA mini-pressurized logistics module prior to removal from the payload bay. Payload bay access stands and payload protective covers are installed; electrical, fluid, and mechanical interfaces are disconnected; and the payload lifting sling is attached to the trunnions. All payloads are hoisted from the bay and placed in the canister or in a customer-provided transporter for removal from the OPF. Removal of payloads normally occurs 5 days after return to the OPF.

Orbiter maintenance (planned and unscheduled) along with system revalidation is completed postflight. Mission-peculiar payload accommodations equipment is removed, and equipment changes required for the next mission are completed. Typical mission accommodations equipment includes such items as power and avionics cables, fluid lines, and remote manipulator system arms.

Operations required for the next payload are then performed, including the cleaning of the payload bay. Postmission payload operations in the OPF include:

a. purging orbiter payload bay

b. safing operations for payload

c. opening payload bay doors

d. installing required access GSE

e. removing time-critical experiments as scheduled

f. removing payloads/GSE from orbiter and placing them in canister or other transporter

g. moving payload equipment to facilities for customer processing disassembly

h. post-flight testing, if required

3.5.2 DISASSEMBLY OF PAYLOADS. Payload equipment returned from space and removed from the orbiter in the OPF is processed further in payload processing facilities. If required, a copy of the payload recorder tape and payload-peculiar equipment will be turned over to the payload owner. Carrier equipment such as Spacelab pallets and modules and upper stage cradles and other ASE are returned to their contractors for disassembly and dispositioning.

3.5.2.1 Spacelabs. The Spacelab, with experiments intact, is transported in the payload canister from the OPF to the O&C where pallets and racks are removed in the Spacelab test stand and placed in their respective pallet and rack stands. Experiments are removed from the pallets and racks for return to the customer. Racks and pallets are reconfigured to the requirements of subsequent payload owners.

3.5.2.2 Mixed Payload Elements. Mixed payload elements, containing both vertically and horizontally integrated payloads, will be transported in the canister to the O&C/VPF where individual payloads are removed from the canister. Vertical components (upper stage ASE) will be loaded on their transporters and taken to the upper stage buildup area at CCAS. The horizontal payload(s) will be moved to the O&C Building for deintegration.

3.5.2.3 Vertical Payloads. Returned hardware containing all vertically integrated payloads (more than one) will be removed from the orbiter by a payload lifting sling in the OPF. The hardware is then returned to the customer in the VPF. Single payload returned hardware will be unloaded individually, placed on their transport vehicles, and taken to the PPF's on CCAS or KSC.

3.5.3 NON-KSC LANDING SITE OPERATIONS. Non-KSC landing sites have been identified for each Space Shuttle mission for Continental United States (CONUS) and non-CONUS. The CONUS primary and alternate landing site for each mission will be identified as mission planning matures. The non-CONUS landing sites will also be identified.

Planned payload operations at any non-KSC landing site are limited to payload safing, science (middeck) experiment removal, and preparation of all the other payload elements for return to the launch site in the orbiter. KSC's plan is to safe the orbiter and payloads, remove science experiments, mount the orbiter on the SCA, and return both the orbiter and remaining payloads to the launch site. Payloads would then be removed in the OPF as described earlier. If the orbiter lands at a non-CONUS site and payloads must be removed because of weight, center of gravity, or safety restrictions, NASA will provide limited transportation to and from a non-CONUS landing site on a space-available basis for customer GSE, other equipment, and personnel. All landing sites are managed by the SPC. NASA will also transport payloads that are removed at a non-CONUS site to the launch site; however, customers must provide the shipping containers and GSE necessary for this transportation.

Before each launch, the customer will identify and KSC will document the payload ground handling and deservicing hardware that is required to safe, remove, and ship a payload from a non-KSC landing site. Customer ground handling and deservicing hardware should be air transportable and should be designed for use with a single crane hook to ensure payload removal and safe return from a non-KSC site, if required.

In the event of a contingency landing following an otherwise successful mission, KSC will take all reasonable measures to maintain the integrity of payloads, experiments, and data returned from space within constraints imposed by uncontrolled environment, safety practices, and the condition of the orbiter itself.

Non-KSC landing site operations planning is an integral part of overall mission planning. Customers will be requested to identify their requirements for these contingencies. Details regarding submittal of these requirements will appear in the LSSP, program requirements document (PRD), and other KSC-prepared documentation.

3.6 SPACE STATION ALPHA ELEMENT TURNAROUND

The logistics modules, carriers, and will be relaunched as necessary to maintain the ISSA on-orbit with consumables and scientific experiments. Activities necessary to turnaround these elements will include deintegration; maintenance, repair, refurbish, and retest; and integration into the next launch package configuration. The logistics modules and carriers will be turned around in the SSPF. Turnaround planning indicates that multiple logistics modules and carriers will be in continuous flow through the SSPF.

3.7 PAYLOAD PROCESSING VARIATIONS

Figures 3-1, 3-2, and 3-3 show the standard flow for horizontally and vertically integrated payloads and Space Station Alpha element processing. Many variations from the standard flow can be accommodated at KSC. Customers should discuss proposed variations with the assigned LSSM. Agreements between the customer and

KSC on the payload processing flow for any given payload will be documented in the LSSP.

Some specific variations from the standard flows that are being planned are discussed in subsequent paragraphs.

3.7.1 PROCESSING OF GETAWAY SPECIAL (GAS) PAYLOADS. Processing of GAS payloads is a specific variation from the standard payload processing flow shown in figure 3-1. Since these payloads have limited interfaces with the orbiter and since they are not installed on trunnions in the orbiter, they cannot be processed as standard payloads. See figure 3-6. GAS payloads do not normally require a CITE test; therefore, they are received and assembled in the Radioisotope Thermoelectric Generator Facility (RTG-F), then transported to the OPF, and installed in the orbiter on a special GAS adapter-beam. If the GAS payloads are scheduled to be mounted on the GAS bridge, which can hold up to 12 GAS cans, the special structure bridge may be transported to the O&C, loaded into the canister, then moved to the OPF to be installed in the orbiter or transported to the VPF to be integrated with additional payloads and installed in the orbiter at the launch pad.

After flight, GAS payloads are returned to the RTGF for deintegration and return to their owners, K-PSM-11.3, *Get-Away Special Payloads (GAS)* (Small Self-Contained Payloads) LSSP, describes the GAS payload processing in further detail.

3.7.2 PROCESSING OF LIFE SCIENCE PAYLOADS. Processing of life science payloads is a specific variation from the standard payload processing flow described in figure 3-1. The flight hardware associated with life science payloads normally follows the flow outlined for horizontally integrated payloads (see paragraph 3.2). However, live, non-human specimens for these payloads are received at the LSSF, Hangar L on CCAS. Science operations activities in the LSSF are generally under the direction of KSC-MD, as are the maintenance responsibilities for the facility. Materials processing experiments, plant and/or tissue experiments, and other non-human experiments could be processed in the LSSF laboratories. The Ground Support Requirements Document (GSRD) is developed from the support requirements provided to the KSC LSSM. The Payload Operations and Payload Mission Management responsibilities are under the direction of KSC/CM.

Processing and/or support to life science human experiments are available in the O&C Biomedical Laboratory and the BDCF. A wide range of biomedical instrumentation and expertise is available to support pre- and postflight human research protocols. Requirements should be prearranged with KSC-MD.

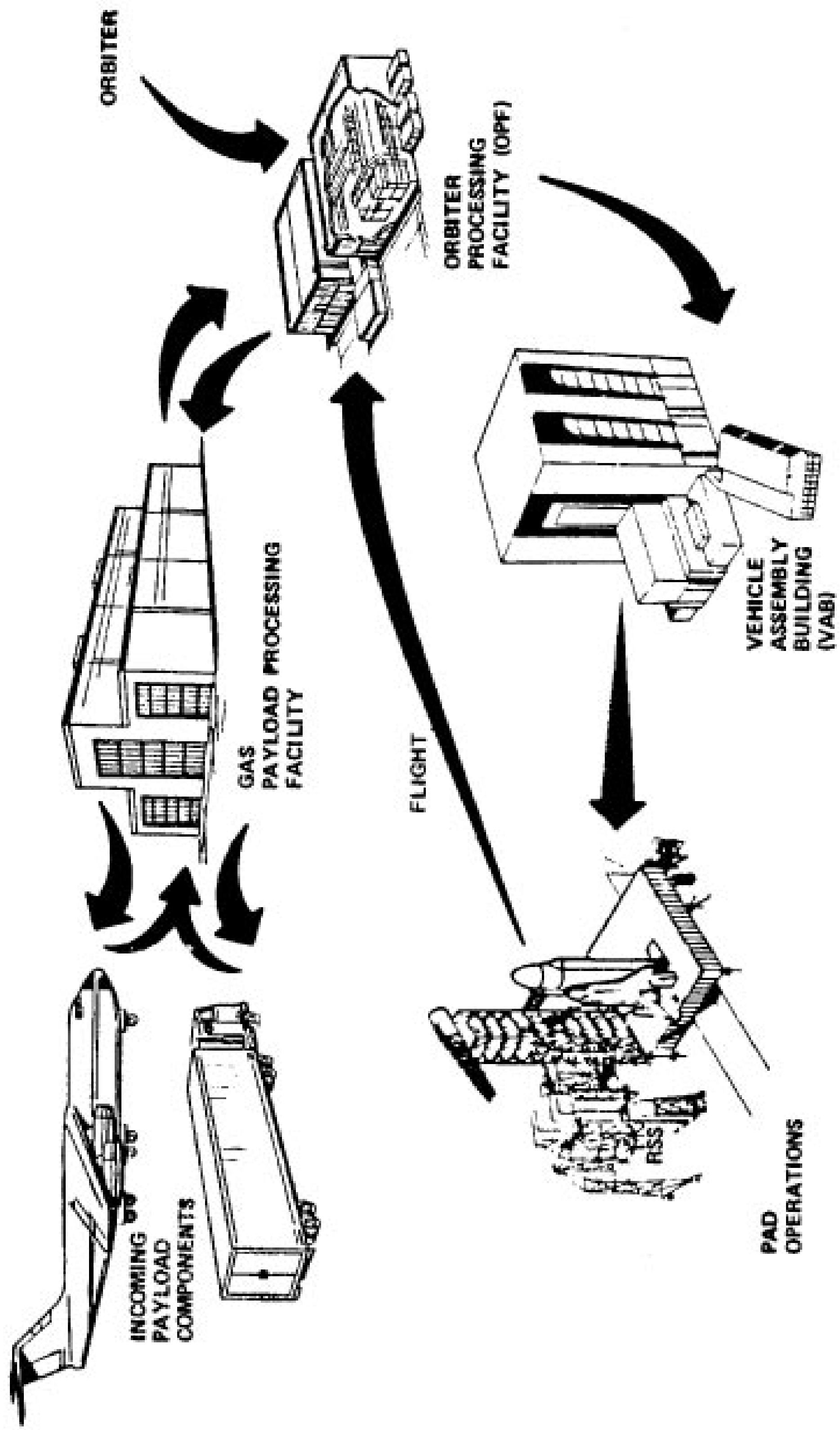


Figure 3-6. GAS Processing Flow (without Gas Bridge)

The means or method for accomplishing the installation varies with the stowed location of the specimen(s) for launch. Spacelab module stowage at the launch pad requires use of a special equipment consisting of winches, slings, and restraints for personnel installing the specimen containers. Live specimens are installed in the module at the launch pad approximately 26 to 33 hours before launch. Science experiment (middeck) stowage must be completed 14 hours prior to launch.

Specific flows and timelines for each life science payload will be developed by KSC and will be contained in the LSSP, the Master Milestone Schedule, and the appropriate integrated OMI. A proposed flow for a typical life science payload is shown in figure 3-7.

3.7.3 MIXED PAYLOAD PROCESSING. Pallet and special structure payloads are generally integrated with their experiments in the O&C bay area. After experiment integration, when IVT and integrated testing are complete, the pallet or structure with its integrated experiments is placed in the payload canister on the transporter, moved to the Canister Rotation Facility (CRF) for rotation of the canister with its payload, and transported to the VPF, where it is joined by the other payloads. In the VPF, the remaining payloads are placed in the canister with the pallet or special structure payload and all payload elements are taken to the launch pad in the vertical canister, installed in the PCR, and readied for flight. When the shuttle vehicle arrives at the pad, the RSS/PCR is rotated to mate with the orbiter and the payloads are installed.

3.7.4 SCIENCE (MIDDECK) PAYLOADS PROCESSING. The science payloads stowed in the middeck of the orbiter are categorized in two types.

a. One type requires processing upon arrival at KSC. The processing can include any of a number of activities such as functional checkout and inspection in an off-line laboratory in the O&C or the LSSF, fit-checks in the orbiter middeck in the OPF, continuous power, late installation prelaunch in the orbiter, interface verification testing with orbiter power, and early removal from the orbiter at the landing site. All of these activities fall under KSC responsibilities.

b. The other type of science experiment is a pre-pack middeck locker. This type of science experiment requires no KSC processing other than routine installation in the orbiter middeck at the launch pad. The experiment arrives at KSC in a pre-packed locker with all elements of the experiment ready for flight. Interface verification testing is not normally required for these pre-pack payloads. The pre-pack locker is removed during normal destowage operations at the landing site. The KSC Safety Office will have limited involvement with pre-pack payloads to determine whether the experiment contains hazardous materials.

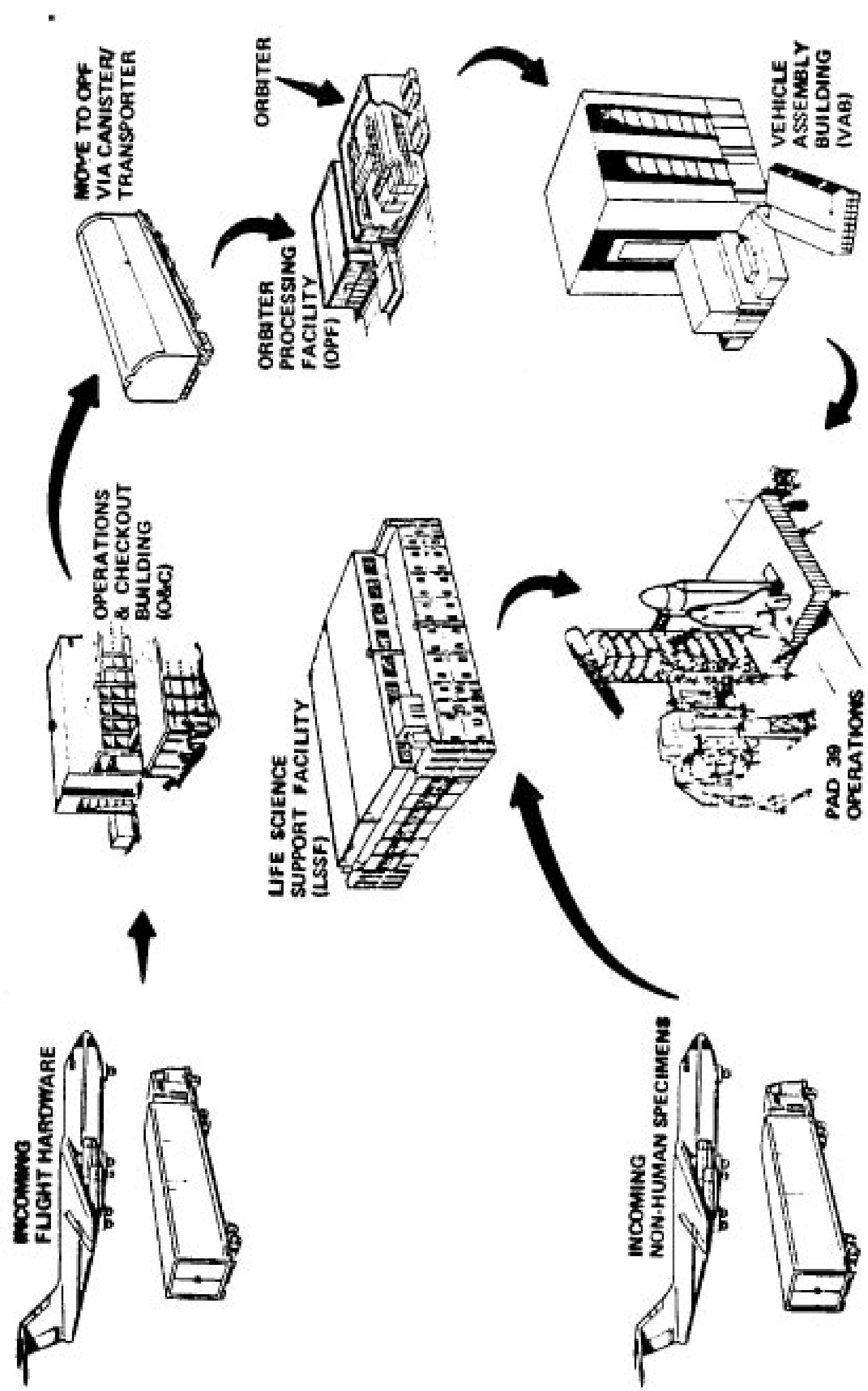


Figure 3-7. Payload Processing Flow for Life Sciences

3.8 PROTECTION OF PAYLOAD PROPRIETARY DATA

During the planning, processing, and flying of payloads in the Space Shuttle, payload data are usually interchanged and freely distributed among the various NASA elements and their contractors. Consequently, proprietary data should not be disclosed to NASA or its contractors unless specifically requested and after protective measures have been agreed upon. Payload data that are considered proprietary by the customer can usually be protected if appropriate requirements are identified to the appropriate NASA payload and mission managers and LSSM's. If a payload's proprietary characteristics are concealed within the configuration or proprietary data disclosure is not required, no protection by NASA will be needed. Where proprietary characteristics are not concealed, or where hazardous chemicals or potential hazards are identified with the proprietary elements, some disclosure will be required, and the levels of protection to be provided will be negotiated.

Normal work rules at KSC, oriented to protecting the Space Shuttle as a National Resource, will generally provide some level of protection against casual inspection of proprietary hardware, materials, and documentation. In addition, some level of basic proprietary data protection will be provided at the launch site. Optional service charges may be incurred for proprietary data protection if significant resources are required.

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SECTION IV

PAYLOAD FACILITIES AND SUPPORT EQUIPMENT

4.1 GENERAL

This section describes the payload assembly and test areas, the launch complex, and other specialized facilities utilized by the customer during prelaunch and postlanding activities. Information on the CCAS and KSC payload facilities is presented to familiarize the customer with payload operations areas and provide assistance in facility planning and establishing requirements.

Launch site payload processing facilities are described in three levels of documentation. These levels and their purposes are:

a. K-STSM-14.1 - *Launch Site Accommodations Handbook for Payloads* - This document provides a brief summary of each facility and KSC launch and landing site operations (this section). It is under configuration control.

b. Facility Handbooks - Each handbook provides a narrative description of the facility and its systems. Also, general operating rules and regulations and safety systems are discussed in these handbooks. Handbooks available are listed in table 4-1.

   These facility handbooks are not under formal configuration control; however, they will be reissued or amended as necessary to maintain usefulness to customers in their planning for launch site processing of their payloads.

c. SID's - The SID's provide the design-to interfaces for the payload integration and processing facilities. See table 4-1.

   SID's are not available for all payload processing facilities; therefore, the facility handbooks must be used for design-to information. When SID's are available, they should be used as the official definition of the facility interfaces and supplemented by the Facility Handbooks. As shown in table 4-1, there are some SID's for which there are no handbooks, such as the payload strongback; in such cases, the SID's must be used, alone. Copies of these documents can be obtained through the LSSM.

KSC documents launch site facility utilization assignments for payloads in the LSSP after coordination with the LSSE and the customer.

4.2 FACILITY UTILIZATION

For orientation purposes, the KSC and CCAS areas for payload operations are shown in figure 4-1.

Table 4-1. Payload Processing Support Facilities and Equipment

Facility and Equipment	Building Numbers	Document
Building AE	60680	K-STSM-14.1.1
Building AO	60530	K-STSM-14.1.2
Spacecraft Assembly and Encapsulation Facility - 2 (SAEF-2)	M7-1210	K-STSM-14.1.7
Radioisotope Thermoelectric Generator Facility (RTG-F)	M7-1472	K-STSM-14.1.8
Life Science Support Facility (LSSF) (Hangar L)	1732	K-STSM-14.1.9 SID 79K24867
Rotating Service Structure (RSS)	Pads 39A & 39B	K-STSM-14.1.10 SID 79K18218 & 79K28802
Vertical Processing Facility (VPF)	M7-1469	K-STSM-14.1.12 SID 79K16210
Orbiter Processing Facility (OPF)	K6-894	K-STSM-14.1.13 SID 79K18745
Operations and Checkout (O&C) Building (Horizontal Processing)	M7-355	K-STSM-14.1.14 SID 79K16211
Payload Hazardous Servicing Facility (PHSF)	M7-1354/ M7-1357	K-STSM-14.1.15

Table 4-1. Payload Processing Support Facilities and Equipment
(continued)

Facility and Equipment	Building Numbers	Document
Space Station Processing Facility (SSPF)	M7-360	K-STSM-14.1.16 SID 82K00760
Payload Spin Test Facility Replacement (PSTF-R)	TBD	K-STSM-14.1.17 SID 82K03223
Payload Ground Transporter and Canister	N/A	SID 79K12170
Payload Strongback	N/A	SID 79K17644
Payload Environmental Transportation System (PETS)	N/A	SID 82K00463
Single Pallet Rotation Device (SPRD)	N/A	SID 82K00678

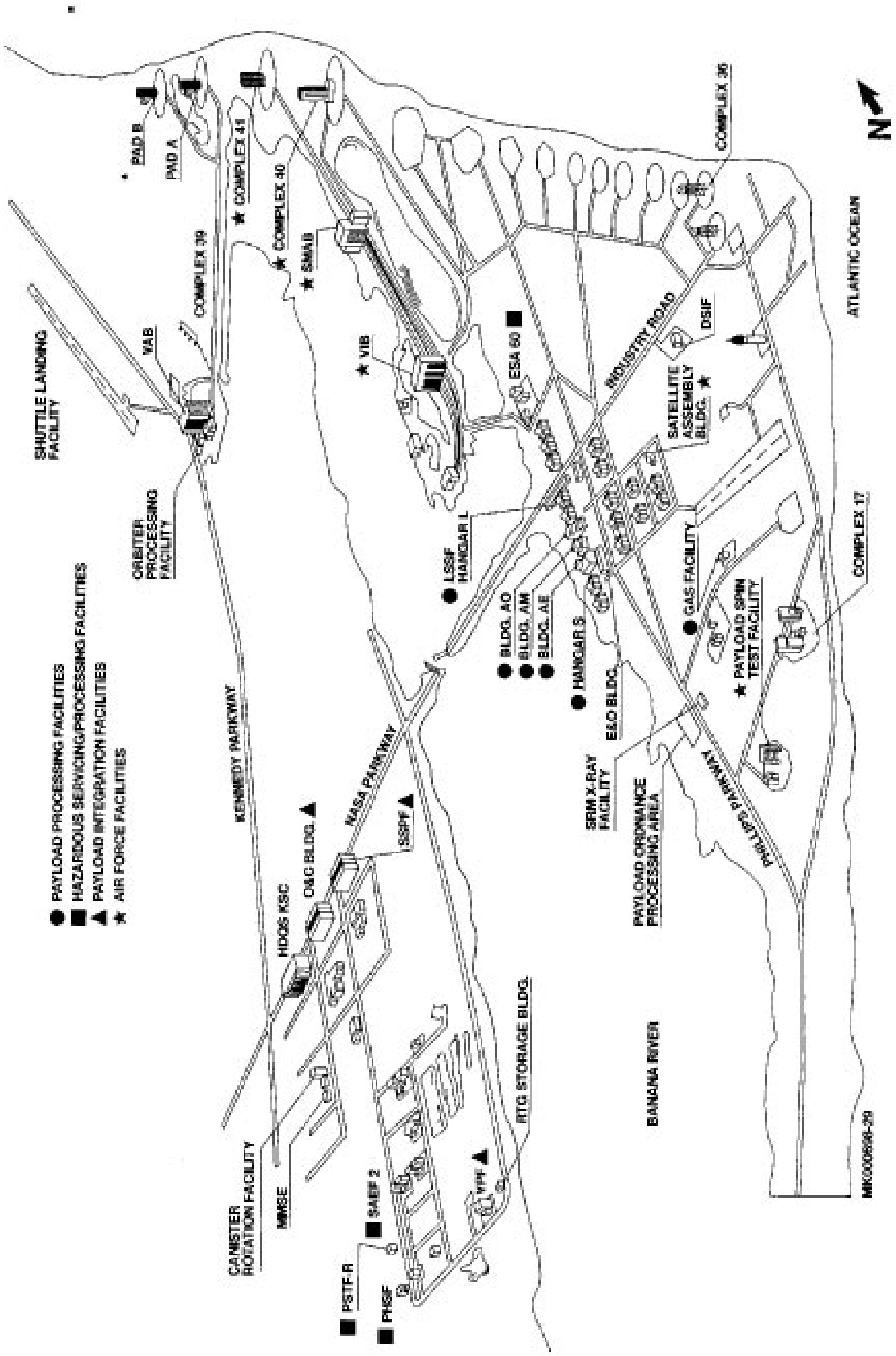

Figure 4-1. KSC/CCAFS Major Payload Facilities

4.3 PAYLOAD FUNCTION AND FACILITY SUPPORT

Table 4-2 lists the standard functions for each facility and its accommodations. The matrix is based on past experience with other space programs.

Table 4-2. Payload Function and Facility Support Capability

Function / Facility	Receiving & Inspection	Assembly	System Test	Nonhazardous Servicing	Hazardous Servicing	Payload-Orbiter Interface Verification	Postlanding Operations	Storage	
Operations & Checkout (O&C) Building #M7-355*	X	X	X	X		Using Simulator	X	X	
Vertical Processing Facility (VPF) #M77-1469*	X	X	X	X			X		
Spacecraft Assembly & Encapsulation Facility (SAEF-2) Building #M7-1210	X	X	X	X	X	Using Simulator	X		Spin Balancing
RTG Storage Building #M7-1472	X			X	X			X	
Building AO #60530	X	X	X	X				X	
Building AE #60680	X	X	X	X				X	
Building AM #60550	X	X	X	X				X	
Life Science Support Facility (LSSF) #1732	X	X	X	X			X	X	Nonhuman LSS
Hangar S #1728	X	X	X	X				X	
ESA 60A Complex #54446/59922/59925	X	X	X	X	X			X	Spin Balancing
Canister Rotation Facility (CRF)									Canister Rotation
Orbiter Processing Facility (OPF) #K6-894			X	X		X	X		Payload
Payload Changeout Room (PCR)			X	X					
Launch Pad			X	X	X	X			Launch
Shuttle Landing Facility (SLF)							X		
Payload Hazardous Servicing Facility (PHSF)	X	X	X	X	X		X	X	
Space Station Processing Facility (SSPF) Building #M7-360*	X	X	X	X		Using Simulator	X	X	
Payload Spin Test Facility Replacement (PSTF-R) Building #TBD	X	X	X	X	X		X	X	

* Includes CITE Equipment/Capabilities

4.4 FACILITY CAPABILITIES

The summary information presented in this section is intended to present an overview of launch site facility capabilities. This data will be helpful in facility requirements identification and during discussions with the LSSM. The buildings described are:

- Building AE
- PSTF-R
- LSSF
- Building AO
- O&C
- VPF
- SAEF-2
- SSPF
- OPF
- PHSF
- RTG-F
- PCR

In addition to the documents referenced in table 4-1, KSC's Engineering Development Directorate has published the following customer-oriented documents that will be helpful in describing payload interfaces at the launch and payload integration facilities:

a. KSC-DL-116 *Payload/GSE/Data System Interface User's Guide for Launch Complex 39A/B*

b. KSC-DL-522 *Payload/GSE/Data System Interface User's Guide for Vertical Processing Facility*

The major KSC Space Shuttle payload integration facilities are environmentally controlled in order to accommodate payload environmental requirements. Table 4-3 describes the environmental control at major KSC facilities. Additionally, except during transfer from the OPF to the VAB and during mating at the VAB, the orbiter payload bay is purged with conditioned air at various major KSC facilities to meet environmental requirements of the payload.

4.4.1 BUILDING AE HIGH BAY CLASS 10,000 CLEAN WORK AREA (CWA) COMPLEX. That portion of Building AE west of the north and south wings and the central frame low bay is the high bay clean room complex (figure 4-2). The unshaded areas in the high bay clean room complex show space available to payload projects. With the exceptions of room 129, which is assigned as a KSC engineering office, and room 118A, the (high bay) test control room, this area is devoted to clean rooms and supporting anterooms. Equipment enters through the 4.5 m by 11 m (14 ft 9 in by 36 ft 1 in) airlock doors. The airlock contains a 5.4 metric ton (6-ton) monorail crane; the test area (room 132) has a 1.8 metric ton (2-ton) monorail and a 4.5 metric ton (5-ton) bridge crane. Three rooms in the central frame low bay and four rooms in the north wing are designated as payload office and equipment areas. Room 133 is the high bay airlock. The facility is used for nonhazardous payload processing. See facility handbook, K-STSM-14.1.1, for detailed information.

Table 4-3. Space Shuttle Payload Integration Facilities and Orbiter Payload Bay Atmospheric Environment at KSC (7)

	Facilities					Orbiter Payload Bay					
	O&C Bldg	SSPF & VPF	Canister	OPF (2)	PCR	Orb. Transfer to VAB (3)	VAB (5)	Transfer to Pad (5)	Pad (4 & 5) Air	Pad (4 & 5) GN_2(6)	Landing Site (4) & (5)
Temperature °C (°F)	21.7 ± 3.3 (71 ± 6°)	21.7 ± 3.3 (71 ± 6°)	21.6 ± 2.8 (71 ± 5°)	21.1 ± 2.8 (70 ± 5°)	21.1 ± 2.8 (70 ± 5°)	Uncontrolled	18.3° to 29° (65° to 85°) (8)	18.3° to 29° (65° to 85°) (8)	7° to 37.8° (45° to 100°) (8)	7° to 37.8° (45° to 100°) (8)	7° to 37.8° (45° to 100°) (8)
Moisture	30% to 50% RH	30% to 50% RH	30% to 50% RH	50% RH Max	50% RH Max		≤44 GR/LB DA (0 to 42% RH)	≤44 GR/LB DA (0 to 42% RH)	≤29 GR/LB DA (0 to 42% RH)	≤1 GR/LB DGN_2 (0 to 42% RH)	≤44 GR/LB DA (0 to 42% RH)
Cleanliness - Particulate (1)	100K Test Stands 300K High & Low Bay	Facility air; HEPA filtered; class 100K, 5000 guaranteed at filter	Facility air; HEPA filtered; class 100K, 5000 guaranteed at filter	Facility air; HEPA filtered; class 100K, 5000 guaranteed at filter	Facility air; HEPA filtered; class 100K, 5000 guaranteed at filter			Air Supplied is HEPA Filtered; class 100K, 5000 guaranteed at filter Hydrocarbon - 15 PPM Maximum			
Cleanliness - Hydrocarbon	15 PPM Max	15 PPM Max	15 PPM Max	15 PPM Max	15 PPM Max						

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NOTES:
1. Not Clean Rooms in context of FED-STD-209
2. Workstand area conditions
3. No conditioning purge for approx 48 hours until connected to MLP ECS unit
4. No conditioning purge until approx 45 min after landing and for 30 min during transfer from MLP ECS to pad ECS
5. Temp values at T-0 umbilical I/F. Payload bay temp varies with climate. Temp can be controlled more closely if required (See note 8)
6. Payload bay purge changed from air to GN_2 30 min before cryogenic propellant loading thru launch and for 4 to 6 hours during orbiter fuel cell servicing
7. Contamination Control Plans
   A) KCI-HB-5340.1 Cargo Facility Contamination Control Implementation Plan
   B) K-STSM-14.2.1 KSC Facility Contamination Control Plan
   C) KVT-PL-0025 Shuttle Facility Contamination Control Plan
8. Payload bay inlet temperature capability is noted. The standard temperature is 65° F ± 5° F. Dedicated payloads may have received an agreement in the PIP to deviate from this standard towards one of the capability extremes.

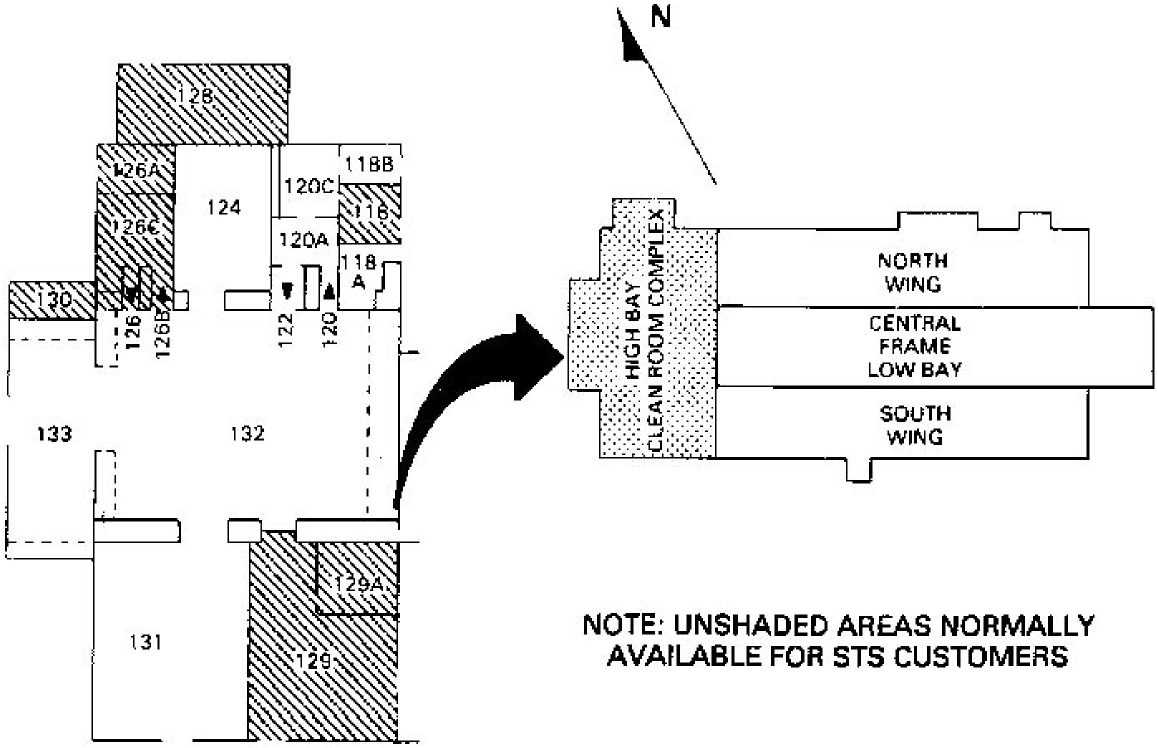
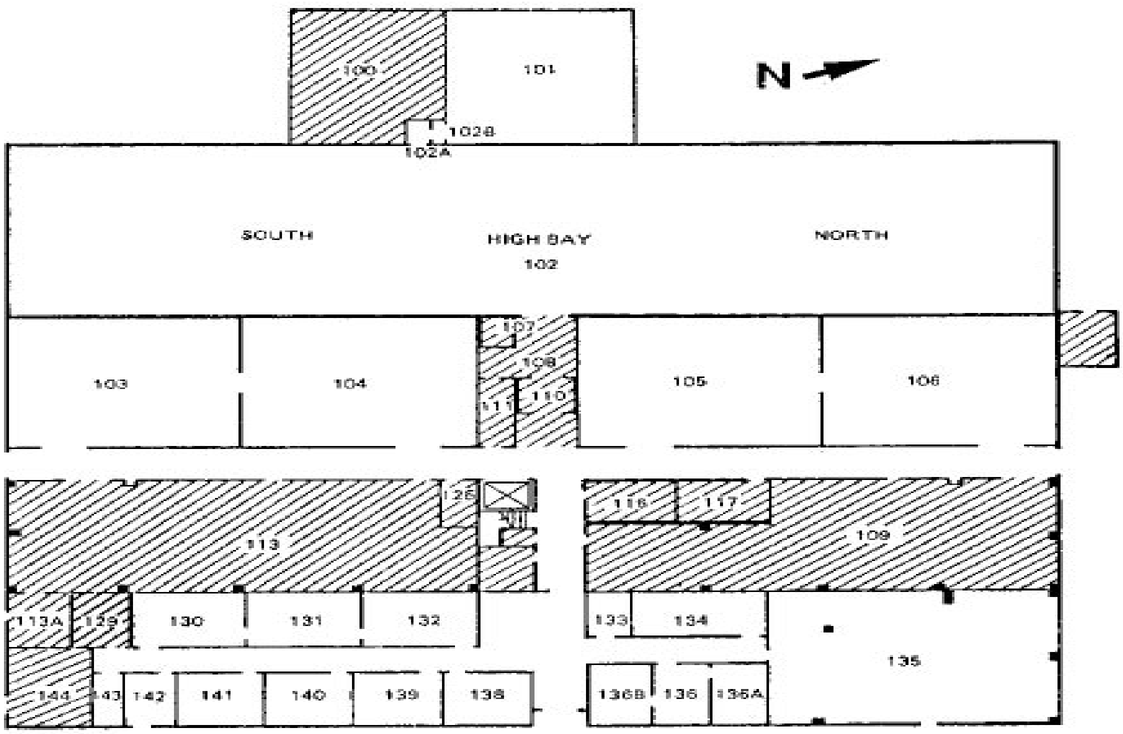


Figure 4-2. Building AE High Bay CWA Complex

4.4.2 BUILDING AO. The operational areas of Building AO consist of a Class 100,000 high bay CWA (room 102), and airlock (room 101), two systems test areas, one operations center, laboratories, storage areas, and offices for project personnel. Equipment in the airlock and high bay CWA can be handled with overhead cranes (a monorail crane in the airlock and one bridge crane in the high bay). The monorail crane and the bridge crane each have a 9.1 metric ton (10-ton) capacity. Two payload projects can be supported simultaneously. When supporting two projects, the high bay is functionally divided into two sections, north and south. No dividing partitions exist, however, in these areas (figure 4-3). Figure 4-4 shows the second floor of Building AO; unshaded portions are normally available for customers.

The biparting, sliding airlock doors are mechanically operated and pneumatically sealed. An emergency egress door is in the north wall.

Large equipment entering the high bay must transition through the airlock 7.6 m by 12.1 m (24 ft 11 in by 39 ft 9 in) east and west doors. Personnel and small equipment enter the CWA through a personnel air shower or an equipment air shower on the east side of the room. Personnel emergency egress doors are located in the center of the north and south walls. See facility handbook, K-STSM-14.1.2, for more information.



NOTE: UNSHADED AREAS NORMALLY AVAILABLE FOR CUSTOMERS

Figure 4-3. Building AO High Bay CWA, First Floor

Behind each high bay CWA area there are two rooms that can be used as control rooms to support testing of the payload. Customers must supply their own test equipment or GSE.

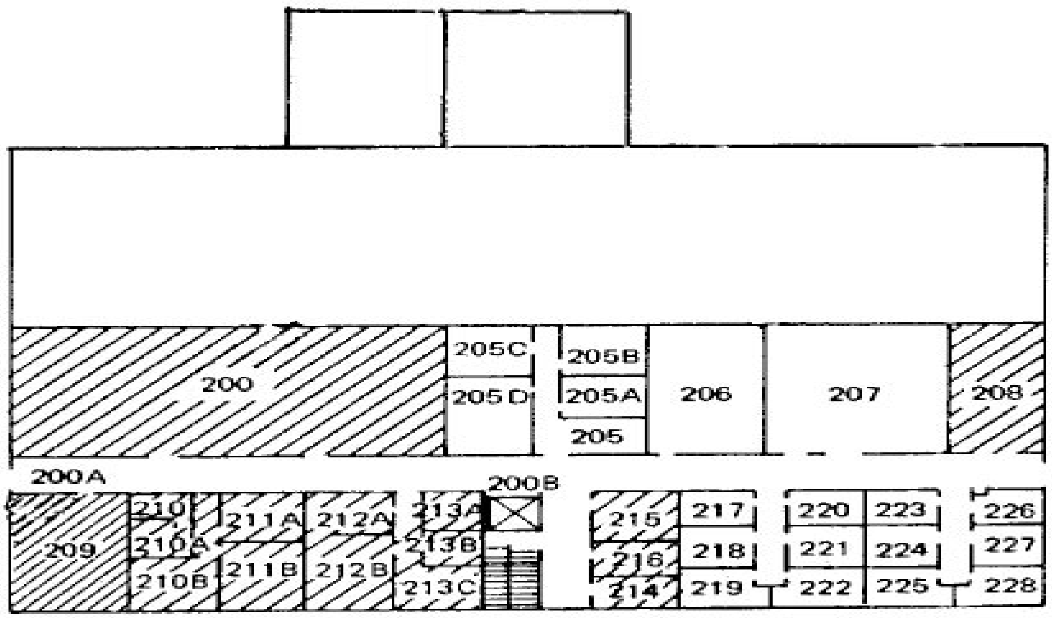


Figure 4-4. Building AO Second Floor

4.4.3 PSTF-R. The PSTF-R HPF (figure 4-5) has a Class 100,000 CWA work area called the service and maintenance area, 18.3 m (60 ft) wide by 41.2 m (135 ft) long with a ceiling height of 18.9 m (62 ft). This area contains an 18.2 metric ton (20-ton) crane with a hook height of 15.2 m (50 ft). Entrance into this service and maintenance area is through a door 8.5 m (28 ft) wide and 12.8 m (42 ft) high located on the east end of the building. Other support areas include a GSE storage/staging area and a component storage/staging area.

Provisions for the monopropellant servicing operations that will be conducted in this facility and made along the south side of the servicing and maintenance area. These provisions will include fuel drains and vents as well as aspirator, separator, fuel scrubber, exhaust fan, water deluge, and fire hose capabilities.

There will be a separate Hazardous Operations Support Building constructed as an extension to the north end of the present PHSF Facility Control Building which will contain office space, the facility control room, and other support space. Refer to facility handbook, K-STSM-14.1.16.

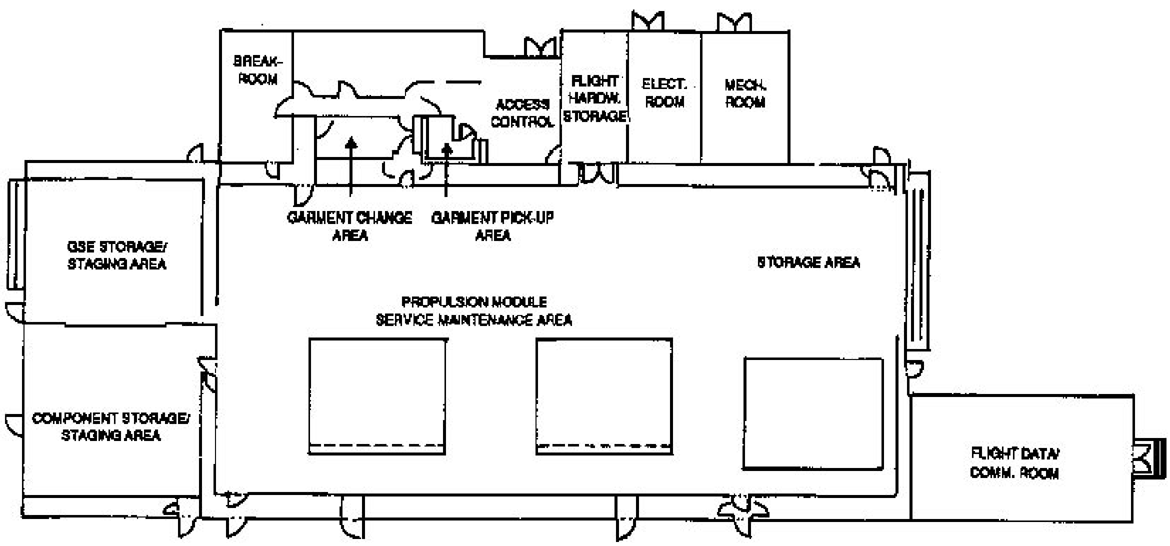


Figure 4-5. PSTF-R Floor Plan

4.4.4 SAEF-2. The SAEF-2 facility (figure 4-6) is used for assembly, test and checkout, ordnance installation, fueling, and encapsulation of payloads. It contains approximately 1556.1 m² (16,750 ft²) of usable floor space.

Functionally, the building is divided into the following areas: a CWA complex consisting of an airlock, a high bay, and two low bays; a test cell; a sterilization oven (non-operational); support office areas; and mechanical equipment rooms.

Large equipment enters the airlock (room 101), which is rated as a Class 300,000 CWA, through the vertical-lift exterior equipment door 6.5 m by 12.2 m (21 ft 5 in by 40 ft). The airlock has a usable floor area of 221 m² (2378 ft²) serviced by a 9.1 metric ton (10-ton) crane.

Equipment enters the SAEF-2 high bay (room 102), rated as a Class 100,000 CWA, through the 6.4 m by 12.0 m (21 ft by 39 ft 5 in) horizontal sliding door separating the high bay CWA work area from the airlock.

The high bay has a usable floor area of 451 m² (4851 ft²) and contains a 18.2 metric ton (20-ton) bridge crane.

Two low bay areas are part of room 102 and are located along the west side of the high bay. These areas have a combined usable floor area of 174.8 m² (1881 ft²).

The test cell (room 118) is located at the northeast corner of the facility and has a usable floor area of 127.2 m² (1369 ft²). Access to the test cell is through the personnel doors and three 6.7 m by 12.2 m (22 ft by 40 ft) vertical lift doors. The test cell is a clean working area. The test cell is also serviced by a 9.1 metric ton (10-ton) crane.

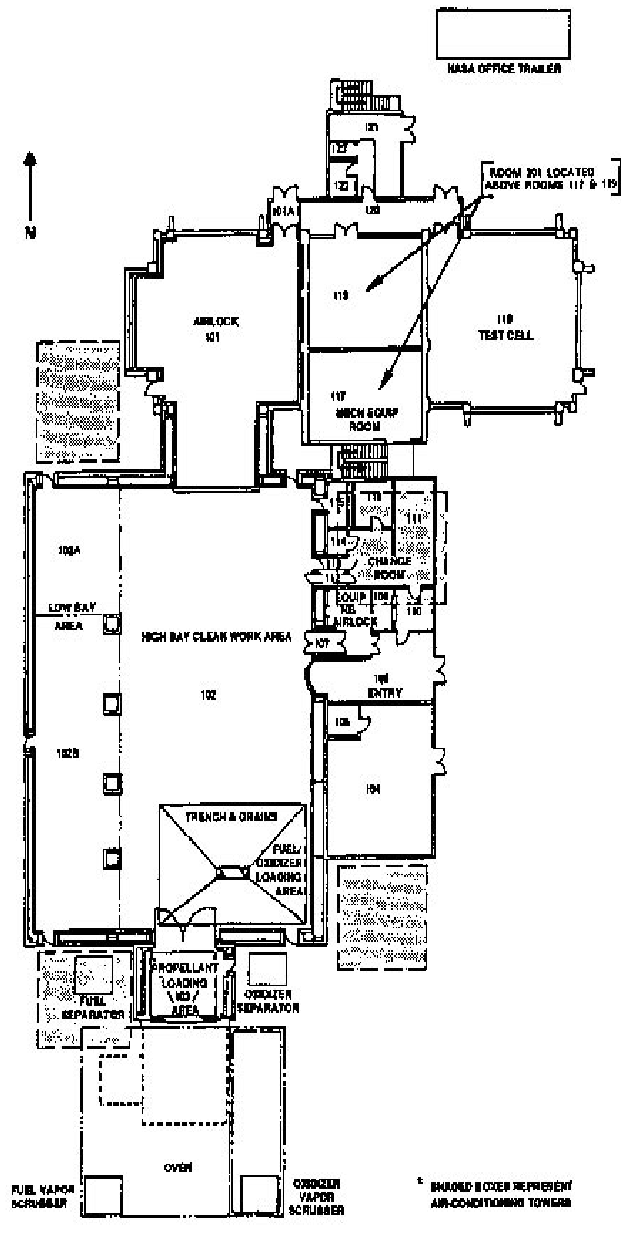


Figure 4-6. SAEF-2 Floor Plan

There are two 9.1 m by 10.9 m (30 ft by 36 ft) remote payload control rooms for the SAEF-2 located north of the facility. These two rooms allow simultaneous testing and processing of two payloads: one in the SAEF-2 and one in another location. Two-way communication exists between these control rooms and the PPF's on CCAS, the VPF, the PHSF service bay, the O&C, and the launch pads.

A spin balance machine has been installed in the high bay near the east wall, adding the capability to spin balance various payloads in SAEF-2.

The sterilization oven (nonoperational) located at the south end of the facility is housed in a 13.1 m (43 ft) wide by 16.2 m (53 ft) long open-ended shed. Ceiling height in the oven area is 4.9 m (16 ft). This area can be used for storage. Fuel and oxidizer scrubbers and liquid separators are installed in the south end of the shed. Two emergency spill containment tanks are located east of the building. Refer to facility handbook, K-STSM-14.1.7.

4.4.5 PHSF. The PHSF (figure 4-7) is designed for use as a PPF and as an HPF. It is capable of supporting assembly and testing of payload components and systems and can also be used for the installation of solid rocket motors, ordnance, and hazardous propellant servicing.

The PHSF has a Class 100,000 CWA service bay 18.4 m by 32.6 m (60 ft 4 in by 107 ft). The airlock is 15.3 m by 25.9 m (50 ft 4 in by 85 ft). This is a total of 997.1 m^2 (10,753 ft^2) of air-conditioned area. Small equipment and personnel enter through the equipment and personnel airlocks. The service bay has two 45.4 metric ton (50-ton) running bridge cranes with 24.3 m (80 ft) hook heights. Access doors for large spacecraft entry (both airlock and service bay) are 10.8 m by 22.9 m (35 ft 5 in by 75 ft). The airlock has a 13.6 metric ton (15-ton) running bridge crane with a 22.9 m (75 ft) hook height.

The west end of the service bay has a 6.1 m by 12.2 m (20 ft by 40 ft) sloped floor area for propellant servicing. The facility is also furnished with an emergency exhaust system and a fire protection system consisting of a water deluge and fire hoses. Fuel and oxidizer drains and vents are equipped with aspirators, separators, scrubbers, and emergency spill containment tanks. Fuel and oxidizer service areas are also located on site.

There is a separate Facility Control Building on the PHSF site which contains two payload control rooms. These two rooms allow simultaneous testing and processing of two payloads: one in the PHSF and one in another location. Two-way communication exists between the control rooms and the PPF's on CCAS, the VPF, the PHSF service bay, the O&C, and the launch pads.

PHSF environment is maintained at 21.7 ± 3.3 °C (71 ± 6 °F) with a relative humidity of 30 to 50 percent.

Customers provide their own specialized checkout equipment and access stands for their payloads.

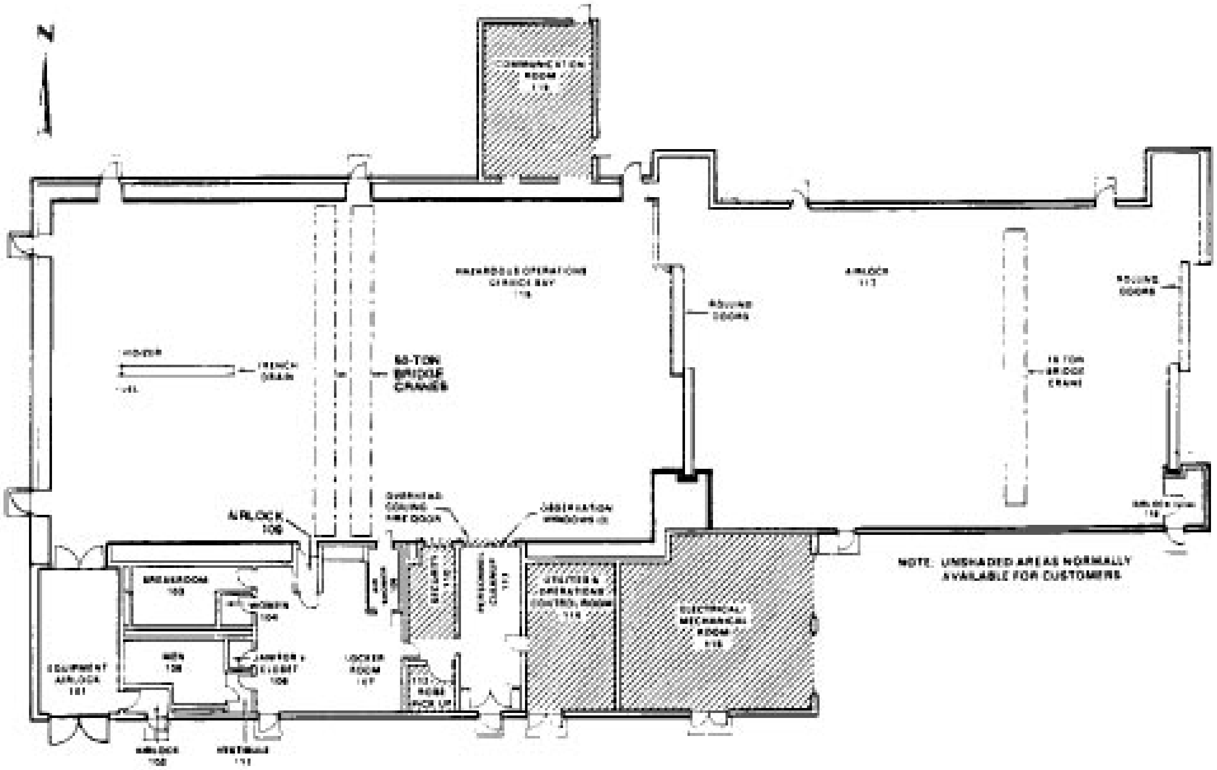


Figure 4-7. PHSF Floor Plan

4.4.6 RTG-F. The RTG-F, shown in figure 4-8, provides for the storage, testing, and monitoring of radioisotope thermoelectric generators (RTG's) used in payload programs. Consistent with the hazardous nature of the operations conducted in this facility, it is remotely located from the main KSC Industrial Area and is surrounded by an 2.4 m (8 ft) high chain link and barbed tape obstacle fence.

Construction is of poured, reinforced concrete framing with masonry block walls; the floor is poured, conductive concrete covered with a vinyl asbestos tile. In the event of an explosion, blowout roof and frangible wall sections provide overpressure relief to minimize damage to the storage area.

GAS Payloads are processed in the RTG-F. Since they cannot be processed as a standard payload and do not require a CITE test, they are assembled in the RTG-F.

The building has a usable floor space of 238 m² (2562 ft²) in the storage area. There are three smaller storage rooms on the east end of the storage area. Room 103 has access from the storage area. Room 104 has access from room 103 and from the outside. Room 102 is 2.9 m by 3.1 m (9 ft 6 in by 10 ft) or 8.8 m² (95 ft²) and is accessible from the outside only. Access to the storage area, room 101, is by means of an overhead door. Room 101 has two 4.5 metric ton (5-ton) electrically-operated, trolley-type hoists mounted on a single bridge. See facility handbook, K-STSM-14.1.8, for more information.

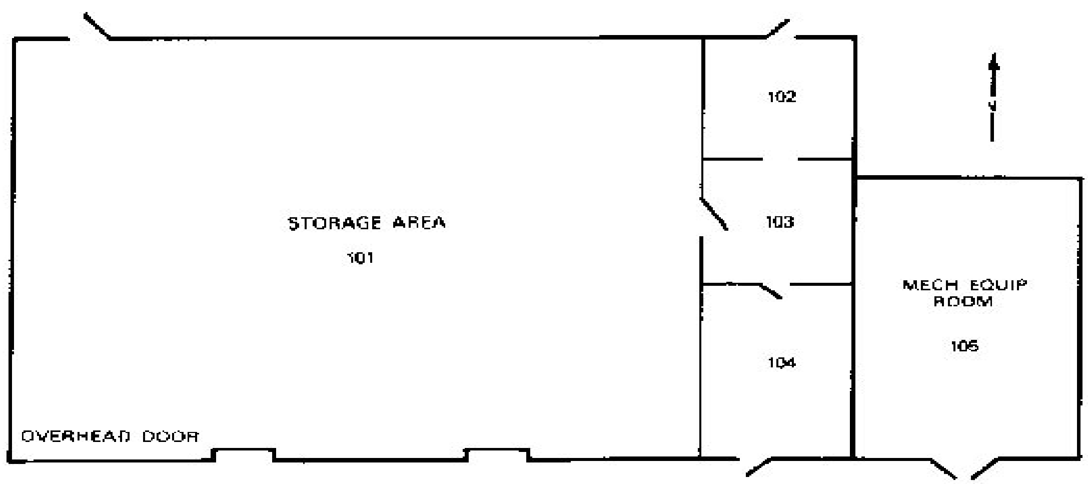


Figure 4-8. RTG-F Floor Plan

4.4.7 LSSF. The LSSF (Hangar L) is a concrete block, steel frame building with two 2-story "lean-to" structures connected at the sides (north and south sides of the facility). See figure 4-9. Overall dimensions of the building are 51.8 m by 56.1 m (170 ft by 184 ft). The facility and parking area are enclosed by a fence. The building supports non-human life science experiments processing. Use of this building is scheduled through the designated LSSM in conjunction with the KSC Life Science Mission Manager.

The LSSF can accommodate numerous principal investigators (PI's). Holding facilities are available for small mammals, plants, fish, and amphibians. Facilities for manipulation of micro-organisms, cells, and tissues are also available. Many of these specimens will be involved in preflight conditioning and selection processes with the remainder required for synchronous ground control experiments and/or postflight analyses. The LSSF also contains laboratories, a shop, and areas for surgery, X-ray, data management, storage, synchronous ground control, and offices as well as providing expansion capabilities for overlapping missions. The experiments monitoring area is designed to support remote prelaunch and mission monitoring of flight experiments. Capabilities include shuttle downlink monitoring (video, audio, and data).
The central high bay area is divided approximately in half. The northern section

consists of laboratories, surgery, X-ray, supply, showers and lockers, receiving area, and cage washing and storage. The southern section consists of four laboratories, an electronics shop, a bonded storage area, and an enclosed high bay. Expansion of the LSSF included a second floor with additional laboratories and a controlled coldroom. At the southwest end of the central high bay is a biomass production chamber and support systems being used as a test bed for the Closed Ecological Life Support System (CELSS).

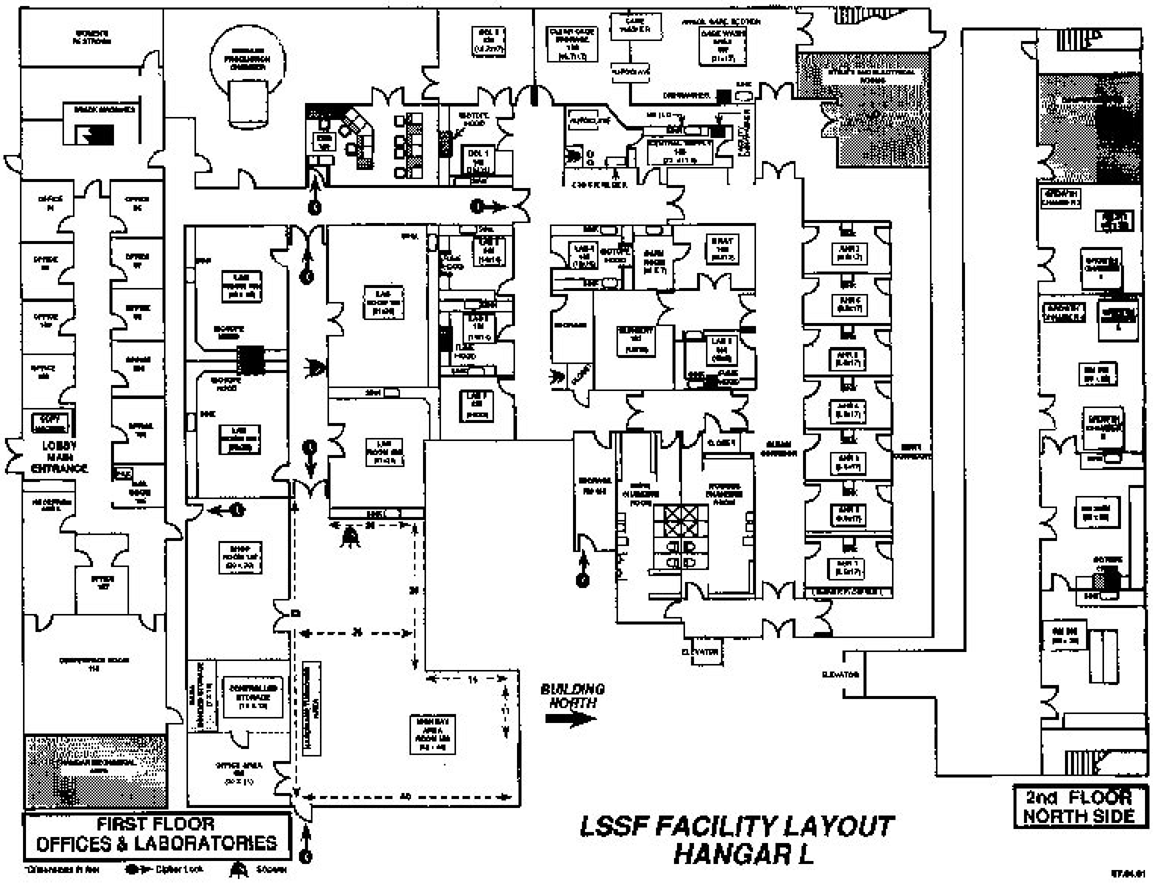


Figure 4-9. LSSF Floor Plan

An emergency power generator (northeast side) providing emergency power to some areas and an incinerator (rear) are outside the building. More information can be found in facility handbook, K-STSM-14.1.9 and SID 79K24867.

The facility just to the south of the LSSF, called Little L, provides 464.5 m² (5000 ft²) of non-air-conditioned secured storage, air-conditioned office space, and four plant growth chambers.

The LSSF Modular Building, located to the west of Hangar L, provides 278.7m² (3000 ft²) of office space for visiting PI's/customers.

4.4.8 O&C BUILDING. The O&C is used as the horizontal processing facility for most pallet-type, Spacelab module payloads, MPESS and some middeck stowed experiments. These payloads are processed through experiment-to-pallet/flight floor, pallet/module-to-complete payload, and payload-to-simulated orbiter integration and deintegration. The main payload processing area in the O&C is the bay area. See figure 4-10. The bay area contains workstands with mechanical and electrical services to support payload processing. Other payload support areas in the facility are laboratories, control and monitor areas, and shops. Rooms are also available to customers for processing their experiments. A two-level CWA 11.2 m by 11.2 m by 11.6 m (36 ft 8 in by 36 ft 10 in by 38 ft high) located at the west end of the bay area can be maintained in accordance with Class 50,000 CWA conditions and can also be maintained in accordance with a Class 10,000 CWA if stringent controls are adhered to as specified in KCI-HB-5340.1. This CWA is serviced by a 4.5 metric ton (5-ton) bridge crane.

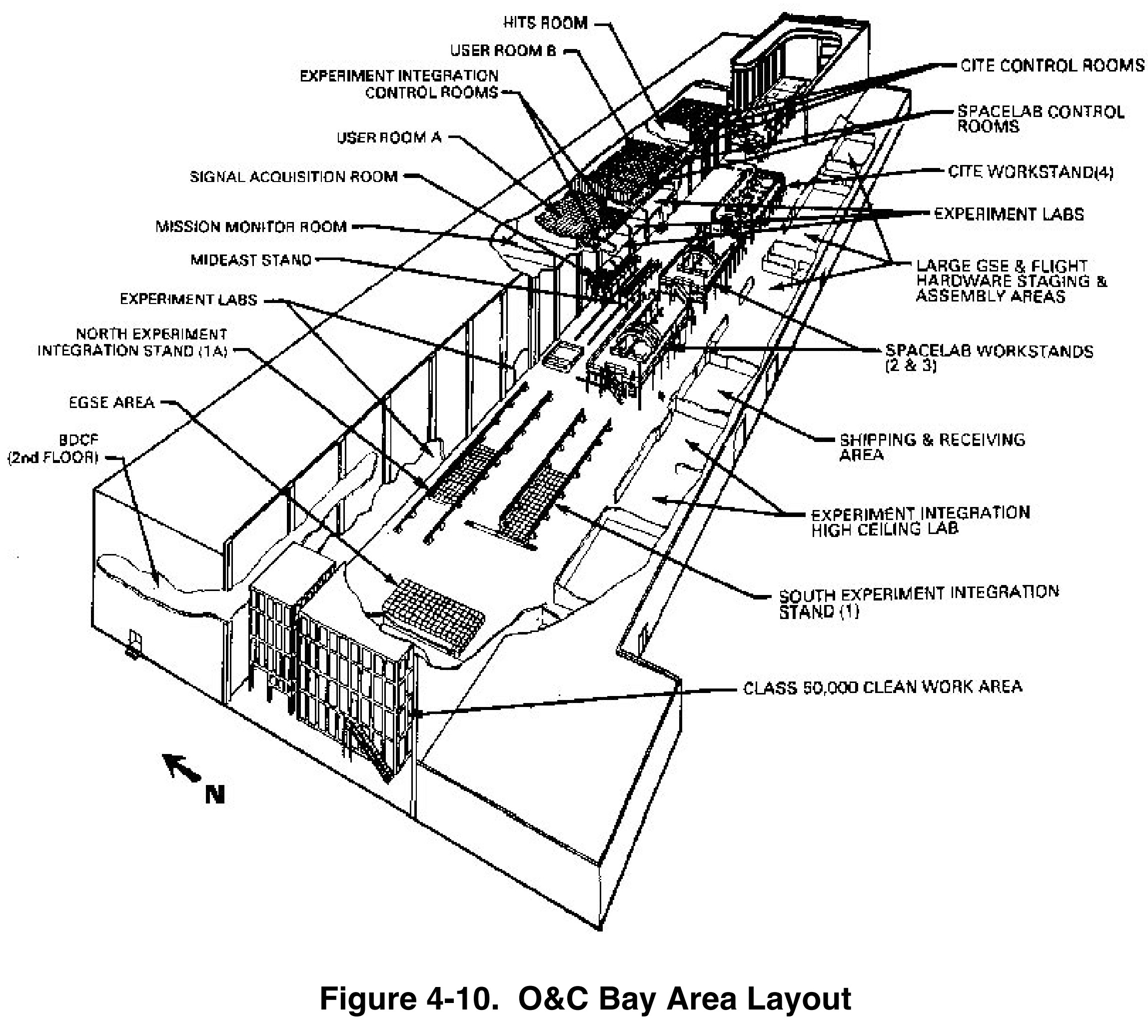


Figure 4-10. O&C Bay Area Layout

Equipment enters the bay area through the east 12.2 m (40 ft) wide, 24.4 m (80 ft) high vertical-lift doors or through the shipping and receiving area, room 1469. Personnel enter the bay area on the north side from the first floor corridor near workstands 1, 1A, and 4 through doors A1 and C7. Personnel may enter between workstands 3 and 4 (door D-14) on the south side of the bay area. Emergency egress doors are on the south and north sides of the bay area and on the east vertical-lift door.

The bay area is serviced by three 24.9 metric ton (27.5-ton) bridge cranes, two of which can traverse all of the high and low bay area of approximately 4575.3 m² (49,250 ft²).

Rooms 2293 through 2299, second floor, west side are designated as the BDCF. This 427.5 m² (4600 ft²) area is used to conduct ground-based tests equivalent to the in-flight protocols for non-invasive human life sciences flight experiments. The BDCF is located beneath the crew quarters for ease of access and proximity. Data are collected before, during, and after flight, if required.

The O&C contains GSE available for use by the customer. Facility handbook, K-STSM-14.1.14, provides details of this GSE. SID 79K16211 contains the standardized interfaces for the O&C-to-payload and payload GSE.

4.4.9 SSPF. The SSPF is be used as the dedicated facility for Space Station Alpha payload and flight element processing. The main processing areas in the SSPF will be the intermediate bay and the high bay (see figure 4-11).

The intermediate bay will be the main experiment processing area and will also contain the rack test and rack processing areas. Experiments will be brought into the intermediate bay where they will be processed by the PGOC for integration into racks which will be integrated into flight elements. This bay contains two 4.5 metric ton (5-ton) bridge cranes, with a hook height of 7.62 m (25 ft).

The high bay, contains two cab-operated 27.2 metric ton (30-ton) bridge cranes with hook heights of 15.3 m (50 ft).It also contains the flight element footprint area where the flight elements will be processed for launch and where the racks will be integrated into the flight elements and the flight elements integrated into the launch package.

The intermediate bay will be 15.3 m (50 ft) wide by 102.8 m (337 ft 5 in) long with a ceiling height of 9.1 m (30 ft) over the experiment processing and rack test areas and a 4.6 m (15 ft) ceiling over the rack processing area.

The high bay will be 24.7 m (79 ft 5 in) wide by 110.6 m (363 ft) long with a ceiling height of 18.6 m (61 ft 6 in). Air bearing pallets and casters will be used to move flight elements in the bay.

Flight elements will enter the high bay through an airlock located at the west end of the SSPF. The airlock will be 14 m (46 ft) wide by 32.9 m (108 ft) long with a ceiling height of 18.6 m (61 ft 6 in) and is equipped with a 14.7 metric ton (15-ton) bridge crane, whose hook height is 15.3m (50 ft).

The intermediate bay, the high bay, and the airlock will be classified as level 4 (Class 100,000) CWA's as specified in KCI-HB-5340.1.

Other support areas in the facility will include laboratories, control and monitor areas, and shops. Facility handbook, K-STSM-14.1.16 and SID 82K00760 will provide more detailed information and the standardized interfaces for this facility.

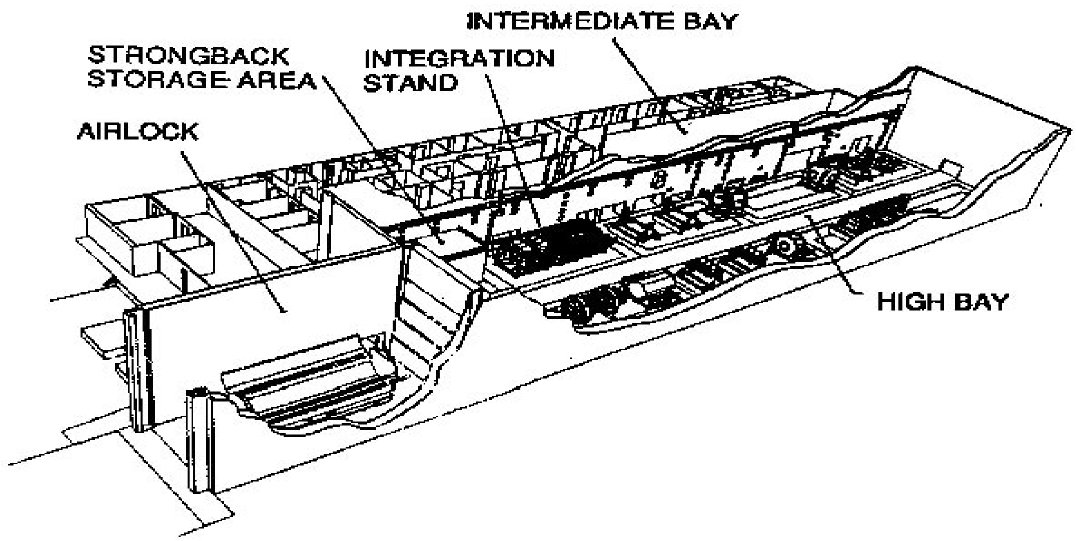


Figure 4-11. SSPF Bay Area Layout

4.4.10 OPF. The OPF's are located west of and adjacent to the VAB. One facility consists of two large high bay areas, each capable of processing an orbiter, a low bay area, and a service and support annex. The other facility consists of a high bay area, capable of processing an orbiter, and a low bay area. The OPF contains workstands that completely surround the orbiter for servicing. These stands and telescoping buckets attached to overhead bridges provide access to the orbiter's payload bay. The OPF is used for payload integration into the orbiter and for final checkout of all horizontally processed payloads. It is also used to remove payloads and flight kits after each mission or in any abort situation (see figure 4-12).

Equipment enters the OPF high bays (dual facility) on the north side through the north orbiter entrance doors 28.4 m (93 ft 4 in) wide by 10.7 m (35 ft) high and on the south side through the 9.1 m by 9.1 m (30 ft by 30 ft) doors (transporter-canister access) or the 3.7 m by 3.7 m (12 ft by 12 ft) roll-up doors. Entry to high bays from the low bay is through 3.1 m (10 ft) high, 3.7 m and 4.9 m (12 ft and 16 ft) wide doors. Equipment enters the single facility high bay on the south side through the south orbiter entrance doors 28.4 m (93 ft 4 in) wide by 10.7 m (35 ft) high and on the north side through the

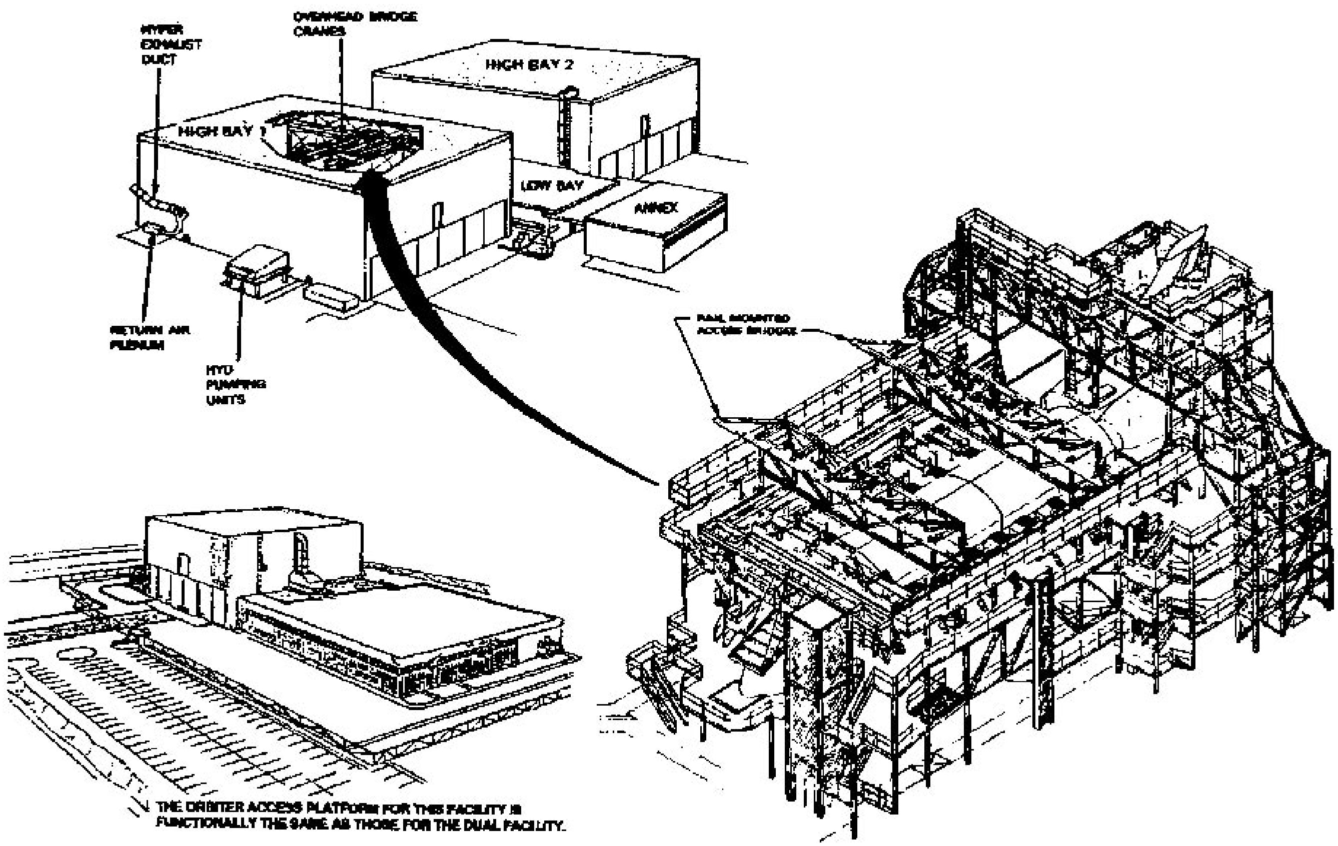


Figure 4-12. OPF Showing Orbiter Access Platform

9.1 m by 9.1 m (30 ft by 30 ft) door (for transporter-canister access) or the 3.7 m by 3.7 m (12 ft by 12 ft) roll-up door. Entry to the high bay from the low bay is through a 3.1 m (10 ft) high, 3.7 m and 4.9 m (12 ft and 16 ft) wide door.

Each of the three high bays contains two 27.2 metric ton (30-ton) overhead bridge cranes. Normally, only orbiter hazardous operations are conducted in the OPF. Refer to SID 79K18745 and facility handbook, K-STSM-14.1.13, for more information on this facility.

4.4.11 RSS/PCR. The RSS (figure 4-13) is the movable, gantry-like structure located on the launch pad. The PCR is part of the RSS and functions as an airlock by maintaining the controlled environment required when payloads are inserted into or removed from the orbiter.

The payload elements are placed in the PCR using the payload canister and PGHM. After the MLP has been positioned on the launch pad, the RSS is rotated to mate the PCR with the orbiter. The mating surfaces and the area between the PCR and orbiter are purged with clean air to preserve the controlled environment during installation and removal of the payloads from the orbiter. Facility handbook K-STSM-14.1.10 and SID's 79K18218 and 79K28802 provide more information concerning payload interfaces and differences between the RSS/PCR at Pads 39A and 39B.

Personnel and small GSE will enter the PCR from the 39.6 m (130 ft) level on Pad A or from the 41.1 m (135 ft) level on Pad B of the RSS by a 1.1 m (3 ft 6 in) wide walkway from the Fixed Service Structure (FSS). See figure 4-14.

Larger equipment can be hoisted by a monorail crane from the ground level of the pad to the 39.6 m - Pad A (130 ft) or 41.1 m - Pad B (135 ft) level of the RSS. Equipment must then be rolled through the equipment airlock into the PCR. The airlock is 3.2 m (10 ft 6 in) wide, 3.7 m (12 ft) high, and 3.9 m (13 ft) deep. See figure 4-14 for a plan view of the PCR airlock at the 39.6 m (130 ft) level. An elevator inside the PCR provides access to each fixed level of the CWA.

When the PGHM is retracted, access to the payloads is from the PCR fixed platforms, the PGHM platform, and the PCR extendible access platforms.

Access to payloads in the orbiter is from the PGHM fixed and retractable platforms. Each fixed level of the PGHM platform has a retractable platform nested directly under it. The retractable platforms consist of three independent "diving board' platforms. Each section can be extended separately to conform to the payload perimeter outline.

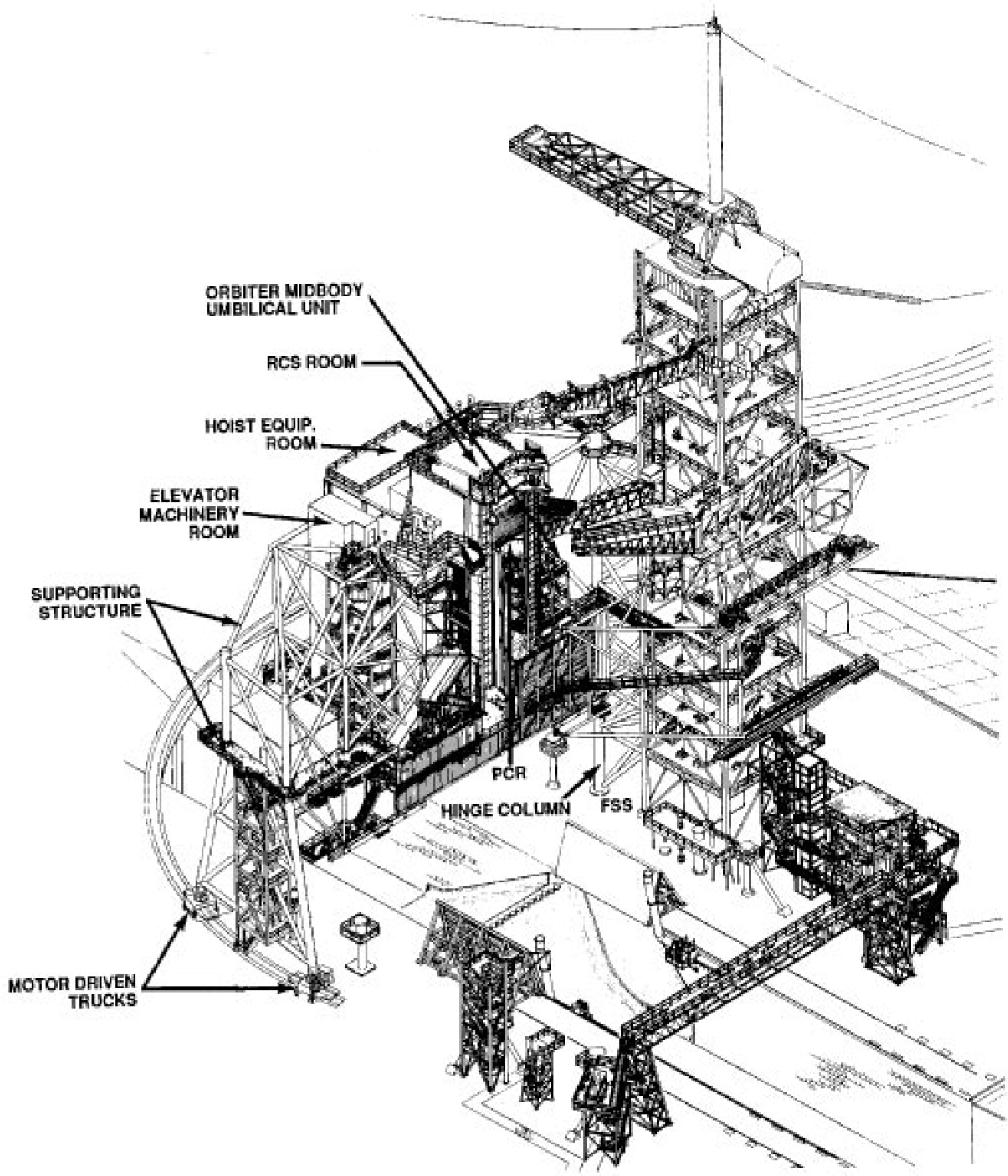


Figure 4-13. Major Features of RSS

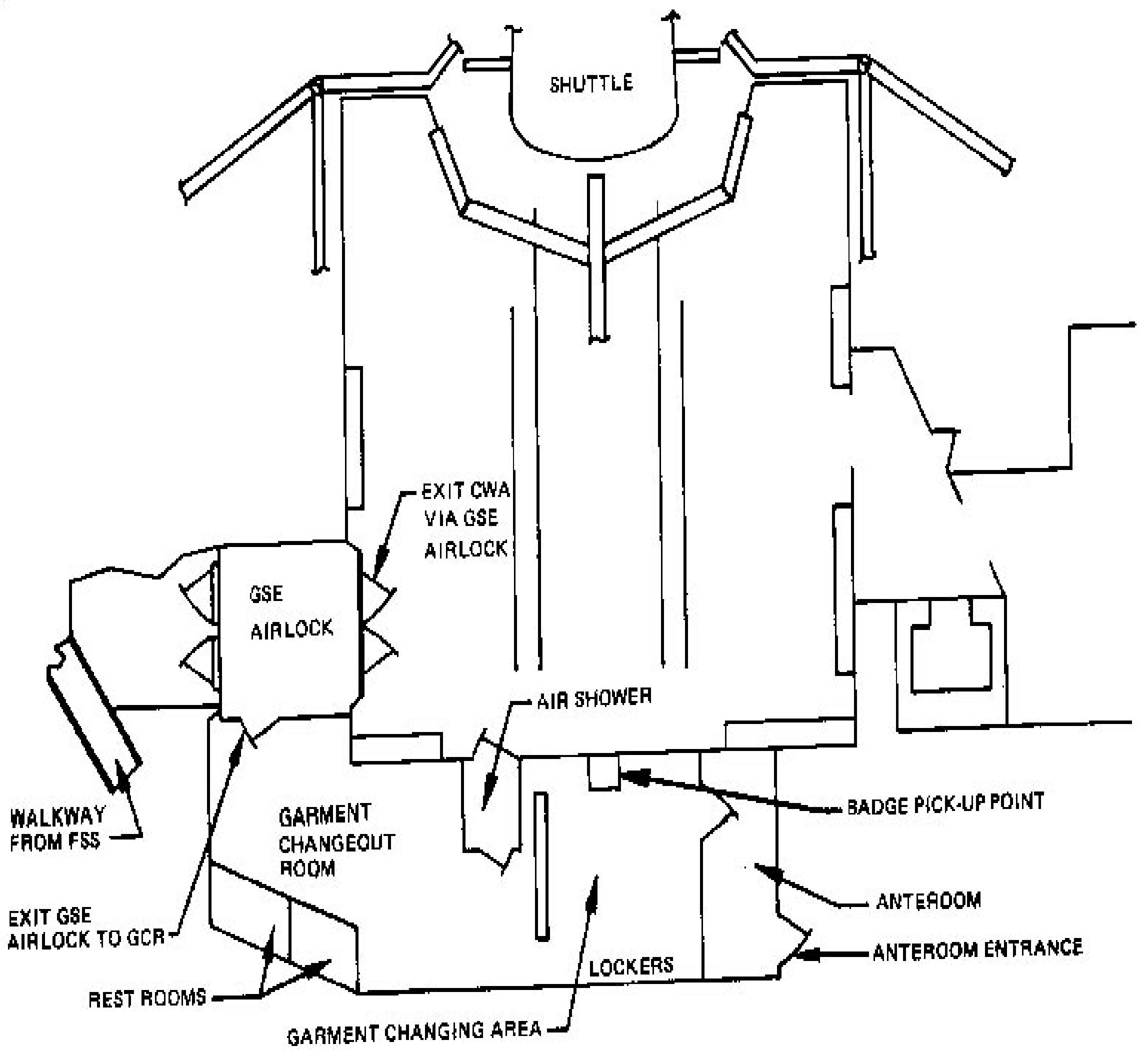


Figure 4-14. Plan View of PCR Main Floor

4.4.12 VPF. The VPF (figure 4-15) is designed to accommodate all vertically processed payloads through payload integration. Figure 4-15 shows the orientation of the facility equipment in the VPF. Refer to SID 79K16210 for more detailed information concerning payload interfaces in the VPF and to facility handbook, K-STSM-14.1.12, for more detailed payload support.

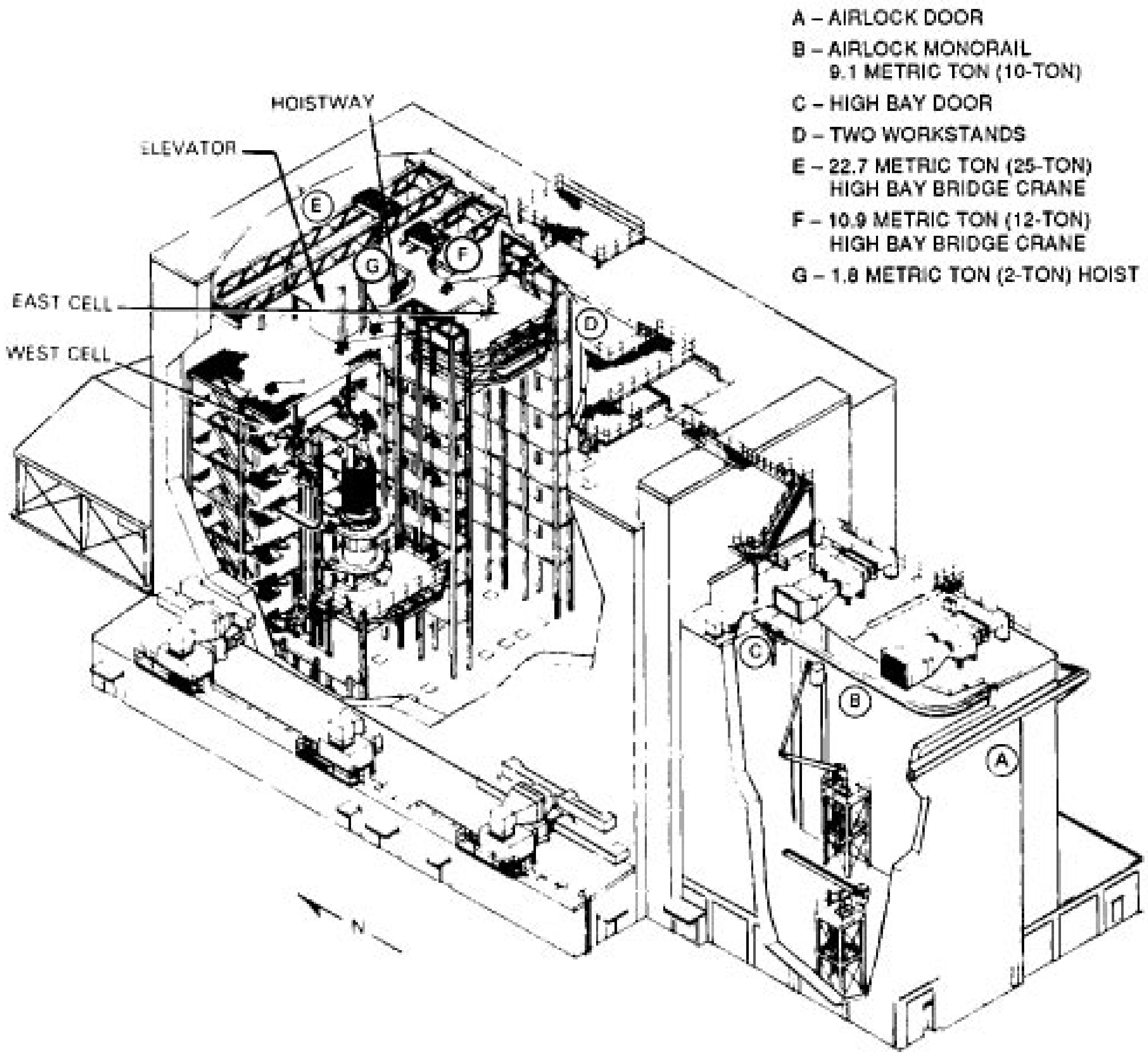


Figure 4-15. VPF Features

The VPF consists of an environmentally controlled Class 100,000 CWA high bay, an airlock and single-story support structures attached to the sides of the high bay. Equipment enters the airlock through a 7.55 m (24 ft 9 in) wide, 21.66 m (71 ft 1/8 in) high door. The door from the airlock into the high bay is 11.6 m (38 ft) wide by 21.7 m

(71 ft 4 1/2 in) high. Two payload workstand structures with six fixed platforms provide access to the payload in the high bay. The payloads are supported in the workstands by the VPHD. In addition, six interchangeable elevating platforms can be adjusted through the entire height of the workstand. A freight elevator and two sets of stairs provide access to each workstand level. A 22.7 metric ton (25-ton) and a 10.9 metric ton (12-ton) bridge crane can be tied together with an equalizing beam for a 31.8 metric ton (35 ton) lift capability in the high bay; one 9.1 metric ton (10-ton) monorail crane is located in the airlock. A 1.8 metric ton (2-ton) hoist services the six fixed platform levels.

The Operations Support Building (OSB), providing a total area approximately 464.5 m^2 (5000 ft^2), is located on the east side of the southeast parking lot. The building provides space for minor electrical or mechanical staging work activities and office space for KSC employees. Payload customers will be assigned temporary office space in two office trailers adjacent to the OSB while their payload is in flow.

4.4.13 PAYLOAD MANAGEMENT SUPPORT AREAS. The Payload Management Support Area in the LCC is located in Firing Room 2. Access to the LCC and the Payload Management Support Area is controlled by special badging.

The Payload Management Support Area acts as a buffer between the prime Firing Room and the outside world and provides an area for technical support to system engineers in the prime Firing Room. Payload Management Support Area personnel can work with offsite personnel to obtain information while system engineers at prime Firing Room consoles continue to monitor and test other parts of the system.

The area contains consoles equipped with displays and keyboards for monitoring vehicle and ground equipment parameters as part of the LPS through the Checkout, Control, and Monitor Subsystem (CCMS). The consoles are the main man-machine interface during test, checkout, and launch operations.

The area is manned by NASA and contractor payload personnel and specialized vendor representatives (payload customers) as test activity dictates. Voice communications are conducted through the Operational Intercommunications System (OIS).

A similar Payload Management Support Area is provided in Rooms 3233 and 3237 of the O&C in support of CITE activities in progress at the O&C, the VPF, or the SSPF.

All off-site representatives assigned to the Payload Management Support Areas must coordinate visits through their respective LSSM's or payload test team leaders for badging access.

4.4.14 PAD ACCOMMODATIONS. There are two converted boxcars in the launch area that provide shared office space for NASA, contractor, and payload personnel. each boxcar can seat 11 people. Desks, chairs, file cabinets, bookcases, and telephones are contained in each car. There is one OIS unit with four jacks in each boxcar to provide communication with personnel on the RSS.

4.5 LAUNCH SITE MULTI-USE MISSION PAYLOAD SUPPORT EQUIPMENT (MMPSE)

The MMPSE is GSE that is available to accommodate certain standard payload or experiment requirements. This equipment is intended to support payload requirements for transportation, environmental control, interface verification testing, end-to-end functional testing, and installation of the payload into the orbiter (see table 4-4). It cannot be assumed that a particular piece of MMPSE can be used to support a specific payload requirement without first checking with the LSSM. Individual payload MMPSE usage requirements should be submitted to the LSSM.

4.5.1 PAYLOAD STRONGBACK. This horizontal payload handling fixture is a truss-type structure fabricated from steel pipe and channel (figure 4-16) and must be suspended from two cranes during operations. It is equipped with attachment mechanisms that support the payload and a counterweight mechanism to compensate for varying payload centers of gravity in the Y_O direction. It carries payloads up to 4.6 m (15 ft) in diameter, 18.2 m (60 ft) in length, and 29,483 kg (65,000 lb) in weight. The payload strongback is designed so that engagement and load transfer at the trunnions can occur while the handling fixture is still attached. It does not induce any bending or twisting loads on any payload elements. Refer to SID 79K17644 for more information on the payload strongback.

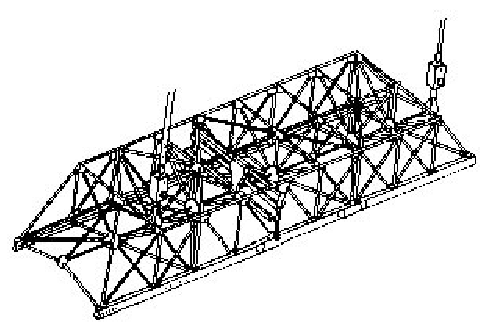


Figure 4-16. Payload Strongback

Table 4-4. MMPSE Capabilities

Capabilities / Support Equipment	Control: Manual	Control: Auto	Handling or Transportation	Pressurize	Servicing	Test or Checkout	Remarks
Payload Handling Fixture Strongback	X		X				
Payload Canister	X		X				2 Similarly Equipped
Payload Canister Transporter	X		X				2 Similarly Equipped
Canister Environmental Control Subsystem (ECS)	X	X	X	X		X	Class 5000 Clean Air Provided to Canister
Canister Fluid and Gas Subsystem (F&GS)	X		X	X	X	X	GHe and GN_2
Canister Electrical Power Subsystem (EPS)	X	X	X		X	X	
Canister Instrumentation and Communication Subsystem (I&CS)	X	X	X		X	X	
Payload Canister Access Equipment	X		X		X		

4.5.2 PAYLOAD CANISTER. Two payload canisters are available at KSC (figure 4-17); each is 19.8 m (65 ft) long, 5.5 m (18 ft) wide, and 5.7 m (18 ft 7 in) high, and is capable of holding horizontally or vertically processed payloads up to 4.6 m (15 ft) in diameter, 18.3 m (60 ft) long, and 29,483 kg (65,000 lb) in weight. Payload trunnion latches support the payload in the same manner as in the orbiter, either in a horizontal or vertical mode. Longitudinal access doors at the top of the canister operate similarly to the orbiter doors and with the same allowable envelopes and clearances. Personnel access doors and ladders are provided as well as service panels, liftpoints, and RSS guides.

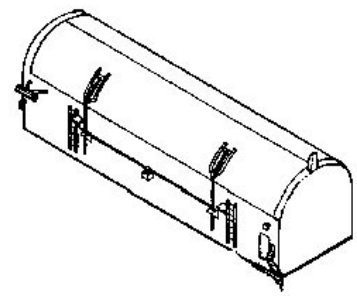


Figure 4-17. Payload Canister

The canister interfaces with and transfers payloads from the O&C into the orbiter at the OPF for horizontal processing, and at the VPF and the RSS/PCR at the pad for vertical processing. For vertical processing, the canister, either loaded or unloaded, is rotated from the horizontal to vertical configuration. The multi-use mission support equipment (MMSE) subsystems mounted on the canister transporter provide the payload with certain ranges of ECS, fluids and gases (F&G), electrical power (EP), and instrumentation and communication (I&C). Refer to SID 79K12170 for a more detailed description of the payload canisters.

Ground transportation loads associated with transportation of payloads in the payload canister will vary with the configuration of the payload and the route traveled. The maximum g-load experienced during testing at KSC has been 0.5g in the Xo direction. This load was recorded on the transporter during an unplanned shutdown. The canister was installed on the transporter horizontally at the time of the shutdown. Loads measured on payloads under normal operations range from unmeasurable to 0.3g with the largest loads usually occurring in the Xo direction.

Canisters can be rotated in the CRF to the appropriate position (horizontal or vertical) using the facility 90.7 metric ton (100-ton) bridge crane which also is outfitted with a 9.1 metric ton (10-ton) auxiliary crane. A canister can be rotated either empty or full (if the payload is non-hazardous).

This crane configuration has 27.4 m (90 ft) north-south travel and a 9.1 m (30 ft) east-west travel. Crane hook heights are 35.4 m (116 ft) for the 90.7 metric ton (100-ton) crane and 35.7 m (117 ft) for the 9.1 metric ton (10-ton) crane.

4.5.3 PAYLOAD CANISTER TRANSPORTER. The transporter (figure 4-18) is a 48-wheel prime mover that transports the canister in either a horizontal or vertical mode between facilities at KSC at up to 8.1 km/h (5 mi/h) loaded and up to 16.1 km/h (10 mi/h) unloaded. There are two transporters similarly equipped. One transporter is 19.8 m (65 ft) long, 7.1 m (23 ft) wide while the other is 20.6 m (67 1/2 ft) long by 6.1 m (20 ft) wide. The transporter bed is adjustable in height and angle, allowing a level payload condition during movement to and from the pad. The transporters are each outfitted with two 2-driver cabs and the primary MMSE subsystems - ECS, F&G Subsystem (F&GS), Electrical Power Subsystem (EPS), I & C Subsystem (I&CS).

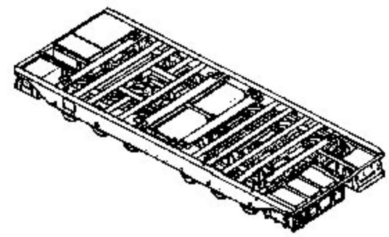


Figure 4-18. Transporter

4.5.3.1 Environmental Control Subsystem. The ECS is mounted in the front end of the transporter and is connected by flexible ducting to the canister. The ECS (figure 4-19) provides conditioned air to the payload in the canister.
The conditioned air specifications are:

a. 21.7 ± 3.3 °C (71 ± 6 °F)
b. 50% RH maximum
c. Class 100,000 clean
d. Hydrocarbon content of 15 ppm maximum of methane equivalent
e. 34.1 to 68.1 kg/min (75 to 150 lb/min) flow rate
f. 0 to 0.1 bar (0 to 0.5 gage in H_2O) static pressure
g. 85 dB (maximum) noise level

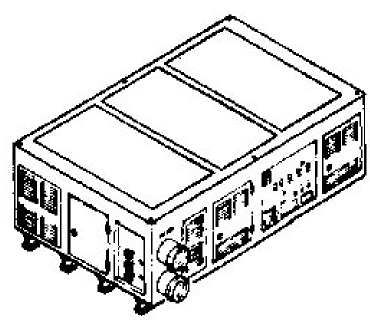


Figure 4-19. ECS Supply Module

4.5.3.2 Fluid and Gas Subsystem. The F&GS (figure 4-20) is mounted in the aft end of the transporter and interfaces with canister service panels. Made up primarily of K-bottles, a rack, and a panel, the F&GS can provide 2.1 bars (30 lb/in^2 gage) gaseous helium (GHe) and 2.1 bars (30 lb/in^2 gage) GN_2 to the payload interface panels in the canister.

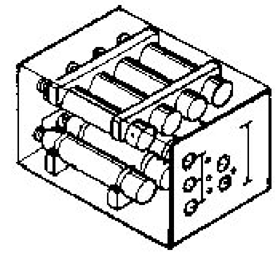


Figure 4-20. F&GS Supply Module

4.5.3.3 EPS. The EPS consists of two generator modules, panels, cables, and fire extinguishing systems. The generator modules (figure 4-21) are mounted in the central section of the transporter. The EPS provides 120-Vac, 1.8-kVA, single-phase power to the payload, as well as power to the ECS (480-Vac, 3-phase, 75-kVA) and I&CS (120/208-Vac, 3-phase, 20-kVA).

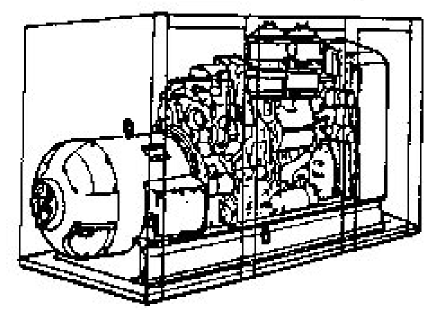


Figure 4-21. EPS Generators

4.5.3.4 Instrumentation and Communication Subsystem. The I&CS (figure 4-22) consists of various instruments, electronics, displays, and cables located primarily in (1) an I&CS cab mounted in the aft end of the transporter, (2) two electronic racks mounted in the forward end of the canister, and (3) sensors and detectors located at various points within the canister. The I&CS provides real-time displays and recording capability for canister environments, payload vibration and shocks, and monitors other subsystems and payload parameters. Limited space is available in the I&CS cab for a payload observer and installation of payload display, monitoring, and recording equipment.

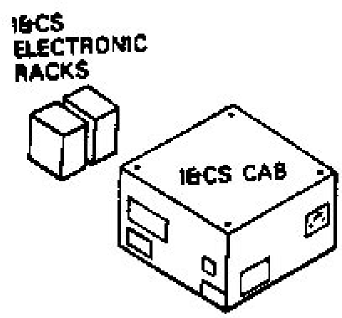


Figure 4-22. I&CS

4.5.3.5 Payload Canister Access Equipment. No requirements for specialized payload access equipment for use within the canister have been baselined. Certain access capabilities within the canister are provided by general purpose access equipment already existent at KSC. Additional or specialized access capabilities will use equipment procured off-the-shelf, or designed and developed for specific requirements.

4.5.4 PAYLOAD ENVIRONMENTAL TRANSPORTATION SYSTEM. The PETS is operated on-site only (KSC/CCAS) by KSC on behalf of NASA and payload customers. Use of the PETS is an optional service. The payload container is 6.2 m (20 ft 6 in) long by 3.8 m (12 ft 6 in) wide in the inside and can accommodate up to 10,705 kg (23,600 lb) or 23.6 kips. The height can vary between 3.5 m (11 ft 7 in) to 5.7 m (18 ft 8 in) inside with the spacer. It can maintain the interior environment at 21.7 ± 3.3 °C (71 ± 6 °F) and maximum 50 percent RH with class 100,000 cleanliness and purge gases can be provided. It contains a portable instrumentation system consisting of two four-accelerometer input recorders, two temperature/RH recorders, and two realtime remote monitor/alarm panels in the cab monitoring out-of-tolerance conditions for any of the recorders. Upon move completion, data analysis can be provided from recorded data. Customers must provide all other devices. See SID 82K00463 for detailed interfaces.

The PETS (figure 4-23) is designed to operate in any weather from -17.8 to 48.9 °C (0 to +120 °F) with up to 100 percent RH. Substandard performance may occur during other conditions. PETS is discussed in paragraph 5.2.6g from the transportation support view.

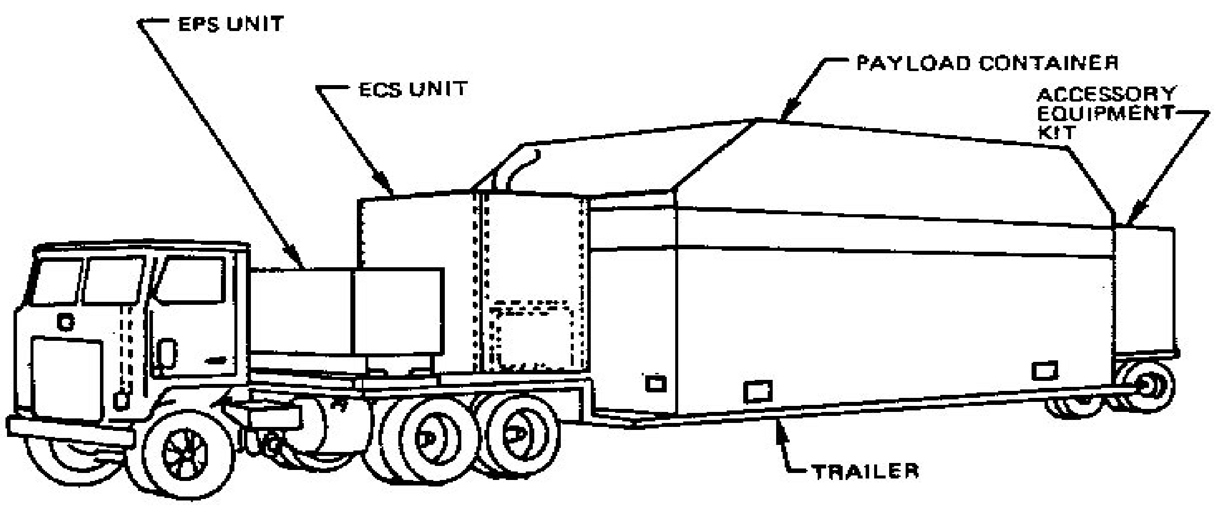


Figure 4-23. PETS

4.5.5 SPRD. The SPRD (figure 4-24) was designed primarily to rotate and install a single palletized payload. Use of the SPRD is an optional service. Payload weight is limited to 4536 kg (10,000 lbs) and the maximum payload length is limited to 3.96 m (13 ft). A secondary purpose of the SPRD is the horizontal transportation of payloads. The SPRD reduces the need for rotating payloads in the canister for mixed vertical payload missions and provides additional capability to move payload elements between facilities. The SPRD may be used as a special ground handling fixture for unplanned work or contingency operations and may be used for post-mission deintegration where partial pallet disassembly is required prior to return to the customer.

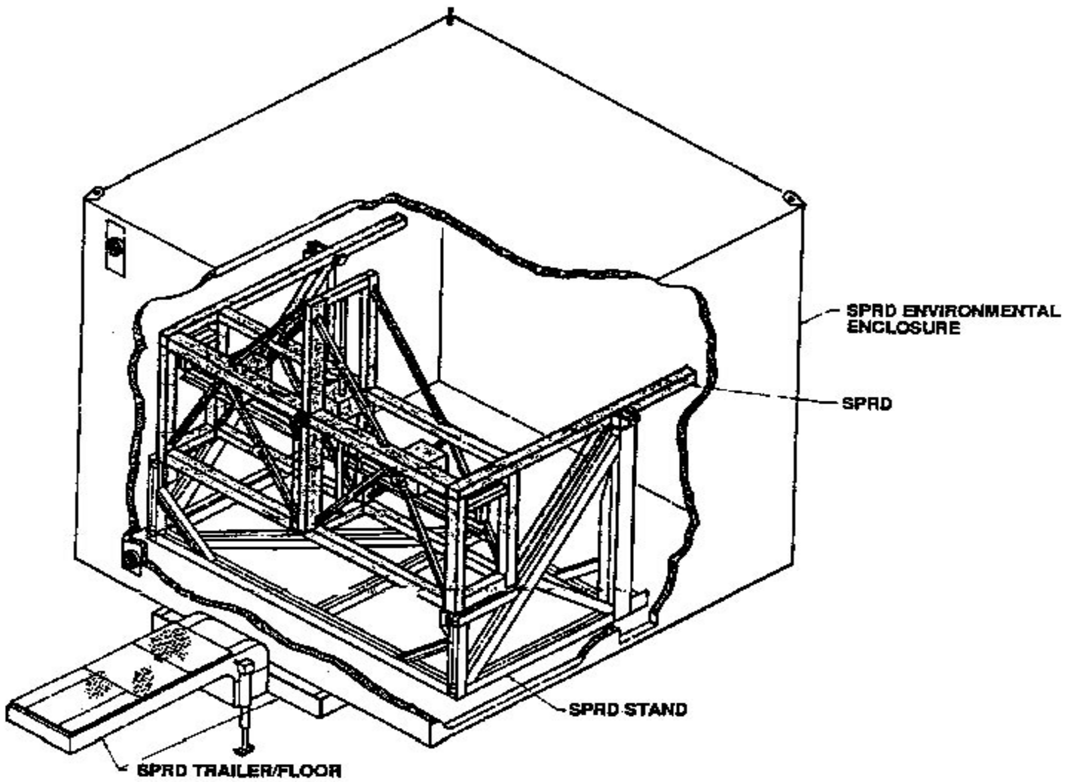


Figure 4-24. SPRD

4.5.6 PAYLOAD HANDLING FIXTURE (PHF). The PHF is a temporary holding structure for use during postlanding operations for removal of large payloads at all non-CONUS landing sites. Its main components are seven steel sections, two rotation towers, four bogies, and four jacks. The structure is intended to mechanically support a payload, can accommodate payloads in either a horizontal or vertical position, and has a capacity of 29,484 kg (65,000 lb).

Platforms are provided around the PHF for personnel access to the payload. Figure 4-25 shows the PHF in the horizontal position.

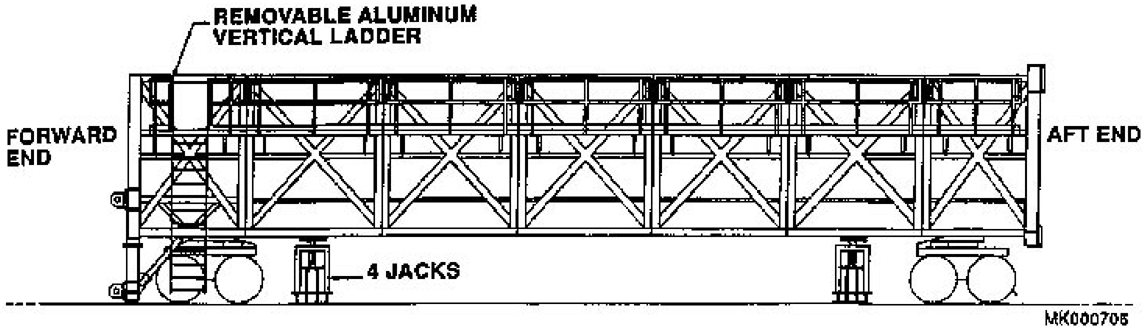


Figure 4-25. PHF in Horizontal Position

The payload environmental control cover (PLECC) is a protective enclosure installed as a liner inside the PHF and is used to completely enclose a horizontal payload in the PHF. The PLECC consists of sections that are made from panels having welded aluminum skeletons covered by inner and outer aluminum skins. The gap between the skins is filled with thermal insulation. A portable ECS is used to supply conditioned air to the PLECC.

Immediately after notification of a non-CONUS landing, the unassembled PHF would be dispatched to the landing site by air or sea transport. After approximately two weeks of assembly, testing, and validation, the PHF would be ready to receive the orbiter bay payload(s). The orbiter bay doors would be opened and payload safing and deservicing would be done at this time. The payload would then be transferred from the orbiter to the PHF using mobile cranes and the payload strongback, also sent by air transport for a non-Conus landing. The PLECC top cover panels would then be positioned and environmental control conditions established. The payload would remain in the PHF until arrangements for environmentally controlled transport to the Untied States are made.

4.5.7 HYDRA-SETS. The Hydra-Sets are portable, self-contained, hydraulically operated instruments capable of definite and precise control of linear movement within .003 cm (0.001 in) when mounted between any crane hook and load. A remote control console is available and powers the Hydra-Set by delivering it an inert gas pressure closely regulated for precisely metered linear motion. A dual-regulator system provides precise and positive control of both lowering and lifting operations. A fail-safe unit locks system pressure in the event of a sudden loss of supply gas pressure, therefore controlling the rate of descent. An electronic digital display indicates movement and direction of movement in .0013 cm (0.0005 in) increments. Figure 4-26 shows a typical Hydra-Set in front and side views and gives the sizes and dimensions of the Hydra-Sets available at KSC.

Program Model No.	Model	Stroke	Weight	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	W	X
H72-0828-6	1 TON-A	12 INCHES	86 lb	4 5/8	17 1/4	4 1/2	23 1/2	26 1/2	2	6	2 1/2	8	1	3/4	2 5/8	2	3 1/2	1 5/8	4	8 1/8
H72-0828-7	2 1/2 TON-B	12 INCHES	86 lb	4 5/8	17 1/4	4 1/2	23 1/2	26 1/2	2	6	2 1/2	8	1	3/4	2 5/8	2	3 1/2	1 5/8	4	8 1/8
H72-0828-8	5 TON-C	12 INCHES	85 lb	4 5/8	17 1/4	4 1/2	23 1/2	26 1/2	2	6	2 1/2	8	1	3/4	2 5/8	2	3 1/2	1 5/8	4	8 1/8
H72-0828-4	10 TON-D	12 INCHES	208 lb	7 1/2	18 15/16	8 3/4	27 11/16	33 1/4	2 7/8	8 1/2	2 1/2	8	1 5/8	1 1/8	3 3/4	2 3/4	5	2	6	10 3/4
H72-0828-9	20 TON-E	12 INCHES	512 lb	9 7/8	18 15/16	10 1/4	34	42	4	11 7/8	2 1/2	8 1/4	2 1/2	1 1/2	6 1/4	4	7	4	9	14 1/4
H72-0828-3	25 TON-ES	12 INCHES	512 lb	9 7/8	18 15/16	10 1/4	34	42	4	11 7/8	2 1/2	8 1/4	2 1/2	1 1/2	6 1/4	4	7	4	9	14 1/4

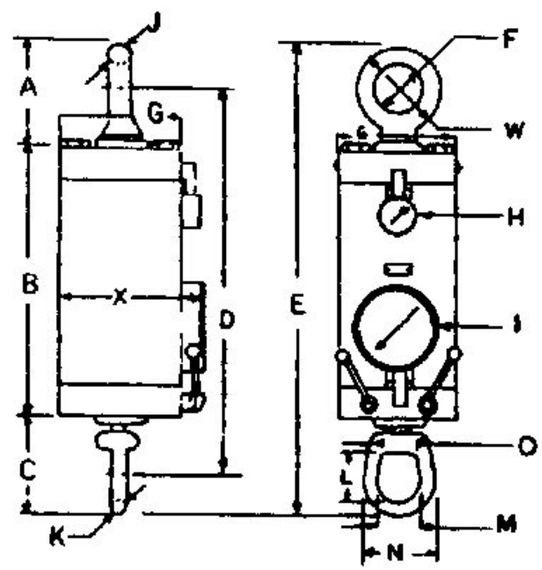


Figure 4-26. Hydra-Set Size and Dimensional Information

4.5.8 CARGO INTEGRATION TEST EQUIPMENT. The KSC CITE Set consists of structural/mechanical and electrical/electronic equipment located primarily in four areas: (1) the O&C high bay area - horizontal CITE stand; (2) the VPF - vertical CITE stand; (3) the O&C third floor - two control rooms (3233 and 3237) capable of supporting either horizontally or vertically processed payloads with room 3237 containing an engineering support area for NASA, contractor, and payload personnel, and the Payload Management areas mentioned in paragraph 4.4.16; and (4) the SSPF high bay, horizontal CITE stands. This CITE is used to verify compatibility between payloads and the simulated orbiter mechanical and functional interfaces. Figure 4-27 depicts the structural and mechanical elements of the CITE stand used for horizontal payload processing in the O&C low bay. Figure 4-28 shows the vertical payload processing CITE stand in the VPF. Figure 4-29 is a block diagram illustrating the CITE functional capabilities provided at both locations. The CITE for Space Station Alpha element processing can be available at various locations within the SSPF high bay. Figure 4-30 is a block diagram of this capability. The SSPF CITE is controlled from the O&C Building.

4.6 PAYLOAD-UNIQUE EQUIPMENT SUPPLIED BY OWNER

The customers supply this GSE with adequate spares to the launch site for use during processing operations. They will supply a listing and brief description of the GSE and coordinate shipments with the LSSM.

4.7 LPS

The KSC LPS is designed to meet Space Shuttle requirements. The LPS is used for systems testing, launch operations control, and status monitoring of the Space Shuttle vehicle and associated GSE. The architecture of the system is shown in figure 4-31. There are essentially two systems: (1) the CCMS including the Record and Playback Subsystem (RPS) and (2) the Central Data Subsystem (CDS).

4.7.1 CHECKOUT, CONTROL, AND MONITOR SUBSYSTEM. The CCMS provides realtime monitoring and control of the Space Shuttle vehicle and its support equipment. The Space Shuttle vehicle interfaces include the pulse code modulation (PCM) data system and the Launch Data Bus (LDB). Commands are initiated from the ground on the LDB, and system responses by the PCM or the LDB are evaluated and recorded. Thirty-seven minicomputers and associated peripherals are used. Of the entire complement of equipment, one computer, a printer, and a man-machine interface console are dedicated for payload-to-orbiter interface verification. The dedicated LPS payload equipment is essentially used to verify payload interfaces with the orbiter, however, additional capability can be provided subject to an optional charge. Payload commands can be sent and data can be evaluated and stored. If customers use standard data formats that are routinely processed by the LPS, they may develop their own LPS program rather simply through use of a high order language (HOL) (Ground Operations Aerospace Language (GOAL)) developed by KSC. If special data formats

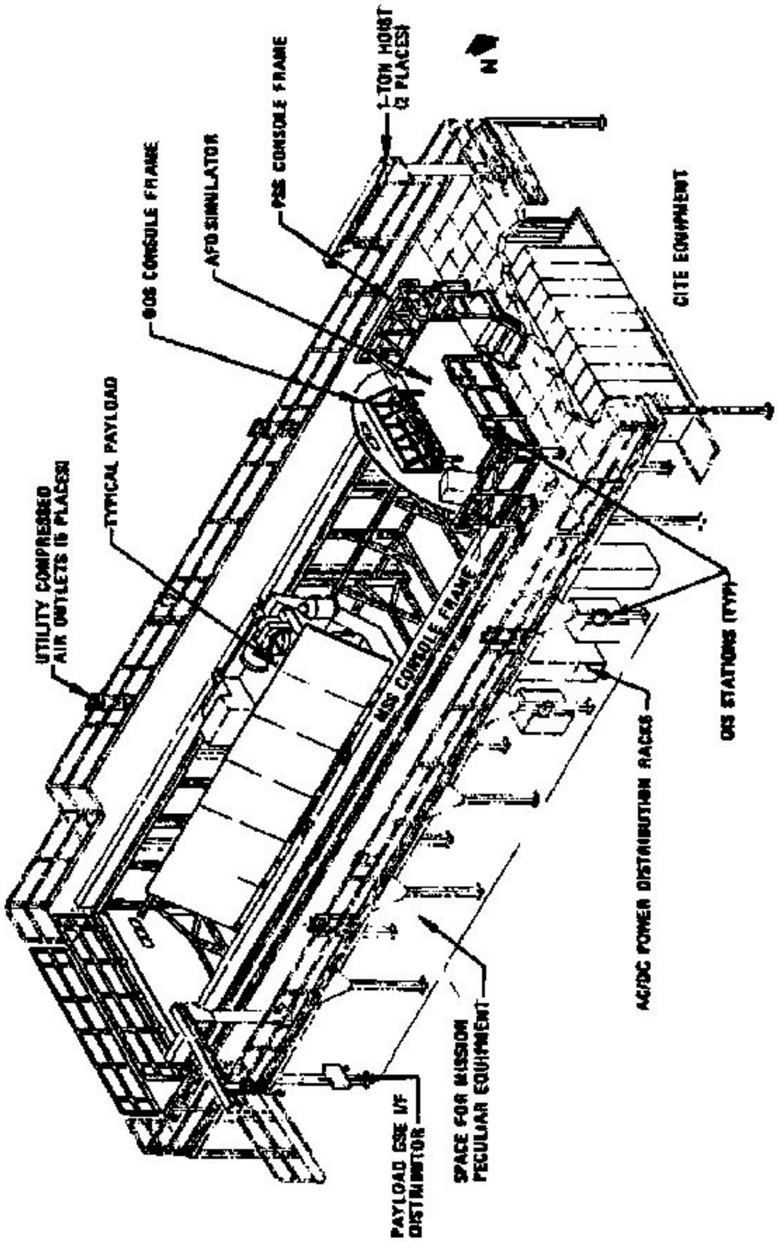


Figure 4-27. Horizontal CITE, O&C

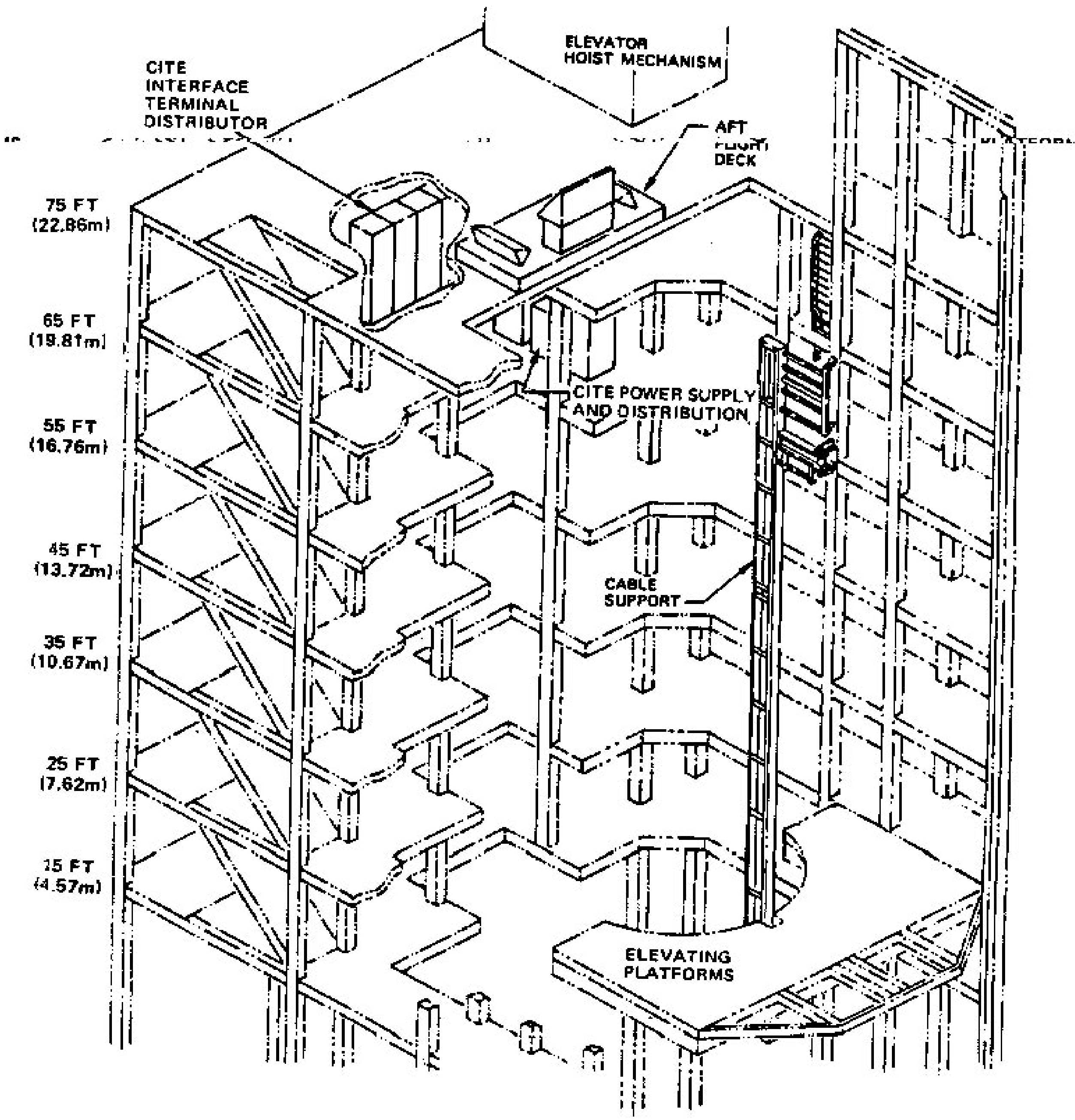


Figure 4-28. Vertical CITE Stand in VPF

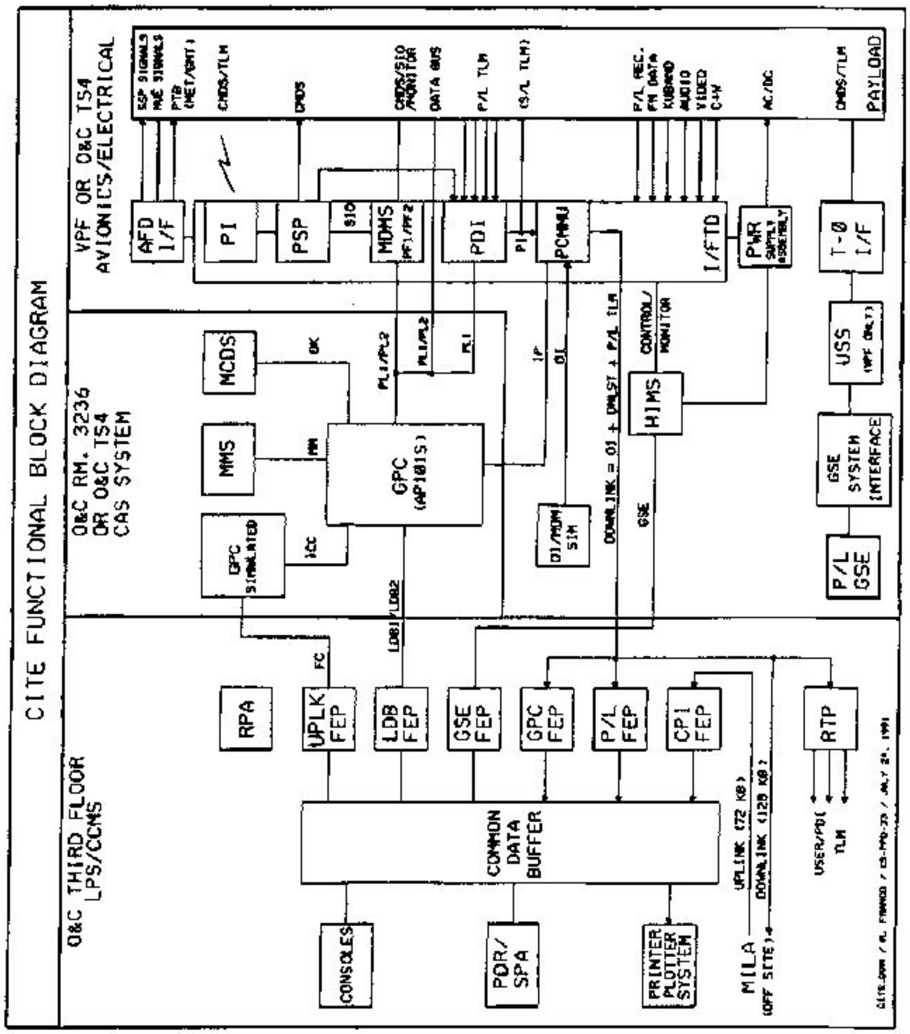


Figure 4-29. CITE Avionics Functional Diagram for Payloads

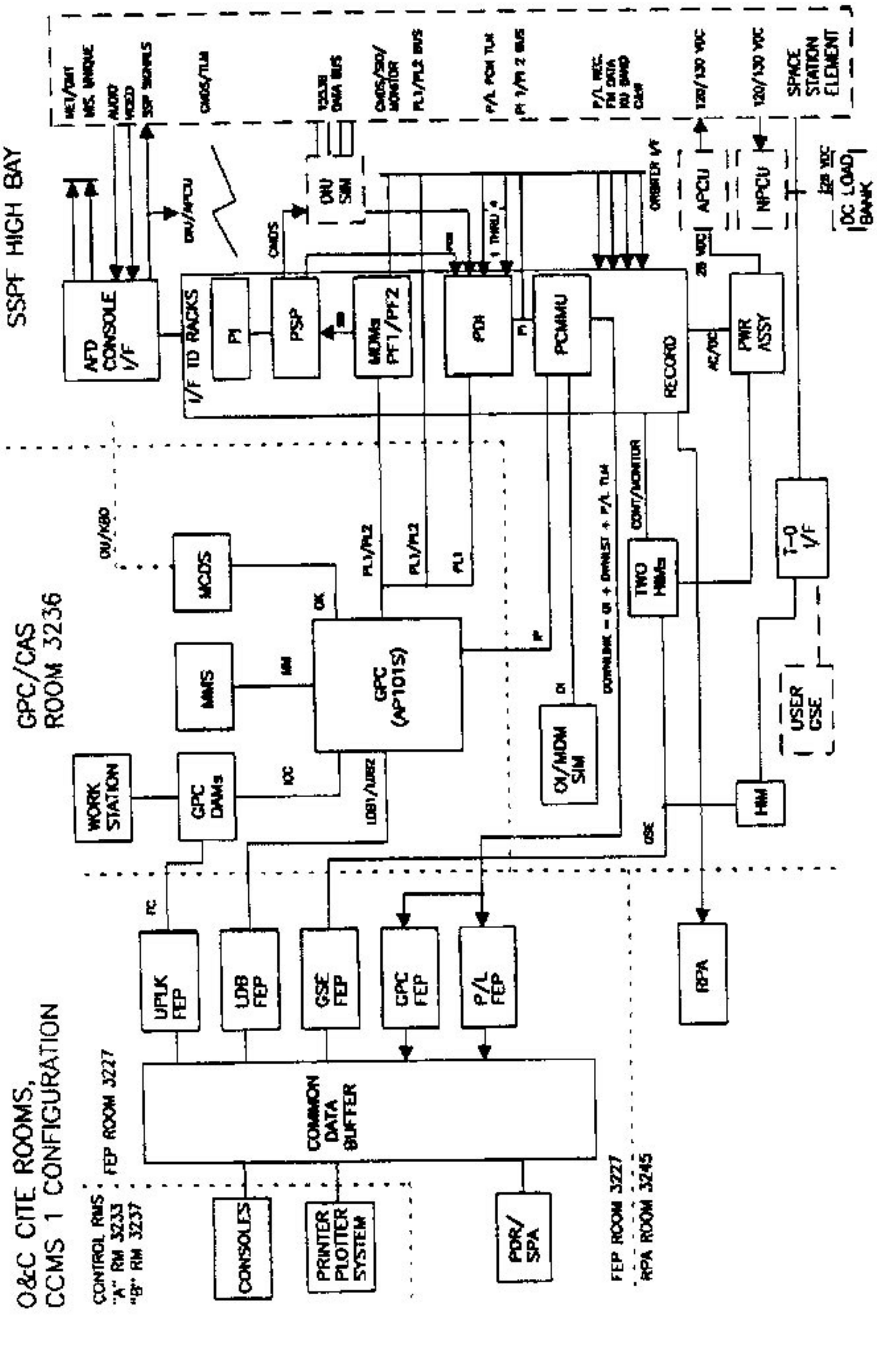


Figure 4-30. SSPF/O&C CITE Functional Block Diagram

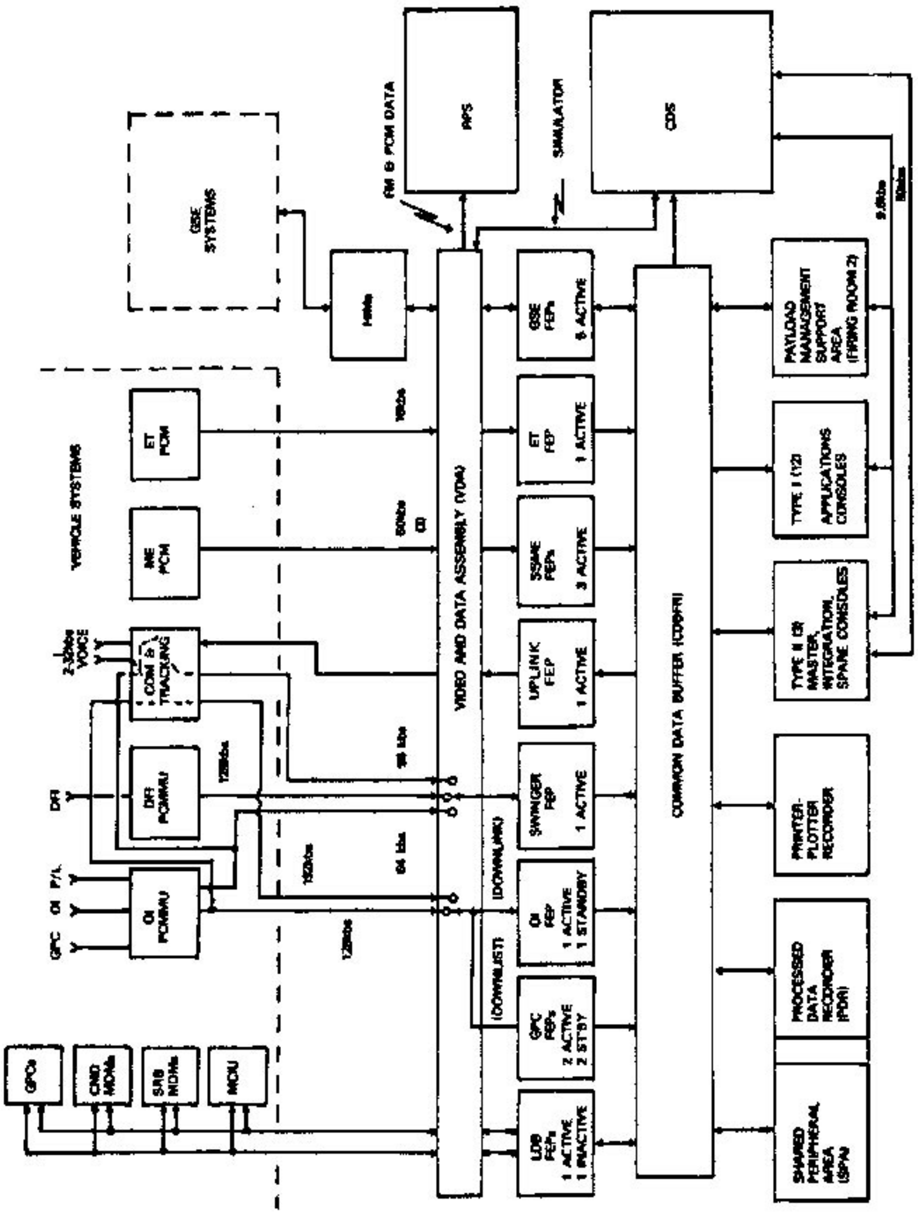


Figure 4-31. LPS Architecture

are required, KSC must develop system software, necessitating a development charge. It is anticipated that a library of payload software programs that will meet tenets of many customers will eventually be assembled.

4.7.2 RECORD AND PLAYBACK SUBSYSTEM. The RPS supports the LPS with recording and playback of raw unprocessed data from all sources of operational instrumentation (OI) and modular auxiliary data system (MADS) data (excluding vehicle and ground data bus). Post-test and limited immediate retrieval of recorded raw data is provided. The RPS monitors selected data signals, evaluates them for quality parameters, retransmits them to other areas and equipment, and processes the DFI and some OI data for real-time display, evaluation, and post-test data reduction.

The RPS performs bit error rate display for analysis of shuttle flight record, bit rate checks, bit jitter checks, frequency modulation (FM) subcarrier pre-emphasis, overall signal quality, and other checks for the evaluation of telemetry during checkouts of the shuttle.

Most of the RPS equipment can be used collectively or individually. This equipment includes line and signal conditioning, signal translating, signal retransmission, signal evaluation and test equipment, raw-data magnetic tape recorders, FM demodulators, FM discriminators, FM and PCM calibrators and signal simulation, analog multiplexer with analog-to-digital (A/D) converter, PCM input converters, digital-to-analog (D/A) converters, strip chart recorders, time-code translators, time-code input converters, and a mini-computer with a line printer, digital disk, and digital tape recorders. Figure 4-32 is a block diagram of the RPS.

4.7.3 SHUTTLE PROCESSING DATA MANAGEMENT SYSTEM-II (SPDMS-II). The SPDMS-II provides automatic data processing hardware and software services for users of information management systems. Two central mainframe computers provide the bulk of this service; one is located in the LCC and the other is located in the Central Instrumentation Facility. Time-sharing services are provided to multi-users implementing various information management systems throughout KSC and also interfacing with other NASA centers and contractor facilities.

4.7.4 USE OF LPS BY CUSTOMERS. The LPS can provide services to customers. If customers think that this equipment can meet their needs, they should investigate the standard services, conventional interfaces, GOAL development, and other software that may require modification or development. Requests for information on the LPS should be directed to the LSSM.

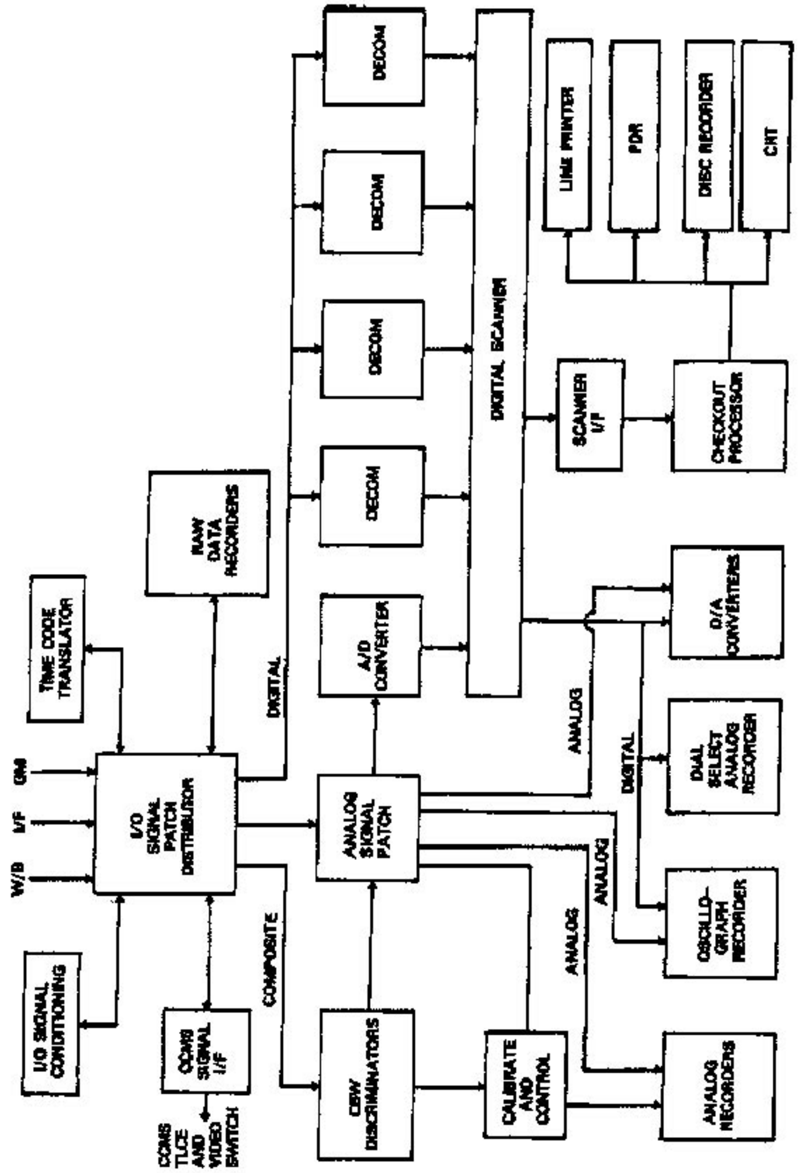


Figure 4-32. RPS Functional Block Diagram

4.8 PAYLOAD DATA MANAGEMENT SYSTEM (PDMS)

The PDMS is a physically and functionally integrated network of micro, mini and mainframe computer and software systems that supports KSC payload processing. PDMS data exists within files and on databases. Some files and databases are used by single applications and others are shared by multiple applications. Most payload information processing and data management functions are provided by PDMS. The PDMS software systems consist of 18 software processes in 14 functional areas. A high level description of each functional area and process is contained within the PDMS Implementation Plan, K-CM-10.1.12. When completely expanded and fully integrated, PDMS will support Payload Ground Operations, Space Station Alpha, and Space Station Alpha logistics information system payload information processing requirements. To satisfy expanding requirements, PDMS will transition to an integrated environment in which all of the data required to support payload processing, including technical documentation, will be contained within database(s) under the control of Database Management Systems (DBMS's). Most application programs, including those required to produce technical documents, will be resident on and executed from desk top workstations.

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SECTION V

SUPPORT SERVICES

The LSSM receives launch site support requirements from the customers. These requirements are introduced into the KSC system by the LSSP. As necessary, KSC will translate these requirements into various implementing documentation systems including the Universal Documentation System (UDS), the PRD/program support plan (PSP), and Engineering Support Requests (ESR).

After processing the requirements through the KSC system, a commitment or exception is provided in the LSSP. The LSSM, the Payload Manager, and several working teams coordinate to assure the actual support is provided when required.

5.1 GENERAL

This section describes the various KSC support services available to the customer at the launch site. For a general listing of the available support services, refer to KHB 8610.1, Support Services Handbook. The customer must submit his requirements for services through the LSSM.

Both standard and optional services are listed in this section but are not identified as such. There is an extra charge to the customer for optional services. Section IX of this document defines the standard and optional services at the launch site.

5.2 ADMINISTRATIVE SUPPORT SERVICES

Administrative support services (non-technical) available to customers include housekeeping, administrative communications, logistics, security, safety, transportation, medical, training, photographic, food service, reproduction, mail service, and fire prevention and protection.

5.2.1 HOUSEKEEPING. These housekeeping services are available.

a. Office. Office space as available to accommodate the work force.

b. Furnishings. Desks, chairs, bookcases, tables, and cabinets, as existing in assigned areas.

c. Janitorial. Janitorial services (maintenance of floors, walls, restrooms, etc.) in support of normal operations; special service to payload servicing and checkout areas, such as clean rooms, clean work areas, and cryogenics laboratories, as requested.

5.2.2 ADMINISTRATIVE COMMUNICATIONS. Use of existing administrative communication systems and services is available.

a. Telephone System. Provides normal telephone system used in routine day-to-day communications. Commercial long distance and overseas communications are the customer's responsibility.

b. Public Address (PA) and Paging System. Primarily for area warnings or administrative announcements.

c. Portable PA and Paging System. For use on an emergency basis or in areas where permanent PA systems do not exist.

d. Telex/Teletype Wire Transmission (TWX) System. For transmitting a written message to locations with telex/TWX equipment, and a means of sending telegrams and cablegrams to locations not serviced by telex/TWX.

e. Data Fax/Facsimile System. For sending and receiving diagrams, graphs, engineering designs and sketches, engineering and performance data, and other graphic material not adaptable to the teletype format.

f. Teletype. For sending messages categorized as classified or unclassified.

(1) Unclassified - For transmitting and receiving teletype messages. Unclassified messages have no security restrictions.

(2) Classified - Classified means the contents of the message require protection against unauthorized disclosure in the interest of National security; for encryption and transmission, reception and decryption, and storage of classified information. Classified messages are handled by Air Force facilities at the 45 SW, with KSC communication centers controlled by the Base Operations Contractor (BOC).

g. Payloads Operations Network (PON). For administrative data such as communications with other workstations, multi-user host computers, PSCN and TELNET. The PON also provides connectivity to KSDN, BCDS, PDMS and other KSC systems/services. This network is not intended and is not to be used for live operational data.

5.2.3 LOGISTICS. The following logistics support services are available through the PGOC.

a. Supply of Standard Stock Listed Items (Administrative Suppliers.)

b. Loan Tool Crib. Loan tool cribs are located in strategic locations for convenience. Each crib stocks tools and equipment for work performed in that area.

5.2.4 SECURITY. These security support services are available.

a. Classification. Plans for the protection of sensitive information from unauthorized disclosure.

b. Classified Document Control. Plans for managing, regrading, and destroying classified documents, and for the mailing and shipment of classified material.

c. Repositories (Safes) for Classified Documents. Approvals of requests for all safes and arranging for changes in safe combinations; furnishing technical assistance to other NASA offices, as required.

d. Access. Administration of the KSC Unescorted Access and Personnel Reliability Program as documented in KMI 1610.8. Personnel requiring unescorted access to security areas on KSC must be processed in accordance with the provisions of KMI 1610.1F.

e. Payload Customers. Provides payload customers (any person other than a NASA employee or permanent on-site KSC contractor personnel) with the proper credential(s) for admittance to KSC and internal areas or facilities.

f. Technical Security. Alarm systems, access control systems, and other electronic countermeasures to protect secure areas from unauthorized entry or electronic infiltration.

g. Security Education. A continuing program of personnel education in security matters including security regulations and procedures.

h. Security Violations. The KSC Security Office has the responsibility to thoroughly investigate all irregularities, violations, and infractions by all personnel on KSC or KSC-controlled facilities at CCAS or other locations. Investigation results will be the basis for recommendation of disciplinary action, or revisions to regulations and procedures.

i. Installation Security. Security services for perimeter access control, personnel control, security surveillance (roving patrols), traffic escorts, and traffic control. Traffic escort services are provided for those items identified in KHB 1610.1. All requests for security services contained in PRD's will be reviewed, validated, and implemented by the Security Operations Office, IM-PSO.

j. Investigations. General security investigations; i.e., thefts, drugs, breaking and entering, and property damage.

k. Security Surveys and Briefings. Surveys to ensure that all classified material at KSC is properly safeguarded under applicable NASA and Department of Defense regulations; security briefing for newly designated classified material control clerks and continuing assistance thereafter; review of facilities, systems, payloads, etc., under National Resource Protection guidelines by Resource Protection Analysts.

l. Locks and Keys. Installation, repair, and replacement of security locks and keys at KSC; security desk and cabinet locks and keys.

5.2.5 SAFETY. These safety support services are available.

Safety, Reliability, and Quality Assurance Directorate. Develops and maintains safety plans and controls for all operations at KSC.

a. Operators' safety - Personnel are available to development of payload operational procedures, monitor (on a 100-percent basis) all high-level hazardous operations, spot check less hazardous operations, and perform industrial safety efforts within assigned areas.

b. Procedure review and approval - Procedures developed for use at KSC, CCAS, or at VAFB are reviewed to ascertain that the hazardous operations are identified and appropriate hazard controls are specified.

c. Safety technology - Maintains a library and provides technical administration (OSHA) and NASA directives relating to payload processing.

5.2.6 TRANSPORTATION. These transportation support services are provided through the NASA transportation office (IM-SAT):

a. General.

(1) Shuttle bus - Frequent shuttle bus service is provided between major KSC facilities and major buildings located on Hangar Road on CCAS on normal workdays for all badged personnel (for official business use only). No other shuttle bus service is available on CCAS.

(2) Taxi service - No taxi service is available.

(3) Special bus service - Limited special bus service is available on center for training classes or other specific projects.

(4) Government vehicles - Permanent or temporary assignment of General Services Administration (GSA) vehicles may be possible for Government agencies and their support contractors. This vehicle support is reimbursable by the customer, and arrangements should be made as far in advance as possible with the GSA by the customer. Each driver must have a valid and appropriate state license for the type of vehicle being operated.

(5) Rented or leased vehicles and chartered buses - Information and some assistance is available in locating local sources, mainly in Orlando. Advance planning and reservations are recommended.

b. Special and Charter Aircraft. Information and assistance are available concerning the use of aircraft to and from KSC. Aircraft are permitted to land for business purposes only after completion of required prior arrangements. Assistance in chartering all types of aircraft and helicopters at the customers' expense is also available. Support services include transportation, loading, and offloading.

c. Marine Transportation. Chartered marine equipment can be arranged. Specific information is available concerning waterways, procedures, equipment, and docks.

d. Railroad. The KSC is served by railroad and also operates its own switching locomotives for onsite relocations.

e. Freight Shipments. The KSC is served by both major and local carriers.

(1) Incoming Freight - The KSC policy requires that all inbound customer payload shipments be consigned as follows:

Domestic
PGOC Transportation Manager
PGOC Warehouse, Building M6-698
Kennedy Space Center, FL 32899
Deliver to:
C. Fiers, CG-LMD-2
Telephone: (407) 867-3504
Room 1469, O&C Building
Mark for: (Name of PI/ED)

International
Transportation Officer NASA
C/O PGOC Warehouse, Bldg. M6-698
Kennedy Space Center, FL 32899
Deliver to:
C. Fiers, CG-LMD-2
Room 1469, O&C Building
Mark for: (Name of PI/ED)

Complete service is provided for over, short, and damaged claims, tracing, and expediting.

(2) Shipping - The KSC Central Shipping and Receiving Facility has daily pickup service by scheduled airlines and motor freight carriers for shipments. Complete shipping services are available including shipment preparation, freight classification, selection of mode of transportation, determination of freight rates, preparation of bills of lading, overdimensional permits, and import and export documentation of liaison services with U.S. Customs, Immigration, and Department of Agriculture for shipment processing.

(3) Packaging and preservation - The KSC provides a complete service including advisory assistance for preservation, packaging, and packing.

(4) Delivery - The KSC operates both scheduled and on-call pickup and delivery service for internal distribution and subsequent movement of material except for items that have unusual size, weight, or physical characteristics (like propellants).

f. Unscheduled Delivery Service. Special delivery of materials required to support an imminent vehicle test or launch can be provided on an exceptional basis.

g. Payload Transportation. Other types of specialized transportation equipment (flatbeds, forklifts, etc.) are available from either existing KSC resources (specialized equipment with trained operators) or private firms and carriers engaged in such business.

5.2.7 MEDICAL. The following medical services are available.

a. Occupational Health. Emergency treatment (including ambulance service) and a preventive medicine health program is provided for all personnel at KSC, CCAS, and VAFB.

b. Environmental Health. Various types of engineering services (such as industrial hygiene monitoring of environments and facilities) are provided for the control of health hazards with regard to sanitation, ionizing and non-ionizing radiation, illumination, noise, industrial waste disposal, air and water pollution, food, and potable water. Environmental health personnel can provide health consultation by telephone or active support for routine or previously approved operations on a 24-hour basis.

c. Medical Certification. Personnel participating in certain operations (e.g., propellant handling and designated crane operations) will be required to undergo a physical examination. Non-KSC personnel must have this examination performed by their organizations medical facility and must be coordinated with the KSC biomedical office.

5.2.8 TRAINING. Specific training is required for persons having a need to access certain work areas or to become familiar with selected equipment and/or systems, and for persons who will be working with hazardous materials. The LSSM documents any necessary operational training in the LSSP and will arrange for this training at an appropriate time prior to arrival at KSC, CCAS, and VAFB. Video training tapes for some facilities can be sent to the customers for viewing at their plants.

5.2.9 PHOTOGRAPHIC. Documentary photography provides both still and motion picture coverage of operations and developments of the shuttle program at KSC and CCAS. (Video coverage of operations can be arranged at either site.) Personal cameras are allowed on site at either KSC or CCAS except in restricted areas; camera passes in some operational areas may be allowed after appropriate training.

5.2.10 FOOD SERVICE. KSC provides food service support.

a. Cafeterias. Dining room and carryout food services are provided to support KSC and CCAS operations. Breakfast and lunch are served Monday through Friday.

b. Mobile Van. A mobile van services KSC working areas not supported by a cafeteria.

c. Vending Machines. Vending services are in areas without a cafeteria or snack bar operation and in other selected locations for personnel convenience.

5.2.11 REPRODUCTION. Reproduction services are available.

a. Self Service. Office copying machines are located throughout the buildings for quick reproduction.

b. Documentation Services:

(1) General - Personnel and facilities are available for multiple copy and large volume reproduction, offset printing, and bindery services.

(2) Technical - Personnel and facilities are available for reproduction of technical documents (engineering drawings, schematics, specification documents) from original documents, microfilm, and aperture cards.

(3) Classified material - Personnel and facilities are available for the reproduction of classified material. Each facility maintains a file of classified material and authenticated signatures of persons authorized to approve the reproduction of classified material.

5.2.12 MAIL SERVICE. Mail service support is available.

a. Routine Mail. KSC provides a mail delivery and pickup service on a scheduled basis at KSC and CCAS and at certain adjacent areas (i.e., Operational Support Group with offsite offices). Office codes have to be established.

b. Mail Service to Other NASA Centers. Mail service between NASA organizations, contractors, and payload owners and operators located at the various other NASA Centers (JSC, George C. Marshall Space Flight Center (MSFC), Goddard Space Flight Center (GSFC), and NASA Headquarters) is available.

c. Post Office. Routine postal services such as stamp sales, box rentals (not available to individuals), and money orders are available at the KSC Headquarters Building, east end, during specified hours.

d. Classified Documents. Receipt and control of mailed classified materials is provided at KSC and CCAS.

e. Electronic Mail. Official electronic mail can be sent and received by use of the PON.

5.2.13 FIRE PREVENTION AND PROTECTION. These fire prevention and protection services are available.

a. Fire Prevention. Surveillance of facilities, structures, and other areas of KSC and CCAS to assure compliance with fire prevention rules and regulations and to ensure the reliability and operational capability of all installed fire protection systems; for emergencies call 911.

b. Fire Protection. Twenty-four hour coverage by professional fire-fighting personnel and strategically located and maintained fire suppression equipment.

c. Water Deluge. The water deluge system in some of the PGOC operated facilities are shut off at the main valves. The customer will be

requested to coordinate a fire watch/valve operator with the LSSE/LSSM if their payload is fueled with hazardous liquid fuels.

5.3 TECHNICAL SUPPORT SERVICES

The technical support services available to the customer are described in the following paragraphs. Instrumentation and communications are described separately in subsection 5.4 because of their specialized nature.

5.3.1 CLEAN WORK AREAS. See applicable facility descriptions in section IV.

5.3.2 CRANES. See applicable facility descriptions in section IV and KSC-DD-111, Facility Access and Handling Provisions for Payloads at KSC.

5.3.3 PROPELLANTS, LIQUIDS, AND GASES. The KSC may provide certain propellant, liquid, and gas support. The KSC's support services organization does not stock propellants, liquids, or gases for potential use by the customer. Customers must state their requirements in terms of types, quantities, specifications, and need dates. This information is needed as early as possible, up to 3 years in advance for hypergols. The KSC will work with the customer in determining the equipment, propellants, liquids, or gases that are or can be made available. If a request is made for fluids to be supplied by KSC, it is recommended that they be specified according to JSC-SE-S-0073.

a. Propellants. By prior arrangement only.

b. Cryogens. Facilities for filling portable GSE dewars with liquid oxygen (LO_2)/liquid hydrogen (LH_2)/liquid nitrogen (LN_2)/liquid helium (LHe) for payload servicing.

c. Hypergols. Facilities for hypergol flushing, rendering inert, loading, and unloading.

d. Pressure Gas-Mobile. High pressure nitrogen, helium, hydrogen, oxygen, air, and mixtures of oxygen and nitrogen. During unscheduled outages of all high-pressure gas facilities, support is provided solely by mobile units.

5.3.4 ORDNANCE. The KSC provides this ordnance support.

a. Ordnance Test. A safe facility for test and checkout (receiving inspection, lot verification testing) of ordnance devices.

b. Ordnance Storage. Environmentally controlled storage for payload ordnance items.

NOTE

All ordnance items must be packaged and shipped separately.

5.3.5 CHEMICAL SAMPLING AND ANALYSIS. This chemical sampling and analysis support is available.

a. Chemical Sampling. Sampling services for obtaining representative quantities of material for specification conformance analysis.

b. Chemical Analysis:

(1) Gas analysis - Analysis of gases such as hydrogen, oxygen, helium, nitrogen, and breathing air to verify that gas purity conforms to specifications required by KSC and/or the payload owner or operator.

(2) Liquid analysis - Purity analysis of liquids such as hypergolic fuels and oxidizers, hydraulic oils, solvents, spacecraft coolants,

cleaning chemicals, RP-1, water, hypergolic decontamination flush fluids, and lubricant oils to verify that liquids conform to specifications required by KSC and/or the payload owner.

(3) In-field analysis - Analysis and other services at the site such as conductivity, pH, dewpoints, moisture, environmental particle counts, airflow measurements, and temperature and humidity determination.

5.3.6 NONDESTRUCTIVE EVALUATION (NDE). This NDE support is available to the customer.

a. Nondestructive Inspection. Detection and analysis of material defects (cracks, porosity, electrical discontinuities, and weld defects) by methods that will not impair further use of the item tested.

b. Leak Detection. Detection of the existence or absence of leaks in the payload system, subsystems, and unique GSE and facility checkout equipment.

5.3.7 TECHNICAL SHOPS. The KSC provides emergency mechanical, electrical, and electronic shop support to customers. These shops have limited capability for in-field repair of equipment.

5.3.8 LABORATORIES. The KSC has this laboratory support available for the customer.

a. Battery. A battery laboratory with consoles, sinks, and GN_2 required in activation of orbiter batteries. Operation of this laboratory by a customer is not permitted, but a customer may request work from this laboratory by furnishing, with the lab's aid, an OMI to cover the work requested. Any work done in this manner would incur an optional charge.

b. Transducer Calibration. Calibration, maintenance, repair, and replacement of transducers and signal conditioners.

c. Biomedical. Check-out of flight biomedical instrumentation and flight experiments, astronaut physical examinations, life science specimen conditioning, examination and selection, and technical assistance to the Occupational Health Services.

d. Proof Test. Routinely, the customer is required to have equipment proof-tested prior to arrival at KSC. However, the capability exists at KSC for periodic re-evaluation of handling devices (slings and harnesses) to assure conformance to KSC, CCAS, and payload owner safety and reliability specifications.

e. Cleaning and Testing. Precision cleaning of components and systems, refurbishment of components, decontamination of hypergolic components and systems, proof and functional testing of components, hydrogen peroxide passivation of parts, and reevaluation of flexhoses.

f. Materials Testing. Capability for evaluation of plastics, elastomers, coating, metals, lubricants, and composites. Testing of the compatibility of these materials with liquid oxygen and other fluids.

g. Environmental Testing. Both climatic and dynamic testing on components and systems. Conditions that can be simulated are vibration, shock, acceleration, temperature, humidity, vacuum, pressure, and spray.

h. Failure Analysis. Investigative services and operation and maintenance of a diversified and comprehensive laboratory and equipment facility. Metallurgical, electronics, and mechanical systems and fluids laboratories are available.

i. Microchemical Analysis. Non-routine qualitative and quantitative chemical analysis of gases, liquids, and solids. A variety of spectrometric, chromatographic, and other instrumental methods as well as classical wet chemistry techniques are available for analyzing samples in sizes down to microscopic.

j. Development Testing. Development and fabrication of mechanical and electrical and electronic hardware including "make-work" modifications. Electrical, electronic, mechanical, woodworking, metalworking, and plastics technology, fabrication, and system testing are available.

5.3.9 LIFE SUPPORT. Portable respiratory equipment and garments are available which provide personnel protection from toxic substances and hazardous/oxygen deficient atmospheres.

a. Respiratory Equipment. Self-contained air packs with 5 minute emergency egress and Scott Air Packs with 30 minute operational durations. Hoseline supplied respirators are available for extended durations.

b. Protective Garments. Propellant Handlers Ensemble with breathing air supplied from either a portable cryogenic backpack or hoseline. Personnel using this equipment must have a medical examination and certification training.

All of the protective equipment is described and pictorially shown in the Life Support

Capabilities Document available from the BOC.

5.3.10 PHOTOGRAPHY. Engineering photography services include:

a. General. Filmed records of damaged components, wiring, and mechanical and hydraulic configurations.

b. Documentary. Photographic coverage of shuttle and payload test, checkout, launch countdown, and launch, such as sequential events and attitude of shuttle during liftoff.

5.4 OPERATIONAL INSTRUMENTATION AND COMMUNICATIONS

The specialized scope, operational interfaces, and considerable onsite capabilities for these two technical support services require separate description.

The Support Services Handbook, KHB 8610.1, provides further definition of these and associated services.

5.4.1 INSTRUMENTATION. The KSC provides this instrumentation support.

a. Telemetry Ground Station:

(1) Acquiring of telemetry signals RF radiated or over data lines.

(2) Recording, reproducing, or copying of recorded telemetry signals and the conversion and processing of telemetry signals and data for display, retransmission, computer processing, and records.

b. RF Checkout Station. The RF checkout support for payloads, experiment, Inertial Upper Stage, Payload Assist Module, Spacelab, and other payload elements.

c. Data Processing. The LPS/CDS support; non-LPS computation support, realtime batch processing, Management Information Systems, and Automatic Data Processing.

d. Magnetic Tape Certification. Tape certification capability for GSE and flight tapes.

e. Flight Sensor. Flight sensor calibration capability.

f. Remote Data Transmission. The LPS/CDS or other methods for transmitting data, television (TV), timing, and countdown to remote KSC or off-KSC locations.

g. Data Display. Data display capabilities through cathode ray tube, strip chart recorders, and event recorders for special purpose, one time only, or recurring display needs. Data may be from LPS/CDS or other sources.

h. Test Equipment Loan Pool. Test equipment on a loan basis.

i. Electromagnetic Compatibility Operations. Portable and fixed testing and verifying capability (element-to-element and payload to GSE); includes area and system electromagnetic monitoring and laboratory facilities for testing and verifying components and systems to established RF interference and electromagnetic compatibility standards.

j. Facility Environmental Monitoring System. Equipment to remotely measure, record, and display critical facility parameters.

k. Instrument Calibration and Repair. Facilities for calibration and repair of test instruments used in launch and support operations.

l. Timing. Digital timing system to generate, distribute, and display countdown timing signals from launch checkout or computer-controlled tests and to display Greenwich mean time to test areas.

m. Meteorological. Specific weather data, both forecasts and observations, during shuttle and payload ground operations, countdown, launch, abort, and landing. This service requires monitoring of certain meteorological parameters such as lightning activities and tracking and monitoring severe weather systems; for example, high winds and precipitation.

n. RF Antenna Field Services. Installation and maintenance of reflectors, mounts, rotors, electrical components, waveguides, and pressurization systems; antenna alignment, voltage standing wave ratio (VSWR) checks, cable and path loss checks, and onsite RF equipment repair.

o. OIS. KSC training is required to operate the OIS.

5.4.2 OPERATIONAL COMMUNICATIONS. Operational communication resources are shared between shuttle, ELV, and payload organizations. Therefore, the identification of communication requirements, especially data and voice, must be identified in detail approximately 18 months prior to first mission payload test at KSC. This early identification will allow KSC payload communication personnel adequate time to coordinate, and resolve support conflicts with Shuttle Operations, the Air Force Range (45 SW) and the LSSM/LSSE. Operational communication support available includes:

a. Operational Intercommunications System. The OIS is a multichannel voice communication network interconnecting the operational areas required to support processing at KSC. A Transistorized Operational Phone System (TOPS) is used at the PPF's and HPF's on CCAS and can interface with the KSC OIS network.

b. Operational TV (OTV). Monitoring capability of spacecraft activities at the Space Shuttle launch pad. Two pad video signals can be transmitted simultaneously to payload processing facilities as required. The OTV cameras at the OPF and pad are remotely controlled from the LCC, room 1P2 by technicians who can pan, tilt, and zoom cameras on command. Video recording is available at LC-39 for all prelaunch tests and launch countdown. The OTV is also available at the ELV launch pads, all PPF's, all HPF's, the O&C, and the VPF and has video recording capability.

c. Wideband Transmission System. Provides closed-loop transmission media for complex electromagnetic signals through two methods:

(1) Analog transmission
- 30 Hz to 4.5 megahertz (MHz) frequency response
- 124-ohm balanced differential I/O impedance
- 1.0 Vp-p +0.2 V I/O voltage terminated into a 124 ohms balanced load

(2) Digital data transmission
- 100 bps to 256 kbps non-return to zero-level (NRZ-L)
- 100 bps to 128 kbps bi-phase
- RS-422 balanced differential I/O format

Customer interface as defined in KSC-DL-116 and KSC-DL-522.

These data can be transmitted to most KSC and CCAS major operating and support sites and to other NASA centers (such as JSC and MSFC).

d. Audio Recording System. Provides magnetic tape recorders for centralized audio communications recording.

e. Paging and Area Warning. The area warning system interfaces with the paging system for distribution and is used to alert personnel of unsafe conditions.

f. Payload Operations Network. The PON is not available for use in direct operations support. The PON is used only for administrative tasks. Live payload data is not to be placed on this network. The PON does not protect the data from being lost.

SECTION VI

SAFETY, SECURITY, FIRE PROTECTION, AND HEALTH

6.1 SAFETY

Safety requirements for processing of Space Shuttle payloads at all launch and landing sites are contained in KHB 1700.7, Space Transportation System Payload Ground Safety Handbook. Space Station Alpha Program elements have additional safety requirements found in SSP 30000 and other program documentation.

Safety requirements for processing of ELV payloads are contained in ESMC 127-1 and WSMC 127-1 for CCAS and VAFB respectively.

6.1.1 RESPONSIBILITY. The KSC Director of RQ has the functional management responsibility of the safety program at KSC.

6.1.2 SAFETY REVIEWS.

6.1.2.1 Space Shuttle Payloads. To insure the safety of the Space Shuttle and all its payloads, phase safety reviews on ground operations and GSE are held at KSC for each payload. These reviews involve the customers and payload organizational personnel. These reviews are described in KHB 1700.7, sections 2.0 and 3.0.

6.1.2.2 Space Station Alpha. Elements are reviewed for compliance with the Space Shuttle program. Program and launch site safety requirements in stage safety reviews following Space Station Alpha program design and design certification reviews. These reviews involve work packages and international partners responsible for producing the elements and their prime contractors. The review process for Space Station Alpha elements is found in SSP 30599 (draft).

6.1.3 SAFETY DOCUMENTATION. To assure compliance of the payload and GSE design and safe ground operations for the payloads, the customer submits: phase safety review documentation, payload organization Launch Site Safety Plan, technical operating procedures (TOP's), waivers, and deviations. These documents are discussed in KHB 1700.7, section 3.0.

6.1.4 SAFETY REQUIREMENTS. Section 4.0 of KHB 1700.7 presents policies, practices, and regulations for safety at the launch and landing site. It covers operational considerations, including hazardous operations, as well as personnel, payload, and GSE design criteria safety; environmental considerations; and handling and transport. Specific hazard controls to meet procedural and operational requirements are identified in GP-1098, Ground Operations Safety Plan.

6.1.5 TOP's. TOP's shall comply with the requirements of KHB 1700.7, section 3.0. Appendix C, Guidelines for the Preparation of TOP's, provides further information on these procedures.

6.1.6 ORDNANCE POLICIES. The customer should identify ordnance requirements for payloads as early in the planning phase as possible. The payload owners should contact the LSSM assigned to their payloads for the specific ordnance policies for their payloads and the facilities through which the payloads will be processed. Data requirements for ordnance storage and handling are listed in appendix D of KHB 1700.7.

6.2 SECURITY AND FIRE PROTECTION

The primary security requirements documents for the Space Shuttle are NHB 1620.3B, and NMI 8610.19, *Space Transportation Systems National Resource Protection*, published by NASA Headquarters. The KSC Security Handbook, KHB 1610.1A and the *KSC Security Standard* for the KSC implement the basic requirements and include additional requirements that are unique to KSC, CCAS, and VAFB. Fire protection documents include NHB 1700.1(V9), KHB 1710.26, GP1098, KSC-STD-F-0004D, and National Fire Codes.

6.2.1 RESPONSIBILITIES.

6.2.1.1 Chief, Protective Services Office (IM-PSO). The Chief, Protective Services Office, has the functional management responsibility for the security program at KSC.

6.2.1.2 Chief, Security Operations Office (IM-PSO-2). The chief, Security Operations Office, is responsible for the security and fire protection programs at KSC.

6.2.1.3 Chief, Fire and Rescue Office (IM-PSO-3). The chief, Fire and Rescue Office, is responsible for fire rescue operations, fire prevention inspection, fire protection engineering and criteria, and flight crew rescue.

6.2.1.4 Payload Owner or Operator. The customer is responsible for:

a. compliance with existing regulations

b. identifying unique security requirements

c. coordinating daily operational security support requirements through the LSSM

6.2.1.5 LSSM. The LSSM is responsible for:

a. scheduling customer security support

b. serving as or designating a point of contact to coordinate access requirements between the KSC Security Office and the customer

c. identifying unique security requirements to the KSC Security Office

d. reporting security discrepancies to the KSC Security Office

6.2.2 ACCESS CONTROL SYSTEMS.

6.2.2.1 Payload Access Control System (PACS). Entry into the KSC facilities (O&C Processing Area, VPF, SAEF-2, PHSF, OPF, pad) is controlled by the PACS. Personnel will be allowed to enter the facilities if they possess a KSC Area Permit (KSCAP) with the applicable operational codes or a "no-escort required" temporary area authorization (TAA) with the applicable operational codes.

6.2.2.2 Electronic Security System (ESS). The ESS consists of a Personnel Access Control and Accountability System, an intrusion door alarm system, and a motion detection system. The ESS provides a method of controlling access at selected facilities on KSC and can provide access control and surveillance during non-operating hours, weekends, and holidays.

6.2.3 KSC General Access Requirements. U.S. citizens requiring access to KSC or CCAS do not need to possess a clearance or have a visit request containing clearance information on file at the KSC Security Office. Persons making an unclassified visit or a visit not requiring unescorted access into security controlled areas may be authorized issuance of a badge or pass by the person to be visited through established badging channels. (Reference section 12, KHB 1610.1F, *KSC Unescorted Access and Personnel Reliability Program* and KHB 1610.2 *Personnel Security Handbook*.) Foreign nationals requiring access to the Launch Complex 39 area shall be escorted at all times. Customers must coordinate all visit requests to KSC or CCAS with the LSSM.

6.2.3.1 Unescorted Access. Although a "security clearance" is not required, a person requiring unescorted access into the controlled PPF or payload-related controlled areas must be investigated under the Personnel Reliability Program (PRP) or be certified for Unescorted Access (UA) PRP from another NASA Center in order to have UA, even those working on a classified contract with a clearance on file at KSC. Those persons with clearances on file may be granted interim UA upon receipt of complete and properly executed forms. Refer to Chapter 5, KHB 1610.2, Unescorted Access and Personnel Reliability Program. In addition, personnel must meet the criteria listed in either a. or b. below:

a. Government Investigation. A National Agency Check (NAC) must be requested for those individuals without a "security clearance" provided by the Defense Industrial Security Clearance Office or who have not been cleared during the past year. Individuals who have no usable clearance or KSC investigation must be escorted in controlled areas at KSC until an investigation and necessary training/walkdown have been satisfactorily completed.

NAC's often take 3 months to complete; therefore, submission of the necessary investigative forms as far in advance as possible of the contemplated arrival at KSC can significantly reduce the escort period after arrival.

Addressees who are aware of individuals requiring investigation should contact their KSC Resident Office or their LSSM for information regarding the required forms and further instructions regarding their preparation and submission.

NOTE

Foreign National and U.S. citizens affiliated with non-U.S. firms or U.S. firms with foreign contracts must request accreditation through the NASA Office of International Affairs (OIA), code LIC, Washington, D.C. The KSC Security Office will in turn be advised by OIA when these individuals are approved for area access. Foreign Nationals requiring access to the Launch Complex 39 area shall be escorted at all times.

b. Security Clearance. If a person possesses a current U.S. Government granted clearance, the security office of record should send a "Visit Request" to the John F. Kennedy Space Center, NASA, Attn: Visitor Records Center, IM-PSO-VRC, Kennedy Space Center, FL 32899, verifying this information.

(1) Full name of visitor

(2) Social Security Number

(3) Date and place of birth

(4) Name and address of visitor's organization

(5) Purpose of proposed visit

(6) Date(s) of proposed visit

(7) Name of KSC contact who is aware of visit

(8) Level of clearance

(9) Date clearance granted

(10) Who granted clearance

(11) Basis of the clearance, if known (such as background investigation, National Agency Check, etc.)

NOTE

In case of emergency, the above information may be telephoned by proper authority to Area Code 407-867-7763,, and immediately confirmed in writing.

6.2.3.2 **Personnel Reliability Program.** Personnel in mission critical positions must meet established screening requirements, which include a favorably adjudicated update investigation. The PRP supplements the DOD and NASA program requirements for security clearances. (Reference Chapter 5, KHB 16120.2, and KMI 1610.1F.)

PRP certification is dependent upon receipt of required investigative forms with sufficient lead time to allow normal processing. The customer's KSC Resident Office or their LSSM will supply the required forms and any additional details required for payload personnel.

6.2.3.3 **Safety Training.** Specific safety training (classroom lectures or video tapes) is required to have unescorted access into the PPF's, HPF's, pads, and PCR's. Training verification is by possession of a KSCAP or an "unescorted" TAA. Refer to KVT-PL-0010, Space Transportation System and Facility Operations Security Plan.

NOTE

Personnel not meeting all of the criteria identified in the paragraphs above will be issued badges, passes, and/or permits in accordance with KHB 1610.1A and will be escorted by a person meeting the criteria.

6.2.4 **PAYLOAD SECURITY PLANS.** Each mission may have unique security access controls dictated by the requirements of the payload contractor, NASA, and/or DOD. Therefore, existing security plans will be modified to accommodate these unique requirements.

6.3 RADIATION CONTROLS

In addition to the criteria on radiation set forth in KHB 1700.7, ERR 127-1, and WRR 127-1, the following policies of paragraphs 6.3.1, 6.3.2, and 6.3.3 apply.

6.3.1 RADIATION PROTECTION. As authorized under KMI 1860.1, KSC exercises centralized control of ionizing and non-ionizing radiation sources to assure that exposures to personnel are restricted and maintained at levels that are as low as reasonably achievable. Organizations intending to use or possess such sources must comply with KSC's Radiation Protection Program requirements as established in KHB 1860.1A, Radiation Protection Handbook (for ionizing sources such as radioactive materials, X-ray machines and devices, and accelerators) and KHB 1860.2, KSC Non-Ionizing Radiation Protection Program RF and microwave equipment, lasers, optical sources. Major radiation sources such as RTG's, nuclear reactors and assemblies, and high intensity accelerators are subject to additional control requirements due to their special nature.

Particular attention should be given to requesting approvals for radiation sources at KSC as early as possible (6 months lead time before hardware arrival). Specific controls will be imposed on a case-by-case basis after appropriate review and approval.

6.3.2 RADIATION SAFETY. KSC controls all radiating devices during hazardous operations to prevent damage to equipment and facilities and to avoid injury to personnel. Enforcement of radiation safety controls is covered in KHB 1710.2. General controls include:

a. <u>Transfer of Liquid or Gas Fuels</u>. Liquid or gas fuels shall not be transferred within the maximum energy range (calculated or measured) of 5 W/cm² peak power density of RF radiating equipment.

b. <u>RF Silence</u>. RF silence will be directed for specific phases of operations, installations of electroexplosive devices, and during other hazardous operations. The test supervisor will notify the System Safety Supervisor that RF silence exists.

c. <u>Laser Beams</u>. Laser beams will not be directed toward flammable or explosive materials, liquids, gases, or vapors.

6.3.3 FREQUENCY AUTHORIZATION. All organizations intending to operate microwave or RF transmitters at KSC must obtain prior approval in accordance with KMI 2570.1 for appropriate frequency allocation.

6.4 INDUSTRIAL HYGIENE

KSC's policy is to keep the potential for personnel exposures to hazardous materials and harmful physical agents as low as feasible. Applicable policies and requirements are provided in KMI 1800.1, KSC Environmental Health Protection Program, KMI 1800.2, Chemical Hazard Communication, KMI 1840.3, Industrial Hygiene Program, and KHB 1840.1, Industrial Hygiene Handbook. General requirements include, but are not limited to:

a. A descriptive listing of all activities involving the potential for personnel exposures to hazardous materials or physical agents must be provided to the Biomedical Operations and Research Office by the customer organization.

b. The customer must compile and maintain an inventory of all hazardous materials to be used. Associated Material Safety Data Sheets will be maintained at the worksite by the customer organization.

c. Customer organization activities involving hazardous materials or physical agents are subject to monitoring and assignment of additional protective measures by the KSC Industrial Hygiene Officer.

d. Planned releases of hazardous materials and waste are prohibited unless approved in advance by the Biomedical Operations and Research Office.

6.5 HAZARDOUS AND CONTROLLED WASTE

In advance of their arrival, customers will fill out KSC Form 26-551, "Process Waste Questionnaire," for any hazardous and controlled waste they expect to generate at KSC during processing. All waste generated at KSC will be managed in accordance with the requirements of KHB 8800.7, *Hazardous Waste Management*. Process waste questionnaires should be submitted to the LSSM 90 days prior to the generation of waste at KSC.

Once a customer has identified launch site waste generations, a satellite accumulation area (SAA) will be set up in facilities denoted as points of generation of these wastes.

These SAA's will be established in order to comply with the intent of the Resource and Recovery Act of 1976, which was established to institute a national program to control the generation, storage, transportation, treatment, and disposal of hazardous and controlled waste.

Customers should coordinate any waste operations or problems with their assigned LSSM. Regulations for the use of, control of, and disposal of waste at the launch site are strictly enforced.

SECTION VII

QUALITY ASSURANCE

7.1 GENERAL

This section describes the quality assurance responsibilities during processing of payloads at KSC, CCAS and VAFB. Three areas of activities with quality assurance responsibilities will be addressed:

a. Customer payload processing

b. Payload integration

c. Orbiter integration

Refer to Appendix B, Glossary, for definitions of these terms.

7.2 QUALITY/MISSION ASSURANCE RESPONSIBILITIES

KSC Quality Assurance and Mission Assurance organizations involved in payload/experiment processing require the participation of representatives from customers, carriers (such as, the Inertial Upper Stage (IUS), and Spacelab) KSC Space Shuttle and Payload Integration contractors. Payload/experiment integration operations are performed by the PGOC and NASA. Throughout all launch site processing, the payload/experiment customer is responsible for assuring launch readiness of their payload/experiment.

7.2.1 OTHER RESPONSIBILITIES. The KSC Quality Assurance and Mission Assurance organizations will perform Quality Assurance and Mission Assurance functions in accordance with the KSC Structured Surveillance Program, which is a new method used in operation and test activities to: identify and remove defects; attain first time quality in Operations and Maintenance; become more efficient in performing the tasks; and decrease overall process flow time. This will be accomplished through the efforts of engineering, operations, and quality, working as a team, to identify these defects. Inspections will be reduced using a structured sampling method of work performed, and performing surveillance of areas and work in progress. When surveillance data identifies processes that exhibit unacceptable trends or exceeds established thresholds, Process Analysis/Control techniques will be used to determine error rate, identify root cause, and seek positive correction action. The avenue used for data collection in the Structured Surveillance System is the Quality Surveillance Record (QSR). Management uses this information to concentrate on inspections, sampling, and area surveillance in areas showing unacceptable trends. The QSR data is used to track first time quality by contractor technicians, quality, and engineering personnel.

The KSC controlled activities on payloads/experiments generally begin when the payload arrives at the KSC. KSC will perform quality assurance and mission assurance functions for integrated testing operations and will maintain cognizance of payload/experiment problems which occur during customer standalone operations. The customer must provide continuing status of problems on flight hardware/software or GSE which potentially constrain mission milestones.

Although customers may choose to use their own Reliability and Quality Assurance (R&QA) documentation system throughout all activities at the launch site, the KSC R&QA documentation system (PRACA) will be used as the official problem tracking and closeout reporting system for all integrated activities. The customer will be required to support disposition of these problem reports.

However, the customer may elect to establish a memorandum of understanding or letter of delegation with the KSC Quality Assurance and Mission Assurance organizations. In these instances, the responsibility for quality assurance and mission assurance activities will be conducted in accordance with these agreements.

7.2.2 ELV RESPONSIBILITIES. The ELV customer maintains processing responsibilities for the payload throughout the entire mission flow. However, the customer may elect to establish a memorandum of understanding or letter of delegation with the KSC Quality Assurance and Mission Assurance organizations. In these instances the responsibility for quality assurance and mission assurance activities will be conducted in accordance with these agreements.

SECTION VIII

DOCUMENTATION AND SCHEDULES

8.1 GENERAL

This section describes typical payload-related activities that customers must consider in their planning, the customer-supplied documentation, KSC-developed documentation, and schedules for payload operations at the launch site.

Sample milestone schedules for Space Shuttle and ELV payload launch-site documentation are shown in figures 8-1 and 8-2 respectively. The PIP documents additional milestones for Space Shuttle payloads.

8.2 CUSTOMER PLANNING OVERVIEW

The functions described in the following paragraphs are typical for the processing of any payload. These functions are defined to assist the customer in the development of payload launch-site requirements for a specific payload.

8.2.1 PAYLOAD TRANSPORTATION TO THE LAUNCH SITE. The launch site can receive payloads shipped by air, land, or water at KSC and CCAS or by air and land at VAFB. (Refer to KCS-PL-0012.0, Payload Operational Logistics Plan for Space Shuttle payloads and Space Station Alpha.) The payload owner is, however, responsible for all off-site transportation as well as for transportation during customer processing and until arrival at the integration facility (i.e., VPF, O&C, SSPF, at KSC and for ELV's at CCAS or Building 836 at VAFB).

8.2.2 RECEIVING INSPECTION. The customer is responsible for delivery to KSC and physical inspection of the payload at the launch site. Receiving inspection includes review of shipping documentation associated with the specific payload and special documentation is required if the payload contains or involves hazardous materials (see section VI on safety requirements).

8.2.3 ASSEMBLY OPERATIONS. Assembly involves those operations necessary to build up payload components and subsystems into module or element configurations. These operations may be conducted during customer processing onsite or offsite, or both.

8.2.4 TESTING. Tests are performed in the PPF or HPF to verify payload integrity and functional operation of components, subsystems, and systems. These tests are conducted during customer standalone processing and primarily involve GSE provided by the customer.

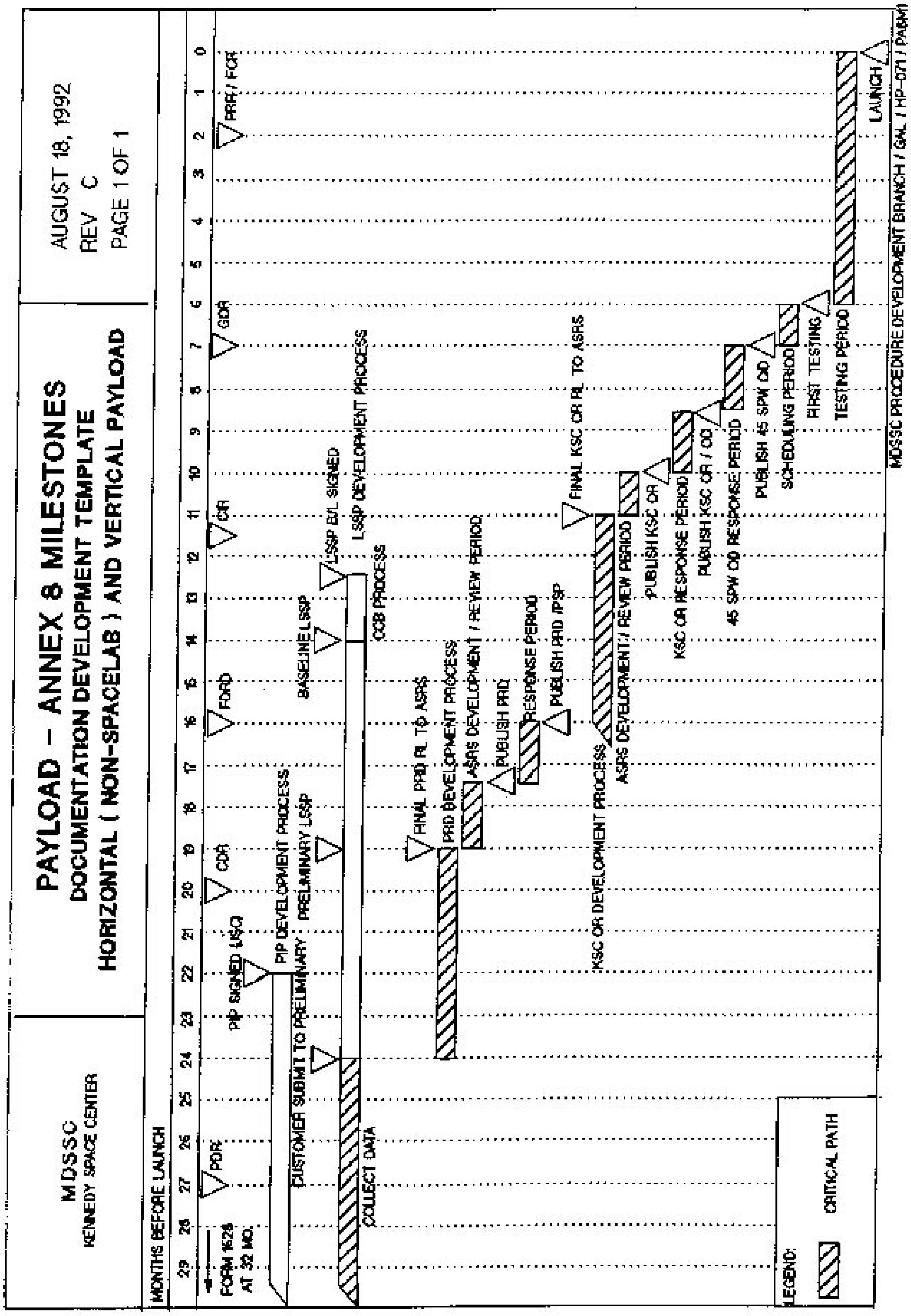

Figure 8-1. Space Shuttle Payload Documentation Development Template (Sheet 1 of 2)

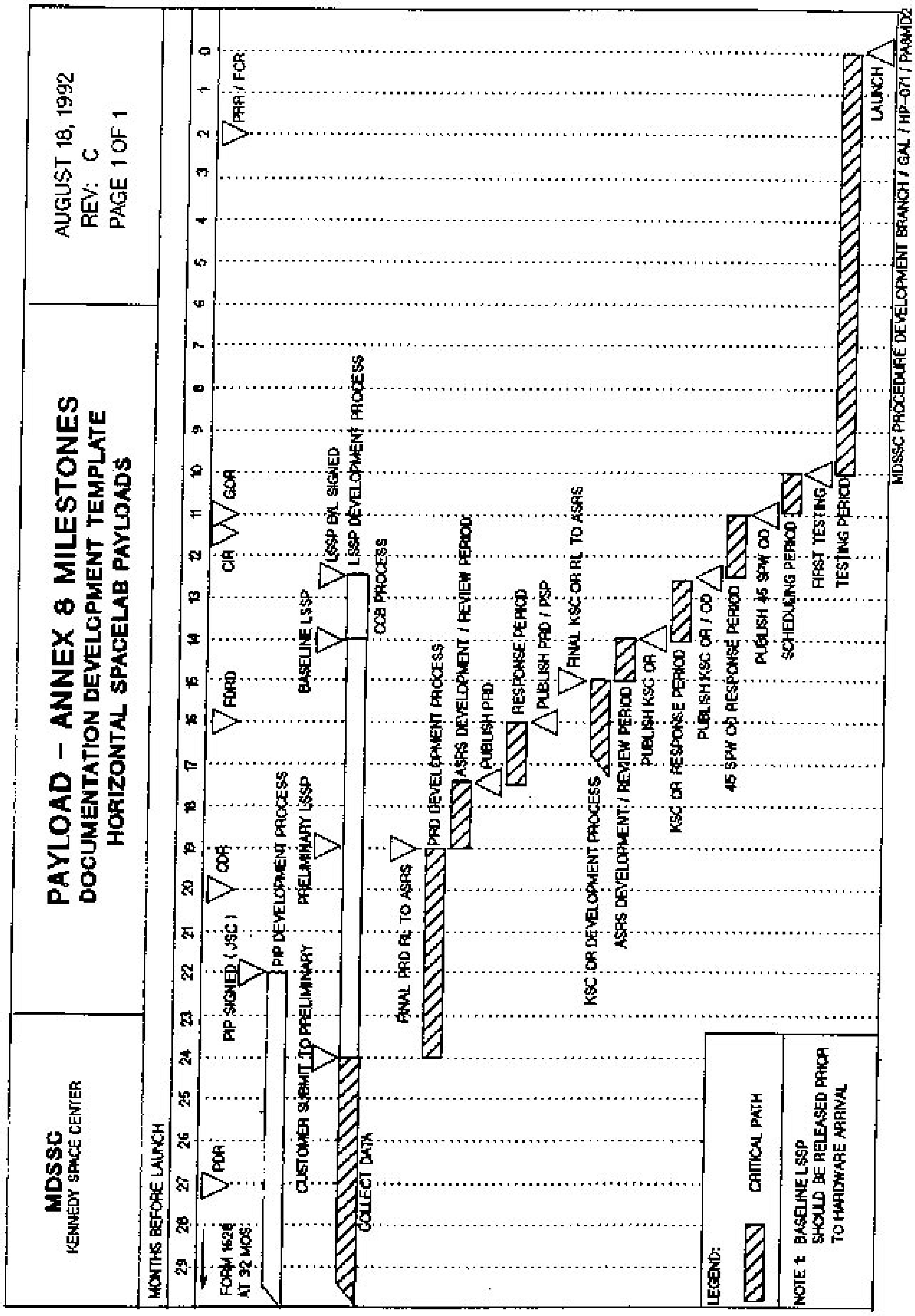

Figure 8-1. Space Shuttle Payload Documentation Template (Sheet 2 of 2)

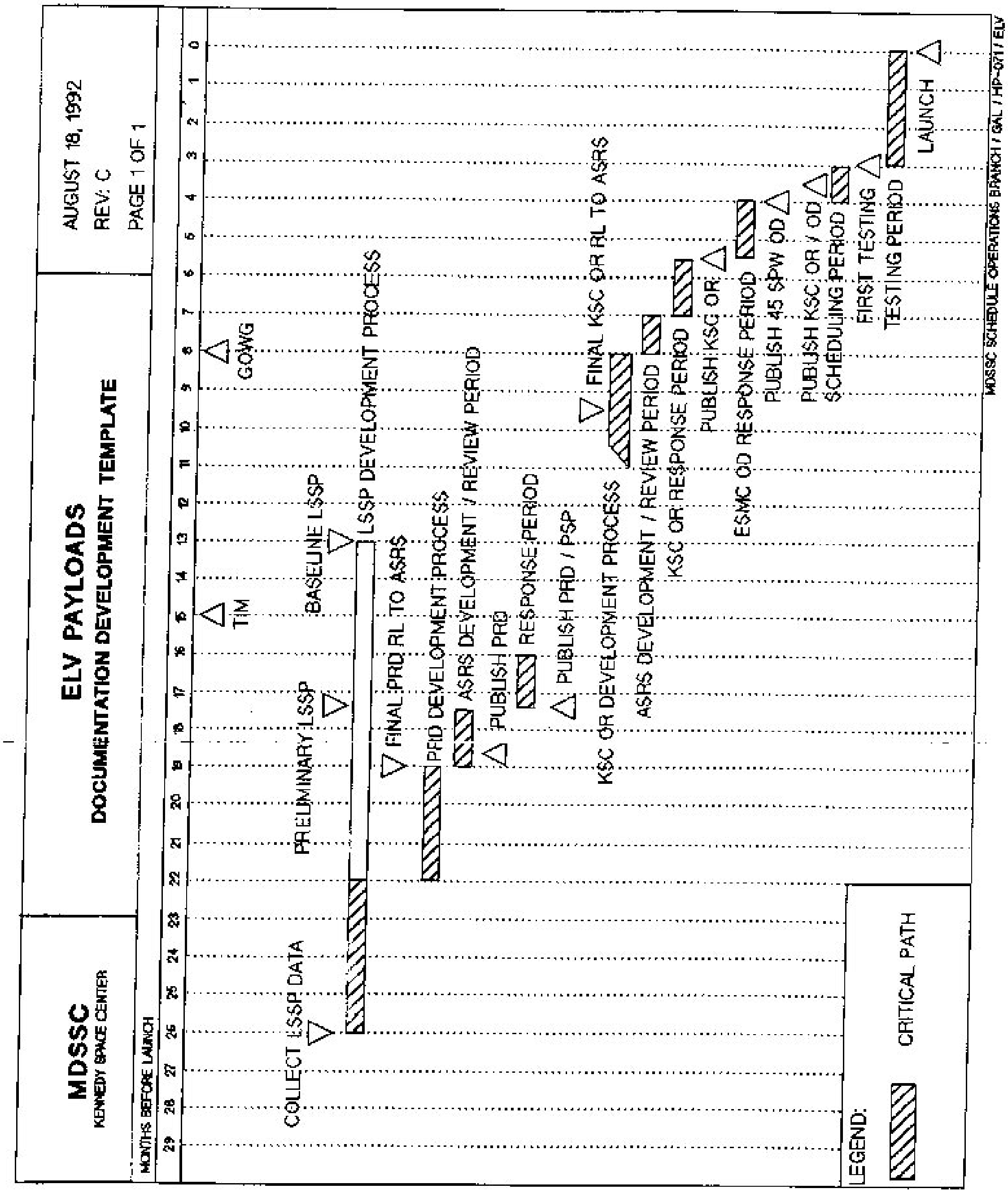

Figure 8-2. ELV Payload Documentation Development Template

RELEASED

8.2.5 SERVICING. Servicing includes such tasks as propellant loading, battery charging and activation, film loading, and installation of solid propellant motors and explosive operation devices. Servicing functions are primarily conducted during customer processing. Many of the servicing functions involve hazardous operations; close coordination with KSC Safety must be maintained during these operations.

8.2.6 PAYLOAD-TO-LAUNCH VEHICLE INTERFACE VERIFICATION

8.2.6.1 PAYLOAD-TO-ORBITER INTERFACE VERIFICATION. The customer is responsible for verifying compatibility with the interfaces and environments specified in the PIP and applicable ICD's. The interface verification requirements and planning will be negotiated and concurred in by the SSP and the customer.

All payload-to-orbiter interface verification requirements are to be identified and submitted by the customer in PIP Annex 9, Payload Interface Verification Requirements, in accordance with the schedule in PIP section 15.0. Those interfaces that cannot be verified prior to flight shall also be documented in Annex 9 or in the PIP with supporting rationale. The format of the interface verification requirements is specified in the NSTS 21000-A09.

All payload configurations require a CITE IVT as a baseline. Processing of repetitive payload configurations will be evaluated by the SSP to determine if CITE testing should be a continuing requirement. The SSP recommendation will be developed and coordinated with the customers. Examples of considerations that enter into this evaluation are: interface complexity, payload design changes, orbiter design changes, flight software changes, extent of flight software involvement (number of formats, commands, measurements), and new test requirements.

When orbiter software is utilized by the payload, the applicable mission phase software (latest version) will be used to support interface testing.

Interface verification tests will also be conducted in the orbiter by the SSP. These tests will verify all payload-to-orbiter interfaces.

8.2.6.2 PAYLOAD-TO-ELV INTERFACE VERIFICATION. Typically, the ELV contractor is responsible for payload-to-ELV interface verification based on mission peculiar documentation. The customer will be given the opportunity to input and review all interface verification procedures. The payload customer is required to participate with the launch vehicle in various tests such as practice countdowns.

8.2.7 LAUNCH OPERATIONS. Launch operations involve the countdown and pad operations. Only preplanned payload operations can take place during the countdown. Launch recycle, scrub/turnaround, and return to launch site procedures will be developed with inputs from the customer.

8.2.8 MISSION SUPPORT. Support at KSC during a mission may be provided through a POCC, which is set up at the customer request. This support must be requested through the LSSM.

8.2.9 POSTLANDING. Postlanding processing for Space Shuttle payloads includes those activities described in paragraphs 3.4 through 3.4.3. For payloads scheduled for reflight, refurbishment activities are begun to restore the payload to flight status for the subsequent mission. This course of action could include offsite repair, modification, and checkout or onsite maintenance, repair, and checkout. The refurbished payload would re-enter a flow at the appropriate point in a subsequent flight. Refurbishment could include addition of desiccants, protective covers to preserve the hardware during storage, or removal of perishable goods. Although this is not the prime role of KSC, close coordination with the LSSM is required to use KSC resources for this purpose. The KSC does onsite maintenance, repair, and checkout of payloads for reflight, depending on type and ownership of the payload.

8.3 REQUIREMENTS CHECKLIST

A payload processing requirements checklist is available upon request in matrix form and keys typical processing requirements to standard functions. The checklist suggests requirements that may be imposed by a customer during launch site processing operations.

8.4 CUSTOMER-SUPPLIED DOCUMENTATION

Customers must submit requirements for processing their payloads at the launch site. Information, even incomplete, is desirable as soon as possible, because long lead times may be needed to provide support. As requirements develop, the original input is revised and changes are submitted to the basic requirements. As indicated previously, refining payload ground support requirements and matching them to launch site capabilities is a continuous process performed by the LSSM and customer organization.

Customers are required to provide Integration Data Packages in accordance with the Hardware Turnover Integration Data Pack appendix to their LSSP.

A description of the documentation required from the customer is listed in the following paragraphs. The items may be combined into an integrated payload requirements document.

8.4.1 CUSTOMER PAYLOAD PROCESSING GROUND OPERATION AND CHECKOUT PROCEDURES. The payload customer processing ground operation and checkout procedures are prepared by the customer organization and serve as the controlling and work authorization document for PPF and HPF test and operation. The procedures should provide the detailed, step-by-step sequence of each specific test or operation to accomplish specified objectives. Although these operations and test procedures do not have to conform to the same content and format as payload and launch vehicle integration procedures, the KSC safety requirements still apply. Customer-prepared and performed procedures for hazardous activities are reviewed by CM, PGOC, KSC Safety, and 45 SW Safety. All customer prepared procedures are reviewed by CM for compatibility with facilities, systems, and any controlling documents. The identification of hazardous operations must comply with section V; this requirement includes stand-alone procedures for the laboratories as well as subtasks to KSC or launch vehicle procedures. Section V of KCA-HB-0018.0 contains information for customer processing ground operations and checkout procedures. Operation and checkout procedure documentation is further addressed in paragraph 8.4.3.

8.4.2 FACILITY REQUIREMENTS. Early determination of facility requirements at the launch and landing site for each customer is necessary. This determination should be initiated in the conceptual phase of project planning. A lead time of up to 5 years is required when major new construction is contemplated. The customer payload facility requirements are evaluated by the LSSM. Areas that make optimum use of existing facilities are assigned to the customers. If no suitable facility exists or if modifications are required, the facility that is best suited for the task and requires the least modification is selected. When customer facility requirements necessitate major modifications to existing buildings or the construction of a new facility, the customer assumes funding responsibility. Coordination meetings are held with customer and launch site personnel to assure that all requirements have been met. Payload requirements in the launch complex or orbiter integration facilities are coordinated through the LSSM.

8.4.3 OMRSD. Space Shuttle payload test and checkout requirements, including specifications and pass or fail criteria that the customer requires the launch and landing site to perform, are contained in the OMRSD.

8.4.3.1 Integrated Operations and Maintenance Requirements and Specifications (OMRS). Customer OMRS for payload-to-orbiter (including CITE) interface testing will be developed by the customer, the KSC, and the JSC. These OMRS's will be documented in the PIP Annex 9, as defined in the Payload Interface Verification Requirements NSTS 14046, and will also be documented in KSC's SPDMS OMRSD, File II, Volume 2, as defined in OMRSD, NSTS 08171, File I.

8.4.3.2 Payload Element-Unique OMRS. This subsection identifies customer OMRS for testing of payload elements prior to mating with the orbiter.

a. Spacelab and Spacelab Payload OMRS - Customer OMRS for testing the Spacelab systems and subsystems are developed by the MSFC and documented in KSC's SPDMS OMRS, File VII, Volume I, as defined in OMRSD, NSTS 08717, File I. The payload experiment OMRS is provided by the developer to KSC in OMRSD File VII, Volume II.

b. All Other Payload Element OMRS Customer OMRS for all payload elements not included in a. above will be developed by the customer and JSC. These OMRS will be documented in PIP Annex 9, and will also be documented in KSC SPDMS OMRSD, File VIII as defined in OMRS, NSTS 08171, File I.

8.4.4 LAUNCH COMMIT CRITERIA. Launch commit criteria required by NSTS 07700, Volume XIV, are developed by the customer and submitted in accordance with PIP Annex 3, Flight Operations Support Annex.

For ELV payloads, the customer will be required to supply launch commit criteria.

8.4.5 CUSTOMER DRAWINGS. Drawings for all payload launch configurations will assist KSC to evaluate customer requirements for access to specific payload coordinates at various times in the payload processing cycle, e.g., at the PCR. For Spacelab and partial payloads, the customer will provide an as-designed engineering configuration list (ECL) and the associated drawings for experiments and MPE which will be assembled/installed/tested by KSC.

8.4.6 PAYLOAD GSE. Information and documentation involving the payload and payload-unique GSE is required to allow for proper location and positioning. The information should include size, weight, cabling lengths, hook heights as applicable, and KSC facilities where the GSE is required.

8.4.7 ACCESS REQUIREMENTS. A list of locations (in orbiter and launch vehicle coordinates) requiring access and overall payload configuration drawings are needed to determine access platform requirements. A description of the operation being performed at each location should be provided to aid in determining platform size, loading, and relative location.

8.4.8 OFF-SITE OPERATIONS PLAN. For Space Shuttle payloads, the customer will provide information on the support and equipment needed for removal of the payload at a landing location other than KSC. This information will be included in the mission specific annex to the KVT-PL-0014, *Off-Site Operations Plan*, prepared by KSC.

8.5 KSC-DEVELOPED DOCUMENTATION

Documentation developed by KSC and provided to the customer includes the LSSP, Operations and Maintenance Documentation (OMD), PRD/PSP, and various schedules.

8.5.1 LAUNCH SITE SUPPORT PLAN. The LSSP, which is required for all payloads and is also Annex 8 to the SSP Payload Integration Plan, is the KSC contractual commitment to the customer's requirements. The LSSP includes all program coordination and planning before arrival of hardware at KSC.

Any variation between program planning and launch site capability is negotiated through the LSSM, and resulting decisions will be documented in the LSSP. The baseline issue evolves from the preliminary issue of the LSSP. The baseline issue is the launch site commitment to provide specific facilities, support equipment, support services, and testing to the customer.

8.5.2 KSC OMD SYSTEM. For Space Shuttle payloads, the KSC OMD system is described in K-STSM-12.8 and controls integrated Space Shuttle operations at the launch and landing site. The OMI's are prepared to control all integrated tests and operations. These instructions contain detailed, step-by-step procedures for performing each assembly, inspection, test, and operation. Customer requirements, supplied in accordance with subsection 8.4.4, are included in these OMI's. The KSC develops these OMI's in accordance with the *NASA/DOD Test Operating Procedures (TOP's) Preparation Handbook,* S00000-2, File I*, and the CM Work Authorization Documentation Handbook,* KCA-HB-OO18.0.

Typical OMI's are:

a. integrated test procedures used during simulated orbiter-to-payload integration testing

b. integrated procedures for verifying the payload to orbiter and experiment to Spacelab interface

c. countdown procedure

d. recycle procedures in case of launch scrub

e. postflight safing and deservicing procedures for both normal and aborted landings

Customer standalone procedures are sometimes referenced in an OMI and are performed as subtasks to the OMI. In these cases, the subtask procedures must be reviewed with the OMI. The KSC shall develop a requirements allocation matrix of the OMRSD and the TOP that implements the requirements, including sequence and step where appropriate.

8.5.3 AS-BUILT CONFIGURATION LIST (ABCL). For Spacelab and partial payloads, KSC will develop an ABCL for which the customer has provided an ECL. (Per paragraph 8.4.6). The ABCL shows the TOP which assembles/installs the experiments and the MPE.

8.5.4 PRD/PSP, Operational Requirements/Operational Directives (OR/OD). For both ELV and Space Shuttle payloads, the KSC PRD presents the customer support requirements in a payload-unique annex. The PSP commits to support the PRD requirements. The OR's are prepared from the PRD and identify the arrangement or utilization of existing resources, either hardware or manpower, for a major test or activity. The OD's are written in response to the OR's and specify the arrangement or utilization of existing resources, hardware or manpower, for the specific test or activity. Templates utilized by KSC for developing documentation production schedules are shown on figures 8-1 and 8-2.

8.5.5 KSC SCHEDULES. The KSC schedules document the time phasing of payload activities at the launch and landing site, including preparation of the required facilities. The operational and facility modification schedules for payload operations at the launch site become more specific as payload processing is defined, and they vary with the complexity and development time for various payloads. Payload operational data are required as input to KSC schedules for various planning purposes. Examples of these schedules are contained in the following subparagraphs.

8.5.5.1 <u>Overall Payload Flow Schedule</u>. An overall prelaunch and postlanding payload flow schedule identifies the processing of a payload from its arrival at the launch site to its launch, as well as any postlanding operations (where applicable). The overall flow shows operations necessary to integrate the payload with other flight elements and includes simulated and actual interface verification. The Master Milestone and Mission Assessment Schedules are examples.

8.5.5.2 <u>72-Hour/11-Day Schedules</u>. Launch site work schedules are 2-week time lines known as 72-hour/11-day schedules, as illustrated in figure 8-3. These schedules take a section of the overall flow and expand the detail to show all tasks planned and the required support during the 2-week period. The first 3 days (i.e., 72-hours) of these schedules are projected by hour, and the last 11 days are projected by shift for planning purposes. Working schedules are updated daily with coordination by all affected elements (payloads, orbiter, external tank, solid rocket booster, and Spacelab).

8.5.5.3 <u>Facility and Equipment Utilization Schedules</u>. These are used by KSC to support resource planning.

8.5.5.4 Facility Modification Schedules. These modification schedules identify those actions necessary to modify existing facilities to support different payload requirements. Early identification for new or modified facility requirements is essential. The need date from the customer is critical for these requirements because lead times may be 5 years for design, construction, and activation.

8.6 GROUND SUPPORT REQUIREMENTS DOCUMENT

Life science payloads deviate from the standard payload processing flow outlined in paragraphs 3.2 and 3.5.2. Therefore, the science operations and maintenance requirements for the LSSF, Hangar L on CCAS, under the direction and management of the KSC MD, are in the Ground Support Requirements Document.

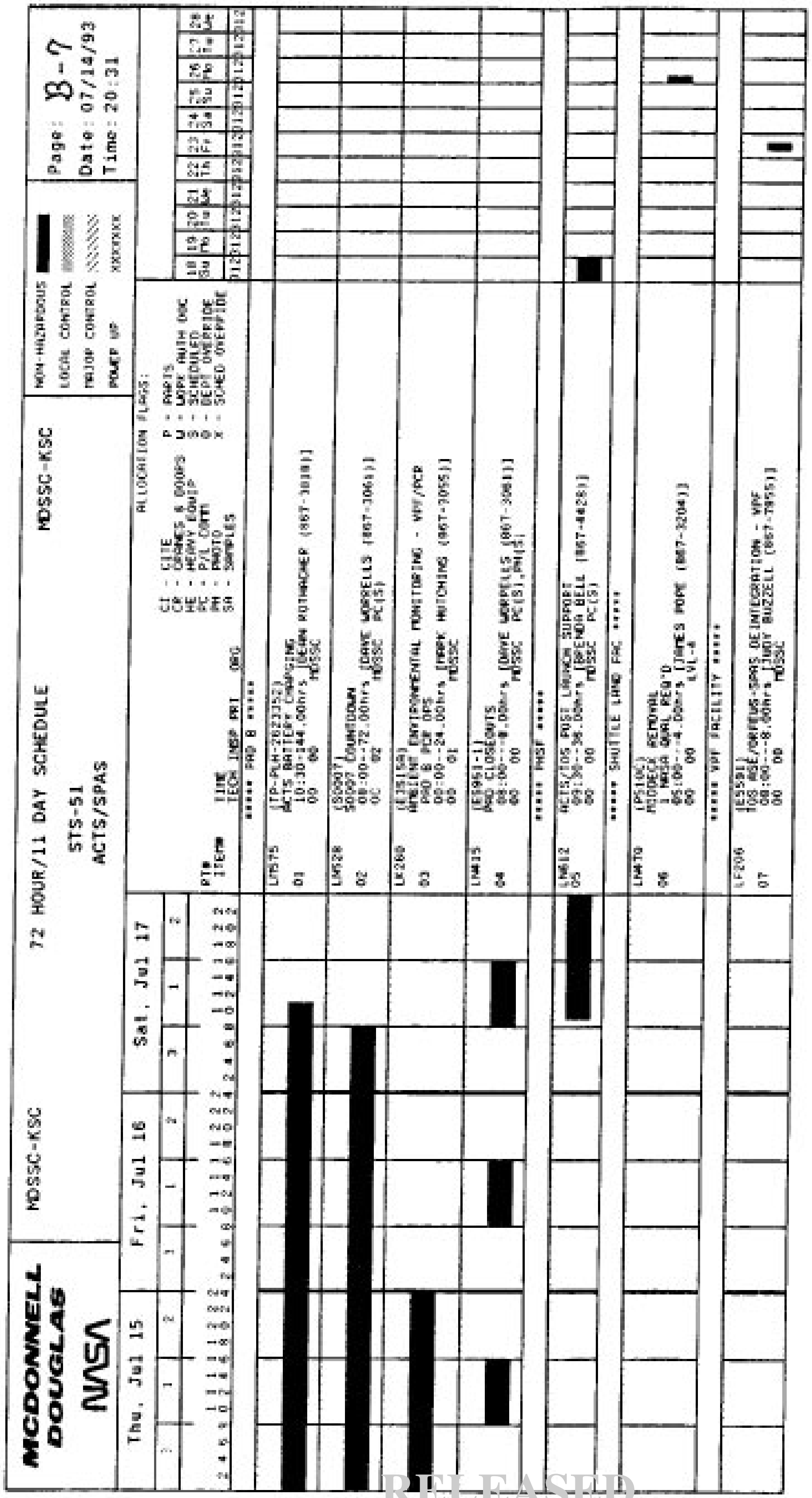

Figure 8-3. Typical Schedule from PICS

SECTION IX

CUSTOMER CHARGES

9.1 GENERAL

NASA policy and prices on reimbursement for use of the Space Shuttle are contained in the latest issues of the STS User Handbook, published by NASA Headquarters; and JSC 11802, STS Reimbursement Guide published by JSC. The policy and prices on reimbursement for use of NASA facilities, equipment, and services at the KSC are contained in JSC 11802. Reimbursement policies on KSC payload processing facilities and KSC launch site support services that are not covered by the standard customer charge are detailed in this section.

9.2 STANDARD CHARGES

The standard customer charge covers these launch site support services:

a. Launch Site Participation. Conducted by mutual agreement, primarily during payload design reviews.

b. Review of all Payload Specifications and Test Data. This is required by NASA to determine operational safety and compatibility of the payload with the launch site processing facilities and systems.

c. Transportation. Space Shuttle customer payload transportation from the location where the simulated orbiter-to-payload interface verification test is normally

d. Installation into CITE and Orbiter. Installation of the customer payload into the CITE equipment, if required, and installation into the orbiter.

e. CITE Testing. Simulated orbiter-to-payload interface verification and compatibility testing in the CITE equipment, which includes use of the engineering support area and Management Support Area in the O&C.

f. Interface Testing. Orbiter-to-payload interface verification either in the OPF or on the pad before launch.

g. Launch Operations. Pad operations through launch, which includes use of the engineering support area and Management Support Area in the LCC.

h. Payload Removal. Removal of a payload that returns to the prime landing site.

i. Payload Removal at a CONUS or Non-CONUS Landing Site. Removal of a payload from the orbiter if it cannot be ferried in the orbiter to KSC from a CONUS or non-CONUS landing site. Also, NASA will be responsible for returning removed payloads to the launch site using customer-supplied handling equipment and shipping containers.

NOTE

Launch site support services for optional flight systems (flight kits, upper stages, Spacelab) are included in the price negotiated for use of these optional systems. See the STS Reimbursement Guide for customer charges for these options.

9.3 ORBITER INTEGRATION SUPPORT

All orbiter integration activities are considered optional except for interface verification testing. Any planned impact to orbiter timelines will incur an optional service charge to a customer. Optional charges are levied for any support services that are provided that would not have otherwise been provided to support standard Space Shuttle operations.

9.4 CUSTOMER PAYLOAD PROCESSING SUPPORT

All KSC-provided payload-unique support is considered an optional service. Use of KSC's payload processing facilities is an optional service charge, and all customers will pay an operation and maintenance charge for use of the following payload processing facilities:

a. SAEF-2

b. Building AE

c. Building AO

d. O&C, except CITE equipment

e. LSSF

f. VPF, except CITE equipment

g. PHSF

The price includes utilities and basic janitorial support. Non-NASA users of these facilities pay an additional charge that is a "use charge" (in lieu of depreciation or replacement cost recovery).

9.5 SUPPORT SERVICES

Optional support services may be provided during both orbiter integration and customer payload processing operations. The JSC 11802, STS Reimbursement Guide, describes reimbursement policy and prices for these services.

9.6 OPTIONAL SERVICE PACKAGES

Several optional service packages can be offered to customers for a fixed price. Packages have been developed for classes or types of payloads, such as a basic deployable satellite and upper stage. Description and price for these packages are documented in the STS Reimbursement Guide or may be obtained from CG-LSO. Use of an optional service package to provide launch and landing optional services will be documented in the PIP and LSSP, along with any additional optional services that are required.

9.7 OPTIONAL SERVICE CHARGES

These charges are defined through the PIP system. Preliminary optional service definitions are jointly developed between KSC and the customer. Prices for the launch and landing preliminary optional services are determined by KSC and included in the PIP for planning and budgeting purposes. Firm pricing sheets are prepared 90 days before a given optional service activity starts. Services are performed after receipt of monies. Once the PIP has been negotiated and signed, any additional requirements or requirement changes will require an official change to the PIP along with additional monies as appropriate.

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SECTION X

PUBLIC AFFAIRS

10.1 GENERAL

This section outlines functions of the NASA KSC Public Affairs Office, Mail Code PA; its Staff Office, Mail Code PA-PSE; Public Information Branch, Mail Code PA-MSB**;** Visitor Center Office, Mail Code PA-VCB; and Education and Awareness Branch, Mail Code PA-ESB, related to customer public affairs activities.

10.2 RESPONSIBILITIES

10.2.1 PUBLIC AFFAIRS STAFF OFFICE. This office is responsible for the protocol, guest activities, and programs to accommodate distinguished visitors to KSC. It is also responsible for planning and carrying out plans for allowing general public viewing of Space Shuttle launches and other special activities on KSC. This branch handles the "Manned Flight Awareness Program" at KSC.

10.2.2 PUBLIC INFORMATION BRANCH. This branch is responsible for KSC's relations with the various news media, the preparation of news releases on NASA programs and activities at KSC and the development and conduct of programs to inform the public concerning Center activities and operations. The Media Services Office is also responsible for coordinating still and video photographic support used for external purposes.

10.2.3 VISITOR CENTER OFFICE. This office is responsible for overseeing the operation of the KSC visitor center "Spaceport USA" and its associated bus tours of the center for the general public. It also acts as the interface between the concessionaire, TW Recreational Services, and organizations desiring to use the facilities for various special events.

10.2.4 EDUCATION AND AWARENESS BRANCH. This branch is responsible for KSC relations with the academic community including schools and universities. It conducts a wide range of programs targeting all age levels with special emphasis on teachers. It is also responsible for the "Manned Flight Awareness Program" at KSC.

10.3 OPERATIONS

10.3.1 NEWS RELEASES. NASA encourages customers to release information to news media concerning their activities. The Public Information Branch works with customers to develop an information plan for launches. In most cases, information about customer's payloads is needed for inclusion in NASA press materials at least 6 months before launch. Each customer should provide KSC's Public Information Branch with the name of its Public Relations manager, or its designee, for clearing news releases and answering questions from reporters.

10.3.2 PHOTOGRAPHY. .Photographs and video of the preparation of payloads may be desired to accompany news releases or to respond to media requests. Video of milestones in payload preparation activity is also necessary to generate a flow tape which is usually used for NASA Select programming on launch day and may also be given to the media upon request. Photographic access is limited to the NASA and Air Force photographic support contractors. Therefore, customer management or public relations representatives requesting photography for external purposes should contact the Media Services branch in advance to arrange for support. Public Affairs does not coordinate photo support used for engineering purposes. This should be arranged through the LSSM. All Public Affairs photography is available to the customer but must be ordered through the LSSM.

10.3.3 ACCESS FOR NEWS MEDIA COVERING CUSTOMER ACTIVITIES. The KSC Media Services Branch will cooperate with customer management, other NASA government Public Affairs offices, or contractor public relations personnel to coordinate access for news media covering payload activities. Customers may meet with news media representatives at the KSC News Center or, if a payload processing facility is more appropriate, an escort will be provided to accompany the news correspondent and arrange appropriate clearances. News media representatives are required to be escorted at all times by NASA Public Affairs personnel while on KSC. The Media Services Branch or the customer may request a payload showing at an appropriate point in the processing flow under controlled conditions.

10.3.4 ORIENTATION TOURS. Customer officials and distinguished visitors may desire orientation tours of KSC. Requests for such tours should be directed to the Public Affairs Staff Office for coordination. Escorts may be provided by the CM Directorate which maintains a customer services office.

10.3.5 LAUNCH VISITORS. The demand for accommodations for guest viewing of launches and landings may exceed available facilities. An attempt will be made, however, to provide guest viewing for as many customer officials and distinguished visitors as possible. Requests for as many customer officials and distinguished visitors as possible. Requests for guest viewing should be coordinated as early as possible through the Protocol and Special Events Branch and/or the payload Customer Services office. Launch viewing for all international VIP's and foreign guests must be handled through the International Affairs Office at NASA Headquarters in Washington, D. C.

10.3.6 EDUCATIONAL ACTIVITIES. Customer plans for activities involving the education community should be coordinated with the Education and Awareness Office.

SECTION XI

ELV PAYLOAD PROCESSING - CCAS

11.1 GENERAL

The ELV payloads are usually received in a PPF; see section IV for PPF locations. These payloads consist primarily but not exclusively of automated payloads combined with upper stages; consequently, the terminology used to describe ELV payload integration is tailored to automated payloads with upper stages. These payloads usually involve hazardous operations that are conducted in HPF's located at CCAS and KSC. A typical flow for an ELV payload is shown in figure 11-1, 11-2, and 11-3 for a Delta, Atlas Centaur, and Titan Centaur respectively.

11.1.1 RECEIVING, BUILDUP, AND CUSTOMER TESTING IN A PPF. The customer is responsible for transportation of the payload to KSC or CCAS. The KSC is capable of receiving payloads shipped by air, land, or sea. The ELV payloads are normally processed in a PPF (Buildings AE or AO)and HPF's (SAEF-2, and the PHSF).

All buildings except AE can accommodate more than one payload customer.

Receiving and physical inspection are the responsibility of the customer. The KSC/CCAS will provide support services such as forklift operator and crane operator as stated in the LSSP.

Following receiving operations, the customer is responsible to perform final assembly and buildup of the payload to its launch configuration. This process includes installation of solar panels, antennas, and other items that were shipped separately to the launch site. Assembly operations in a PPF does not include hazardous operations involving ordnance, cryogenics, or hypergolic propellants.

Hazardous operations are performed in the assigned HPF.

Customer payload functional testing is conducted by customers using their own payload-unique ground checkout equipment. When testing is complete and the payload is ready to move to the next checkout area, the ground checkout equipment usually remains in the PPF (which is dedicated to that particular payload until the payload is launched). Hardline, and voice communication equipment is available to connect the payload to its checkout equipment as the payload progresses through an HPF and to the launch pad.

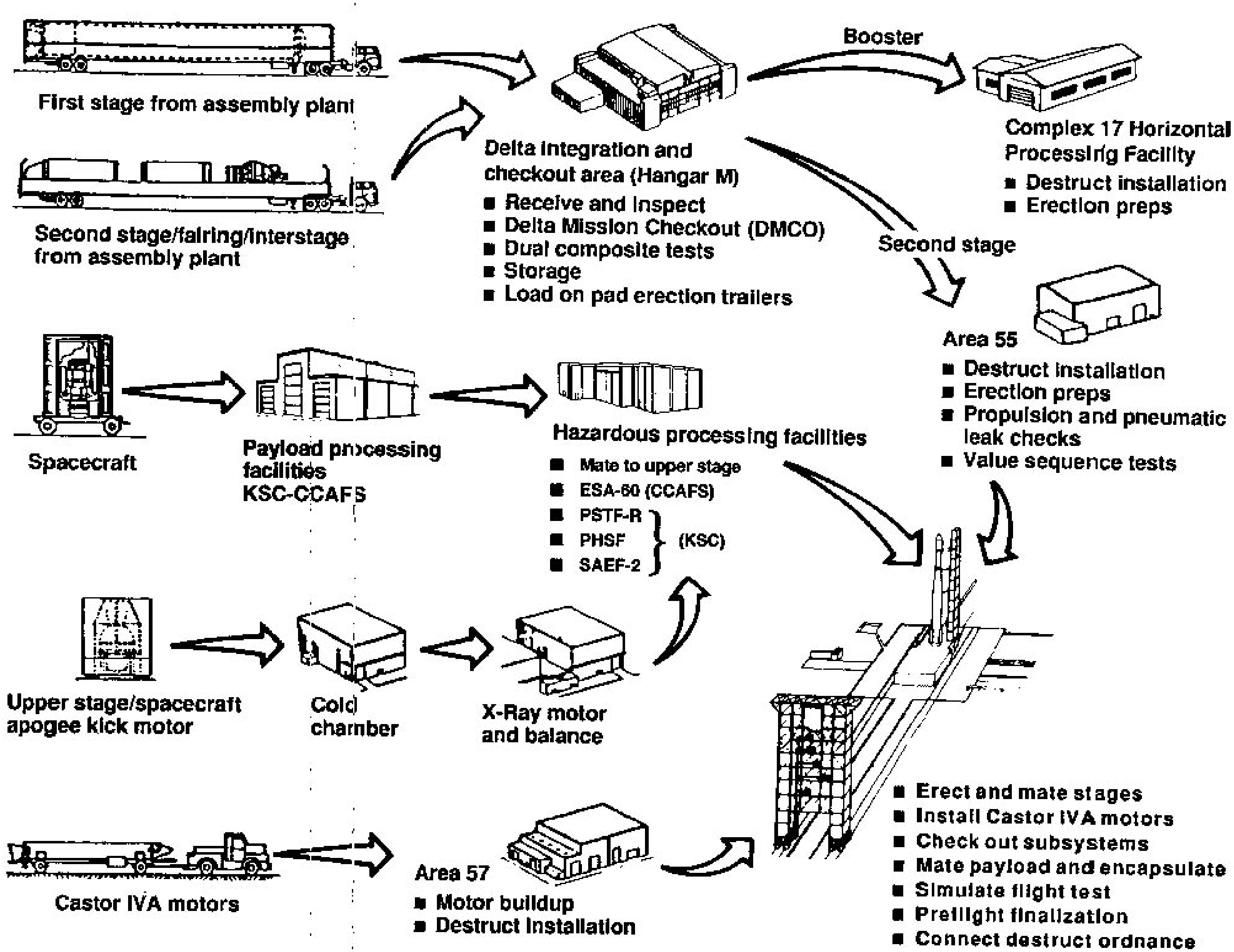

Figure 11-1. Typical Delta Processing Flow

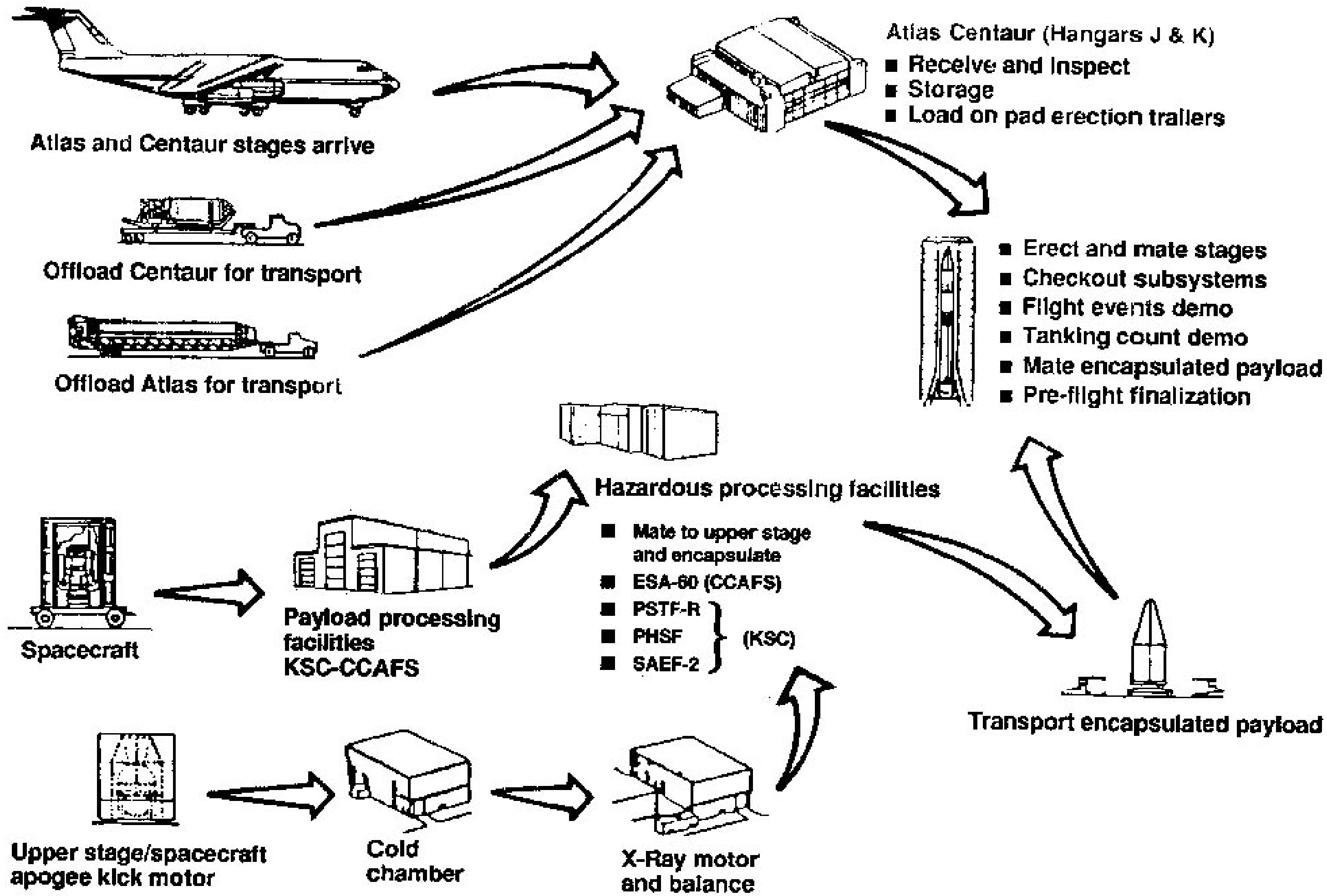

Figure 11-2. Typical Atlas Centaur Processing Flow

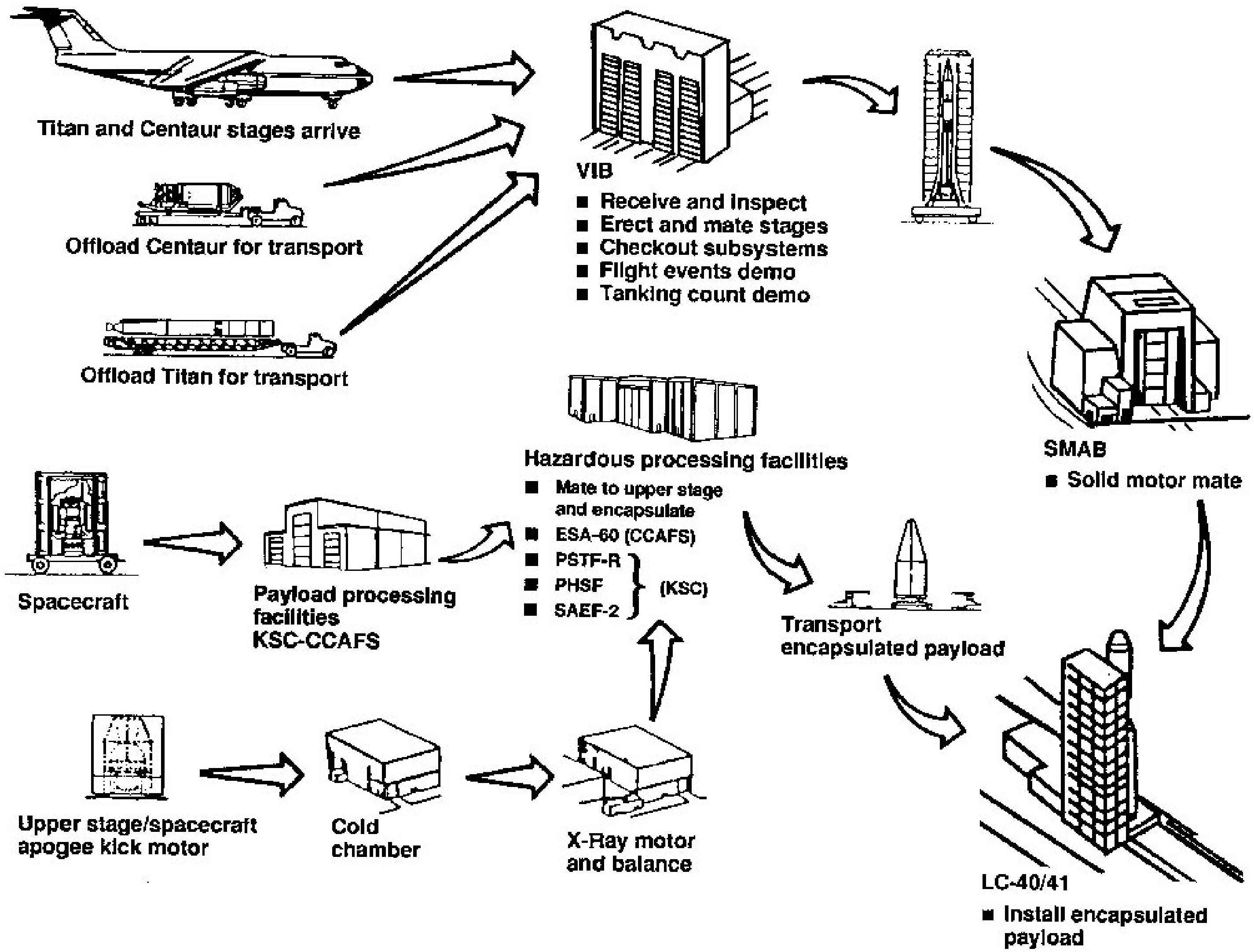

Figure 11-3. Typical Titan Centaur Processing Flow

■

The receiving, build-up, and customer payload testing of a vertically integrated payload include:

a. off-loading from transportation carrier and movement to the PPF

b. receiving inspection

c. post-shipment cleaning

d. erecting workstands

e. building up ship-separate items

f. connecting payload-supplied GSE

g. functional testing by the customer

h. testing for compatibility with the deep space network and ground spaceflight tracking and data network.

11.1.2 MOVE FROM PPF. When any hazardous operations are required after the initial functional tests are completed, the payload is moved to an HPF prior to delivery to the launch pad. When the payload buildup has been completed and no hazardous operations are required, the payload may go directly to the launch pad. Movement to an HPF is the responsibility of the customer, movement to the pad is the responsibility of the ELV contractor.

The KSC provides forklift and crane operators as required and scheduled. Transportation containers and special carriers must be provided by the customer. Any special environmental conditioning required must also be provided or procured by the customer.

Operations to be performed by the customer include:

a. preparing payload for move

b. placing payload in special containers or on transporters

c. providing any special environmental conditioning and/or instrumentation

d. moving to HPF or the launch pad

11.1.3 HAZARDOUS OPERATIONS AND TESTING IN AN HPF. Upon arrival at an HPF, the payload is removed from its transporter or container and installed in a test or assembly stand provided by the customer. The SAEF-2 or PHSF on KSC is normally used for these hazardous operations. These facilities are described in section IV of this handbook. Activities which may be conducted in the HPF's include propellant loading, such as hydrazine, MMH, and N_2O_4, as well as installation of solid propellant apogee motors, ordnance separation devices, and other potentially explosive or hazardous items.

Operations in an HPF are conducted by the customer with assistance by KSC/CCAS as specified in the LSSP. If payload-to-upper stage mating is scheduled to be performed at this point, the receiving, buildup, test, mating, and payload to upper stage interface verification is conducted by the customer.

Hazardous operations and testing include but are not limited to the following:

a. removing payload from transporter or container

b. installing in test or assembly stand

c. installing ordnance

d. servicing hydrazine, MMH, and N_2O_4

e. servicing cryogens

f. installing solid motors

g. mating with upper stage

h. testing and checkout

i. spin balancing

j. encapsulation, if not done at the pad

When servicing, assembly, and testing are complete in the HPF, the payload is ready for movement to the launch pad.

11.1.4 MOVEMENT TO LAUNCH PAD. Movement is the responsibility of the ELV contractor. Transportation operations include:

a. preparing payload for transport

b. placing payload in special container or on transporter

c. providing any special environmental conditioning and/or instrumentation.

d. moving to launch pad

11.1.5 PAD OPERATIONS. Upon arrival at the pad, the ELV contractor has responsibility for installing the payload onto the launch vehicle. The KSC LSSM coordinates interfaces between the launch vehicle contractor and the customer. Typical payload operations may include:

a. payload mate and interface verification to ELV

b. payload encapsulation (if not encapsulated at an HPF)

c. T-O umbilical line, GSE, and cleanliness validation

d. payload functional checks

e. combined systems test with ELV

f. pyrotechnics arming

g. payload closeout activities

11.2 LAUNCH ACTIVITIES

The launch management activities are conducted in the Mission Director's Center, located in Building AE, with support from personnel located at the POCC.

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SECTION XII
ELV PAYLOAD PROCESSING - VAFB

12.1 GENERAL

The ELV payloads are normally received in the Building 836 PPF; see figure 12-1 for this PPF location. These payloads consist primarily but not exclusively of automated payloads; consequently, the terminology used to describe ELV payload integration is tailored to automated payloads with upper stages. These payloads normally involve hazardous operations that are conducted in the Building 1610 HPF. A typical flow for a Delta ELV payload is shown in figure 12-1.

12.1.1 RECEIVING, BUILDUP, AND CUSTOMER TESTING IN THE PPF. The customer is responsible for transportation of the payload to VAFB. The VAFB is capable of receiving payloads shipped by air and land. The ELV payloads are normally processed in the PPF and the HPF.

Receipt and physical inspection are the responsibility of the customer. The VAFB will provide support (such as forklift operator and crane operator) as stated in the LSSP.

Following receiving operations, the customer is responsible to perform final assembly and buildup of the payload to its launch configuration. This process includes installation of solar panels, antennas, and other items that were shipped separately to the launch site. This assembly in the PPF does not include operations involving ordnance, cryogenics, or hypergolic propellants.

Customer payload functional testing is conducted by customers using their own payload-unique ground checkout equipment. When testing is complete and the payload is ready to move to the next checkout area, the ground checkout equipment usually remains in the PPF (which is dedicated to that particular payload until the payload is launched). Hardline, RF, and voice communication equipment is available to connect the payload to its checkout equipment as the payload progresses through such facilities as the HPF and to the launch pad.

The receiving, build-up, and customer testing of an ELV payload includes:

a. off-loading from transportation carrier and movement to the PPF

b. receiving inspection

c. post-shipment cleaning

d. erecting workstands

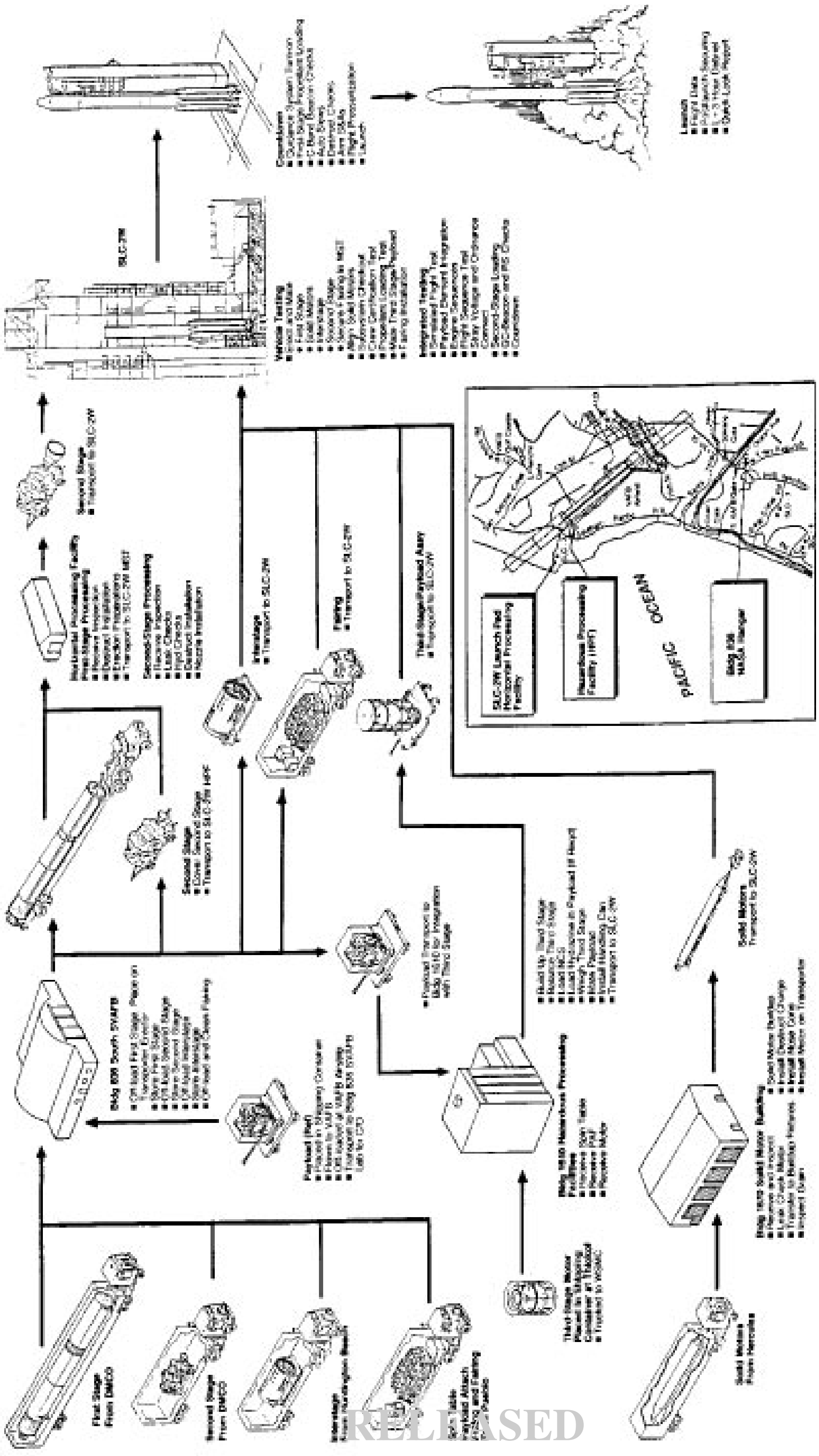

Figure 12-1. Typical Delta Processing Flow

e. building up ship-separate items

f. connecting payload-supplied GSE

g. functional testing

h. testing for compatibility with the deep space network and ground spaceflight tracking and data network

12.1.2 MOVE FROM THE PPF. When hazardous operations are required after the initial functional tests are completed, the payload is moved to the HPF prior to delivery to the launch pad. When the payload buildup has been completed and hazardous operations are not required, the payload may go directly to the launch pad. Transportation to the pad is the responsibility of either the launch vehicle integrator or support contractor.

Crane operators in the PPF and HPF will be either a NASA Contractor or a customer who has been appropriately trained. Transportation containers and special carriers must be provided by the customer. Any special environmental conditioning requirements must also be provided/procured by the customer.

Operations to be performed by the customer include:

a. preparing payload for transport

b. placing payload in special containers or on transporters

c. providing any special environmental conditioning and/or instrumentation

12.1.3 HAZARDOUS OPERATIONS AND TESTING IN THE HPF. Upon arrival at the HPF, the payload is removed from its transporter or container and installed in a test or assembly stand provided by the customer. Activities which may be conducted in the HPF include propellant loading, such as hydrazine, MMH, and N_2O_4, and installation of solid propellant apogee motors, ordnance separation devices, and other potentially explosive or hazardous items.

Operations in the HPF are conducted by the customer with assistance by KSC as specified in the LSSP. If payload-to-upper stage mating is scheduled to be performed at the HPF, the receiving, buildup, test, mating, and payload to upper stage interface verification is conducted by the customer.

Hazardous operations and testing may include but are not limited to the following:

a. removing payload from transporter or container

b. installing in test or assembly stand

c. installing ordnance

d. servicing hydrazine, MMH, and N_2O_4 *

e. servicing cryogens *

f. installing solid motors

g. mating with upper stage

h. testing and checkout

i. spin balancing (Building 1610)

j. encapsulation, if not done at the pad

* May require a safety variance

When servicing, assembly, and testing are complete in the HPF, the payload is ready for movement to the launch pad.

12.1.4 MOVEMENT TO LAUNCH PAD. Movement is the responsibility of the ELV contractor; transportation operations include:

a. preparing payload for move

b. placing payload in special container or on transporter

c. providing any special environmental conditioning and/or instrumentation

d. moving to launch pad

12.1.5 PAD OPERATIONS. Upon arrival at the pad, the ELV contractor has responsibility for installing the payload onto the launch vehicle. The KSC LSSM coordinates the working interfaces between the launch vehicle contractor and the customer. Typical payload operations may include:

a. payload mate and interface verification to ELV

b. payload encapsulation (if not encapsulated at the HPF)

c. T-O umbilical line, GSE, and cleanliness validation

d. payload functional checks

e. combined systems test with ELV

f. pyrotechnics arming

g. payload closeout activities

12.2 LAUNCH ACTIVITIES

The launch management activities are conducted in the Mission Director's Center, located in Building 840, with support from the personnel located at the POCC.

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APPENDIX A

REFERENCED DOCUMENTS

This appendix contains the listing of documents that are referenced in this handbook and some additional documents of value to the customer. The latest issue of each document is applicable.

A.1 NASA HEADQUARTERS

NHB 1620.3	*Space Transportation System Physical Security Handbook*
NHB 1700.1	*NASA Basic Safety Manual - Fire Protection*
NSTS 1700.7	*Safety Policy and Requirements for Payloads Using the Space Transportation System*
NMI 8610.19	*Space Transportation System National Resource Protection*
NRP 1059 Revised	*Space Transportation System and Associated Payloads: Glossary, Acronyms, and Abbreviations*
NSTS 07700, Vol XIV	*Appendix 5 -System Description and Design Data-Ground Operations*
NSTS 08171	*Operations and Maintenance Requirements and Specifications Document*
NSTS 13830	*Implementation Procedure for NSTS Payloads System Safety Requirements for payloads using the Space Transportation System*
NSTS 14046	*Payload Interface Verification Requirements*

A.2 KSC

GP-1098, Vol. 1	*KSC Ground Safety Plan, Safety Requirements*
GP-1098, Vol. 2	*KSC Ground Safety Plan, Safety Operating Procedures*
ICD-2-19001	*Shuttle Orbiter/Cargo Standard Interface*
KCA-HB-0018.0	*CM Work Authorization Documentation Handbook*
KCI-HB-5340.1	*Payload Facility Contamination Control Implementation Plan*

K-CM-05.3	*Guide for Payload Processing at KSC*
K-CM-10.1.12	*PDMS Implementation Plan*
KCS-HB-0001	*Payload Antenna Repeater System User's Planning Guide*
KCS-PL-0012.0	*Payload Operational Logistics Plan*
K-PSM-11.3	*Get Away Special Payloads (GAS) (Small Self-Contained Payloads) Launch Site Support Plan*
K-SF-0003.7	*KSC SR&QA Ground Safety Plan, Offsite Facility, VAFB*
K-SF-0005	*National Resource Protection Plan for the Kennedy Space Center*
K-STSM-09.5	*KSC Support Requirement System Management Plan*
K-STSM-12.4	*KSC STS Transportation Plan, Appendix A*
K-STSM-12.4.1	*KSC Off-Site Transportation Plan*
K-STSM-12.8	*STS and Cargo OMD Plan*
K-STSM-14.1.1	*Facilities Handbook for Building AE*
K-STSM-14.1.2	*Facilities Handbook for Building AO*
K-STSM-14.1.5	*Facilities Handbook for Payload Spin Test Facility*
K-STSM-14.1.7	*Facilities Handbook for Spacecraft Assembly and Encapsulation Facility Number 2*
K-STSM-14.1.8	*Facilities Handbook for RTG Storage Building*
K-STSM-14.1.9	*Facilities Handbook for Life Sciences Support Facility - Hangar L*
K-STSM-14.1.10	*Payload Accommodations at the Rotating Service Structure*
K-STSM-14.1.12	*Facilities Handbook for Vertical Processing Facility*

K-STSM-14.1.13	*Orbiter Processing Facility Payload Processing and Support Capabilities*
K-STSM-14.1.14	*O&C Building Payload Processing and Support Capabilities*
K-STSM-14.1.15	*Facilities Handbook for Payload Hazardous Servicing Facility*
K-STSM-14.1.16	*Facilities Handbook for Space Station Processing Facility*
K-STSM-14.1.17	*Facilities Handbook for Payload Spin Test Facility-Replacement*
K-STSM-14.2.1	*KSC Payload Facility Contamination Control Requirements/ Plan*
KHB 1610.1	*Kennedy Space Center (KSC) Security Handbook*
KHB 1610.2	*Unescorted Access and Personnel Reliability Program*
KHB 1700.7	*Space Transportation System Payload Ground Safety Handbook*
KHB 1710.2	*Kennedy Space Center Safety Practices Handbook*
KHB 1860.1A	*KSC Ionizing Radiation Protection Program*
KHB 1860.2	*KSC Non-Ionizing Radiation Protection Program*
KHB 8610.1A	*Support Services Handbook*
KMI 1610.5	*Kennedy Space Center Area Permits*
KMI 1610.8	*KSC Space Transportation System (STS) Personnel Reliability Program (PRP)*
KMI 1800.1	*KSC Environmental Health Protection Program*
KMI 1800.2	*KSC Hazard Communication Program Handbook*
KMI 1840.3	*Industrial Hygiene Program*
KMI 1860.1	*Radiation Protection Program - Policies and General Provisions for Ionizing and Non-Ionizing Radiation*

KSC-DL-116	*Payload/GSE/Data System Interface User's Guide for Launch Complex 39A/B*
KSC-DL-522	*Payload/GSE/Data System Interface User's Guide for the Vertical Processing Facility*
KVT-PL-0010	*Space Transportation System and Facility Operations Security Plan*
KVT-PL-0014	*KSC Off-Site Operations Plan*
KVT-PL-0024	*KSC PCR Operations Plan*
KVT-PL-0025	*Shuttle Facility/Orbiter Contamination Control Implementation Plan*
S00000-2, File 1	*NASA/DOD STS and Cargo TOP's Preparation Handbook*
79K12170	*Standard Interface Document Payload Ground Transporter Canister*
79K16210	*Vertical Processing Facility Standard Interface Document*
79K16211	*Horizontal Processing Facility Standard Interface Document*
79K17644	*Payload Strongback Standard Interface Document*
79K18218	*Launch Complex 39A Standard Interface Document*
79K28802	*Launch Complex 39B Standard Interface Document*
79K18745	*Orbiter Processing Facility Standard Interface Document*
79K20954	*Payload Environmental Transportation System Standard Interface Document*
79K24867	*Life Science Support Facility (Hangar L) Standard Interface Document*
82K00678	*Single Pallet Rotation Device Standard Interface Document*

A.3	**JSC**
JSC 11802	*STS Reimbursement Guide*
JSC 11804	*Payload Operations Control Center for Attached Payloads*
JSC-2100-IAP	*Integrated Activities Plan Shuttle/Payload*
JSC 14046	*Payload Interface Verification Requirements*
JSC 14363	*Shuttle/Payload Integration Activities Plan*
JSC 18798	*Interpretations of STS Payload Safety Requirements*
JSC-SE-S-0073	*Specification, Fluid Procurement and Use Control*
A.4	**UNITED STATES AIR FORCE**
ERR 127-1	*Eastern Range Safety Regulation*
WRR 127-1	*Western Range Safety Regulation*

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APPENDIX B

GLOSSARY

This appendix contains a glossary of terms used in this handbook and their definitions.

Automated Payloads

An unmanned spacecraft capable of operating independently of the Space Shuttle or launched by an ELV. Automated payloads are detached from the orbiter or an ELV during the operational phase of their flights.

Customer

An organization or individual requiring the services of KSC facilities and personnel to launch a payload into orbit.

ELV

An expendable launch vehicle used to place payloads in low-Earth-orbits, geosynchronous orbits, or on planetary trajectories.

Experiment

The system of hardware, software, and procedures for performance of a scientific or applications investigation undertaken to discover unknown phenomena, establish the basis of known laws, or evaluate application processes or equipment.

Flight

That portion of a mission encompassing the period from launch to landing, or launch to termination, of the active life of a spacecraft. The term Space Shuttle "flight" means a single Space Shuttle round trip -- its launch, orbital activity, and return. One flight might deliver more than one payload.

Free Flyer

Any payload that is detached from the orbiter during the operational phase of that payload and is capable of independent operations (same as Automated Payloads).

IUS

The IUS is an expendable solid propellant multistage vehicle. It extends the payload performance capability beyond that offered by the Space Shuttle alone. The IUS with its payload(s) will be taken to low-Earth orbit in the orbiter payload bay.

Integration

A combination of activities and processes to assemble payload and Space Shuttle components, subsystems, and system elements into a desired configuration, and to verify compatibility among them.

Interface

The mechanical, electrical, and operational common boundary between two elements of a system.

International Partners

Foreign countries which are partners in the development and on-orbit operation of the Space Station Alpha. The National Space Development Agency (of Japan) (NASDA), the European Space Agency (ESA), and the Canadian Space Agency (CSA) represent the International Partners.

ISSA Elements

Flight elements which incrementally build, maintain, and utilize the ISSA on-orbit.

ISSA Experiments and Consumables

Scientific experiments and consumable supply and resupply items delivered to the ISSA as manifested for the utilization and maintenance of the ISSA.

Launch Package

The combination of Space Station Alpha flight elements and flight and orbital support equipment that will be processed for a specific launch and delivery on-orbit.

Launch Pad

The KSC, CCAS, or VAFB area from which the payload will be launched.

LPS

A high speed digital computer-operated checkout system used to support test, checkout, launch control, and operational management of launch site ground operations at KSC.

LSSM

Individual at the launch site center who is the single point of contact with all customers in arranging payload processing at the launch site.

LSST

Members from various KSC directorates who assist in reviewing customer requirements and translating them into appropriate KSC documents for implementation.

Logistics Carriers

Carriers which will deliver payloads to the Space Station Alpha and do not require a pressurized environment.

Logistics Modules

Modules which will deliver payloads to the Space Station Alpha and require a pressurized environment.

Mission

A series of Space Shuttle activities including: orbiter up-mission processing, payload processing and installation into the orbiter, launch, flight, landing, and deintegration.

Mission Build Elements

Those structural elements and functional systems subdivided by physical interconnection, modularity, or aggregation of common features which build the operational Space Station Alpha on-orbit.

Mission Processing Team

A team comprised of the NASA and PGOC Payload Managers; the various KSC and PGOC different divisions, and the customer representatives. The team is directed jointly by the NASA-KSC and PGOC Payload Managers. The team is responsible for planning, scheduling, and coordinating payload processing at the launch site. They review test procedures and meet regularly to schedule the day-to-day payload activities. The team is established approximately 6 months before launch and remains in effect through deintegration of the payload.

Mixed Payloads

A combination of horizontally integrated payload(s) and vertically integrated payload(s) on one flight. Mixed payload elements are joined for integration in the vertical position.

MLP

The structure on which the elements of the Space Shuttle are stacked in the VAB. The MLP and the Space Shuttle are then moved to the launch pad for launch.

Multiple Payloads

More than one payload carried in the orbiter bay.

Offsite

A location other than KSC launch and landing site.

Operational Constraints

Local System Constraints - Conditions, setups, and sequences that are mandatory prerequisites (electrical, mechanical, manual, or automatic) for system operation or safing, which, if not met, could cause test aborts, excessive recycling time, inadvertent loss of fluids or gases, or one of the conditions listed under Hazardous Conditions.

LPS Software Control Logic Constraints - Logic sequences (prerequisite or reactive) that must be software interlocked to prevent an LPS command from causing one of the conditions listed under Hazardous Conditions.

Hazardous Conditions -

- Loss of or damage to GSE hardware or GSE systems
- Loss of or damage to the vehicle or payload structure or system
- Loss of life or injury to personnel

OPF

Buildings at KSC with bays in which the orbiter undergoes postflight inspection, maintenance, and premate checkout before payload installation. Some payloads are installed horizontally in these buildings.

Pallet

An unpressurized platform, designed for installation in the orbiter payload bay, for mounting instruments and equipment requiring direct space exposure.

Partial Payload

A (non-spacelab) payload processed in the O&C which uses the PPCU for verification of orbiter-to-payload interfaces.

Payload

Any equipment or material carried by an ELV or by the Space Shuttle that is not considered part of the basic Space Shuttle itself. It, therefore, includes items such as free-flying automated spacecraft, individual experiments or instruments, payload support equipment, etc. As used in this document, the term payload also includes payload-provided GSE and systems and flight and ground systems software.

Payload Elements

The total complement of payloads (one or more) on any one flight. It includes everything contained in the orbiter payload bay, plus other equipment, hardware, and consumables located elsewhere in the orbiter that are customer-unique, and are not carried as a part of the basic orbiter payload support. The ELV's may also carry more than a single payload.

Payload Manager

An individual who plans, schedules, coordinates, and manages the integrated payload processing; acts as the primary interface with the Space Shuttle processing organizations; conducts the test team meetings, pretest briefings, and formal constraints meetings; acts as the primary interface with customer organizations for integration of the payload and payload interface verification; and prepares for and supports the readiness reviews.

Pressurized Laboratories

Environmentally pressurized laboratories and habitats to be attached to the Space Station Alpha for the scientific utilization of the Space Station Alpha. These laboratories are provided by the Work Package Centers and the Space Station Alpha Program International Partners.

Program

An activity involving manpower, material, funding, and scheduling necessary to achieve desired goals. (Example: Space Shuttle Program, Solar Astronomy Program.)

Space Shuttle

The orbiter, external tank, and solid rocket boosters.

Spacelab

A general-purpose orbiting laboratory for manned and automated activities in near-Earth orbit. It includes both module and pallet sections, which can be used separately or in several combinations for single or multi-disciplines.

Upper Stage

A propulsion unit used with a payload when required. One or more of these units may be used with a payload to provide the additional velocity required to place a payload in the desired orbit or trajectory. A propulsion system that is used to provide mid-course trajectory corrections, braking maneuvers, or orbital adjustment.

Work Package Centers

The NASA Centers responsible for the design and development of SSA Elements prior to delivery to KSC.

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CG	B. BRUCKNER
CG-ESD	S. KERR
CG-ESD-1	P. CLEMENTS
CG-ESD-2	T. KREIZINGER
CG-LMD-2	B. GOFORTH
CG-LMD-2	T. MARIANI
CG-LSO	B. FLETCHER
CG-LSO	K. MEASE
CG-LSO-1	J. COTTRELL
CG-LSO-1	D. HAGIST
CG-LSO-1	E. KLINE
CG-LSO-2	M. BRUDER
CG-LSO-2	B. CERRATO
CG-LSO-2	R. ENGELHARDT
CG-LSO-2	S. GREEN
CG-LSO-2	S. GWYNN
CG-LSO-2	M. HADDAD
CG-LSO-2	B. HIGGINBOTHAM
CG-LSO-2	M. HILL
CG-LSO-2	W. JOHNSON
CG-LSO-2	L. KRUSE
CG-LSO-2	L. LUCAS
CG-LSO-2	R. MARTUCCI
CG-LSO-2	E. OSCAR
CG-LSO-2	N. POPE
CG-LSO-2	T. RUCCI
CG-LSO-2	J. SCHNERINGER
CG-LSO-2	D. SCHULTZ
CG-LSO-2	D. SKELLY
CG-LSO-2	L. WEBER
CG-LSO-2	V. WHITEHEAD
CG-LSO-2	M. WHITNEY
CM-INT	S. FRANCOIS
CM-INT-3	J. STRAIGHTON
CM-INT-6	B. MORRIS
CS	M. CARDONE
CS	T. BREAKFIELD
CS-EXD	J. LACKOVICH
CS-EXD-1	C. BACKUS
CS-EXD-2	G. VEAUDRY
CS-EXD-3	C. MCPHILLIPS
CS-OTE	R. BOURNE
CS-OTE-1	R. LUNNEN
CS-OTE-2	M. RODRIGUEZ
CS-OTE-3	M. KIENLEN
CS-PED	S. BARTELL
CS-PED-1	J. LINK
CS-PED-2	M. MATIS
CS-PED-3	G. WILLIAMS
CS-PED-4	T. ARNOLD
CS-PTS	D. WEBB
CS-PTS-1	L. HOLLEY
CS-PTS-2	C. JACOBSON
CS-PTS-13	M. SMITH
JPL-AO/CCAFS	S. BERGSTROM
MDSS-KSC-F100	T. SMITH
MDSS-KSC-F126	R. BAUMAN
MDSS-KSC-F224	N. VAN SCYOC
MDSS-KSC-F350	T. FERRIS
MDSS-KSC-F364	B. PETERSON
MDSS-KSC-F514	A. TULLY
MDSS-KSC-F500	P. KREMER
MDSS-KSC-F626	P. SECCURO
MDSS-KSC-F674	J. PASTER
MDSS-KSC-F010	D. GILLESPIE
MDSS-KSC-F540	M. LAVIN
MDSS-KSC-F393	J. HOLCOMBE
MDSS-KSC-F526	B. WENKSTERN
TOTAL	71

For distribution changes contact your Validation Representative:
KSC/**CM**--P. Davis:[**CM-LMD-2,7-7755**]
KSC/**DE/DF/DL**--B. Judd:[**DF-ESD,7-4112**]
KSC/**RQ**--D. Coleman:[**RQ-ADM,7-3577**]
KSC/**IM**--H. Brown:[**IM-SAT-5,7-4540**]
KSC/**TM**--K. Biega:[**TM-ADM,7-3898**]
ALL OTHERS [**PAYLOAD**]--P. Davis, **CG-LMD-2**, (**407**)**867-7755**
ALL OTHERS [**SHUTTLE**]--K. Biega, **TM-ADM**, (**407**)**867-3898**
SYSTEM PROBLEMS/PERFORMANCE--KSC Documents Library, **LIBRARY-D**, **7-9601/3613**

45 SPW/SESE	W. BREYER	
BIO-1	J. PULEO	
BIO-3	R. FISER	
CG-LSO-2	LIBRARY	20
CG-LSO	K. MEASE	5
CV-KVR	T. OGLESBY	
DA-STF	D. MOXLEY	
DE-FLS	B. LARSEN	
DE-PMO-3	H. HILTON	
DE-PMO-5	H. PEETE	
DF-ESD-2A	W. GLUSING	
DLR-D2	G. RIES	
DM-MED-3	F. JANKOWSKI	
DM-MED-31	J. PORTA	
FORMS WAREHOUSE		50
GD/SS-CX-36-RR	J. SCHNABEL	
GK-3	W. OWENS	
GTDRS	D. CRISTOFALO	
IM-PEI-2	W. BRANNING	
IM-PSO	G. WISTRAND	
IM-PSO-2	C. BURCH	
LIBRARY-D	KSC LIB DOCS	5
LSO-038	LIBRARY	2
LSO-246	E. MATTHEWS	5
LSO-321	H. LAMBERTH	
MD-MED	G. MARMARO	
MD-PLN	S. HADDAD	
MD-RES-L	W. KNOTT	
MDSS-CX-17	D. MACLEAN	
MDSS-KSC-F376	LIBRARY	
MDSS-KSC-F608	R. GREEK	
MDSS-KSC-F658	TDC LIBRARY	
MILA	A. IPPOLITO	
MK-MIO	S. KICKLIGHTER	
MMC-AF	W. FIELDS	
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