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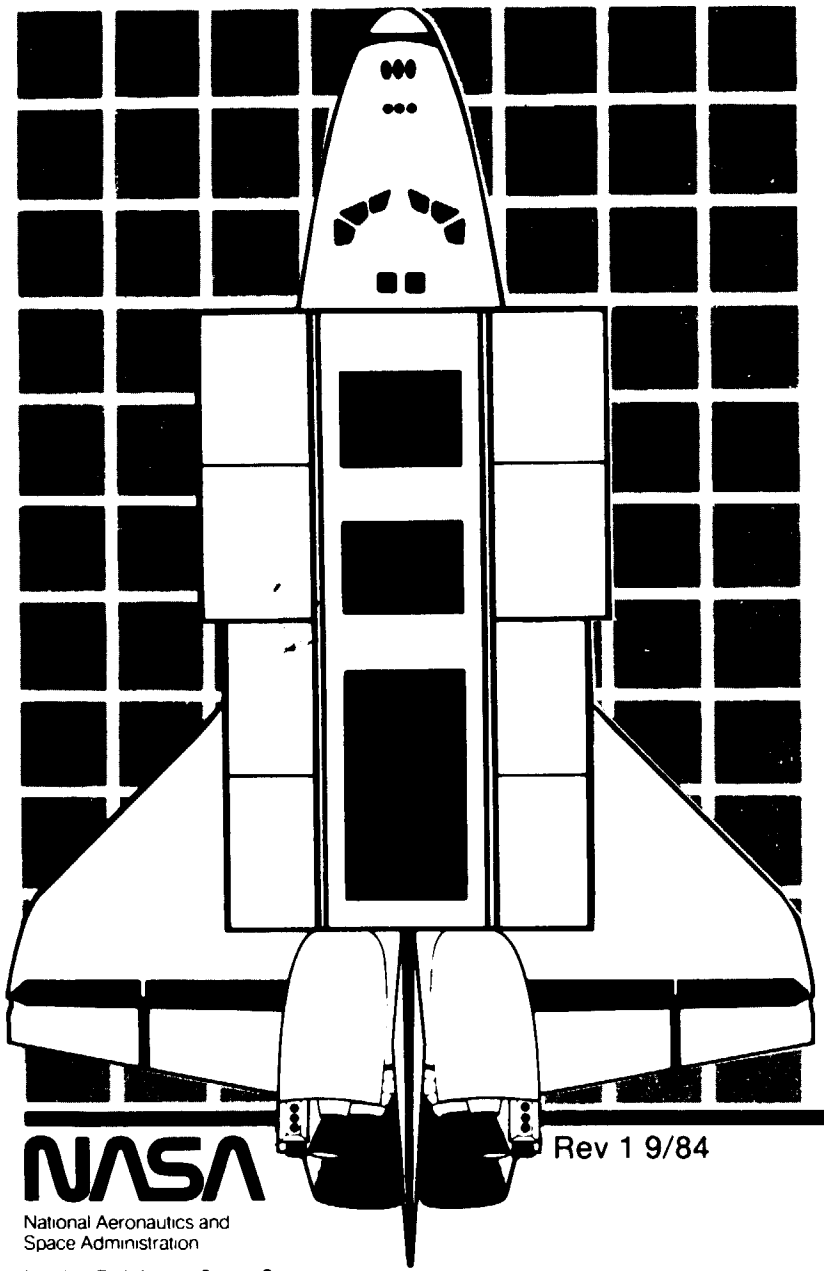

SPACE SHUTTLE PAYLOAD

DESIGN AND DEVELOPMENT

JSC-20052
VOLUME 4

NASA
TM-108762
p. 33

(NASA-TM-108762) SPACE SHUTTLE PAYLOAD DESIGN AND DEVELOPMENT. VOLUME 4: KENNEDY SPACE CENTER OPERATIONS (NASA) 133 p

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KENNEDY SPACE CENTER OPERATIONS

Rev 1 9/84

NASA
National Aeronautics and Space Administration
Lyndon B. Johnson Space Center

FOREWORD

THIS PRESENTATION IS INTENDED TO PROVIDE STS CUSTOMERS WITH A BASIC UNDERSTANDING OF THE:

- CARGO LAUNCH AND LANDING PROCESS AT KENNEDY SPACE CENTER (KSC)
- AVAILABLE PAYLOAD FACILITIES, SUPPORT SERVICES, AND GROUND SUPPORT EQUIPMENT
- FLIGHT HARDWARE PROCESSING EXPERIENCE AT KSC
- KSC REQUIREMENTS NECESSARY TO SUPPORT THE CUSTOMER'S PAYLOAD PROCESSING

KSC FORM 4-588NS (6/84)

CONTENTS

THIS PRESENTATION CONTAINS:

- AN OVERVIEW OF THE KSC ORGANIZATION
- A SCENERIO OF PAYLOAD PROCESSING FLOW AND CARGO OPERATIONS AT KSC
- A REVIEW OF THE KSC/CUSTOMER WORKING RELATIONSHIPS
- SOME EXAMPLES OF CUSTOMER AND KSC REQUIREMENTS
- A DETAILED DESCRIPTION OF THE FACILITIES WHICH KSC PROVIDES TO SUPPORT THE LAUNCH PREPARATION OF PAYLOADS

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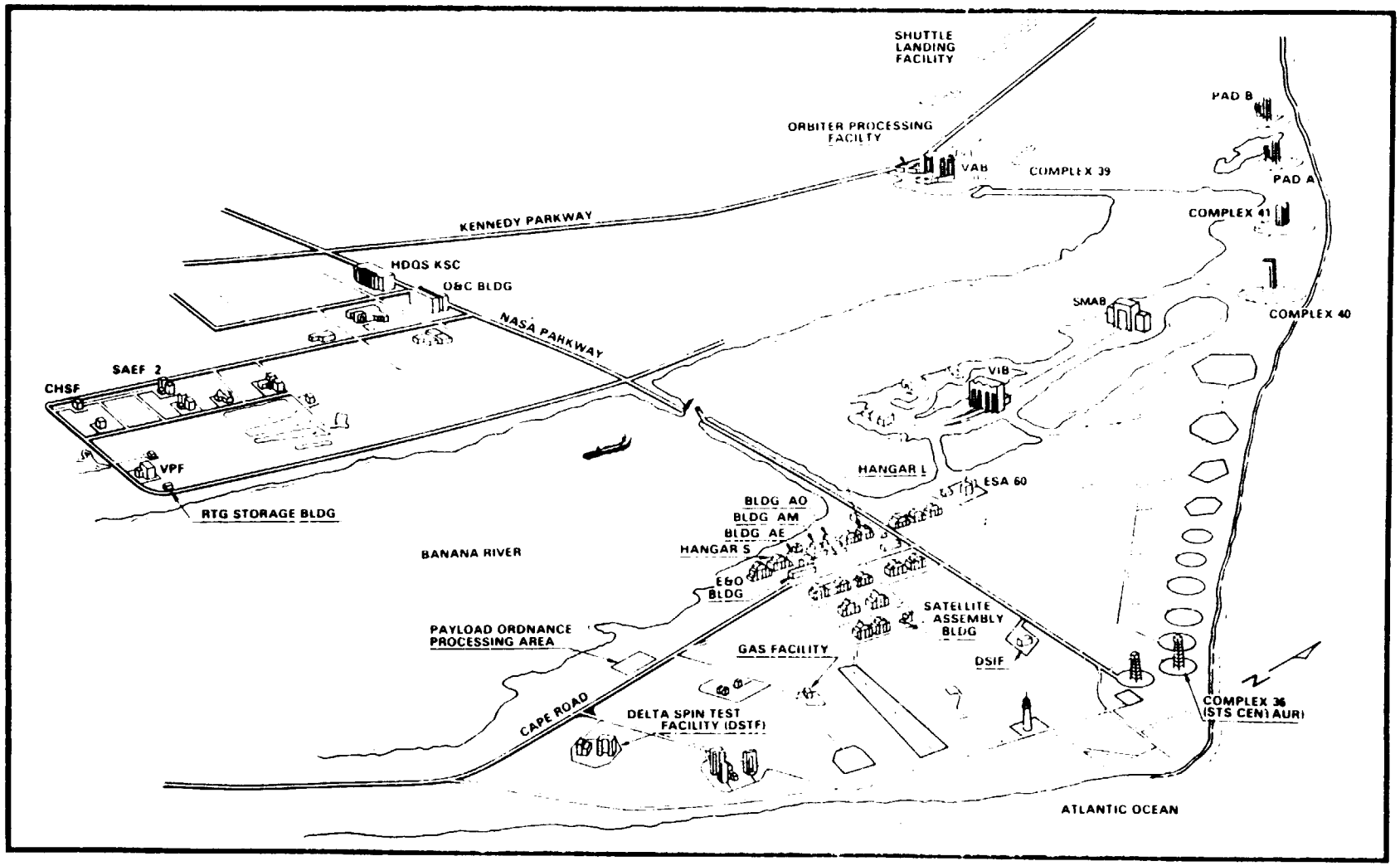
PAYLOAD MANAGEMENT RESPONSIBILITIES

- KENNEDY SPACE CENTER (KSC) IS THE PRIMARY LAUNCH AND LANDING SITE FOR THE SPACE TRANSPORTATION SYSTEM (STS)
  - RESPONSIBLE FOR THE MANAGEMENT AND DIRECTION OF:
    - ASSEMBLY AND VERIFICATION OF THE SHUTTLE
    - PROCESSING OF SPACELAB AND SIMILAR TYPE PAYLOADS
    - FINAL TEST, PREPARATION, AND INTEGRATION OF PAYLOADS IN THE ORBITER BAY BEFORE LAUNCH
    - COUNTDOWN AND LAUNCH
    - PRIMARY AND CONTINGENCY LANDING SITE OPERATIONS
    - DEINTEGRATION OF PAYLOADS UPON THEIR RETURN FROM SPACE
    - PERFORMING THE HOST ROLE AS THE CUSTOMER'S AGENT

KSC FORM 4-588NS (6/84)



SHUTTLE LAUNCH AND LANDING SITE AT KSC

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KSC ORGANIZATION

- CENTER DIRECTOR (CD)
  - RESPONSIBLE FOR GENERAL MANAGEMENT OF THE CENTER, NASA ACTIVITIES AT CCAFS AND VAFB, AND SHUTTLE LANDING OPERATIONS AT PRIMARY AND SECONDARY LANDING SITES.
- SHUTTLE MANAGEMENT AND OPERATIONS (SM)
  - RESPONSIBLE FOR MANAGEMENT AND TECHNICAL DIRECTION OF PREFLIGHT, LAUNCH, LANDING, AND RECOVERY OF ALL KSC SHUTTLE VEHICLES. ALSO FOR INTEGRATION OF CARGO INTO THE ORBITER.
- CENTER SUPPORT OPERATIONS (SI)
  - PROVIDES BASE OPERATIONS, MAINTENANCE AND SUPPORT SERVICES FOR ALL KSC, TENANT, AND TRANSIENT ORGANIZATIONS.
- ENGINEERING DEVELOPMENT (DE)
  - RESPONSIBLE FOR THE DESIGN, ACQUISITION, SUSTAINING ENGINEERING OF ALL KSC FACILITIES/EQUIPMENT.

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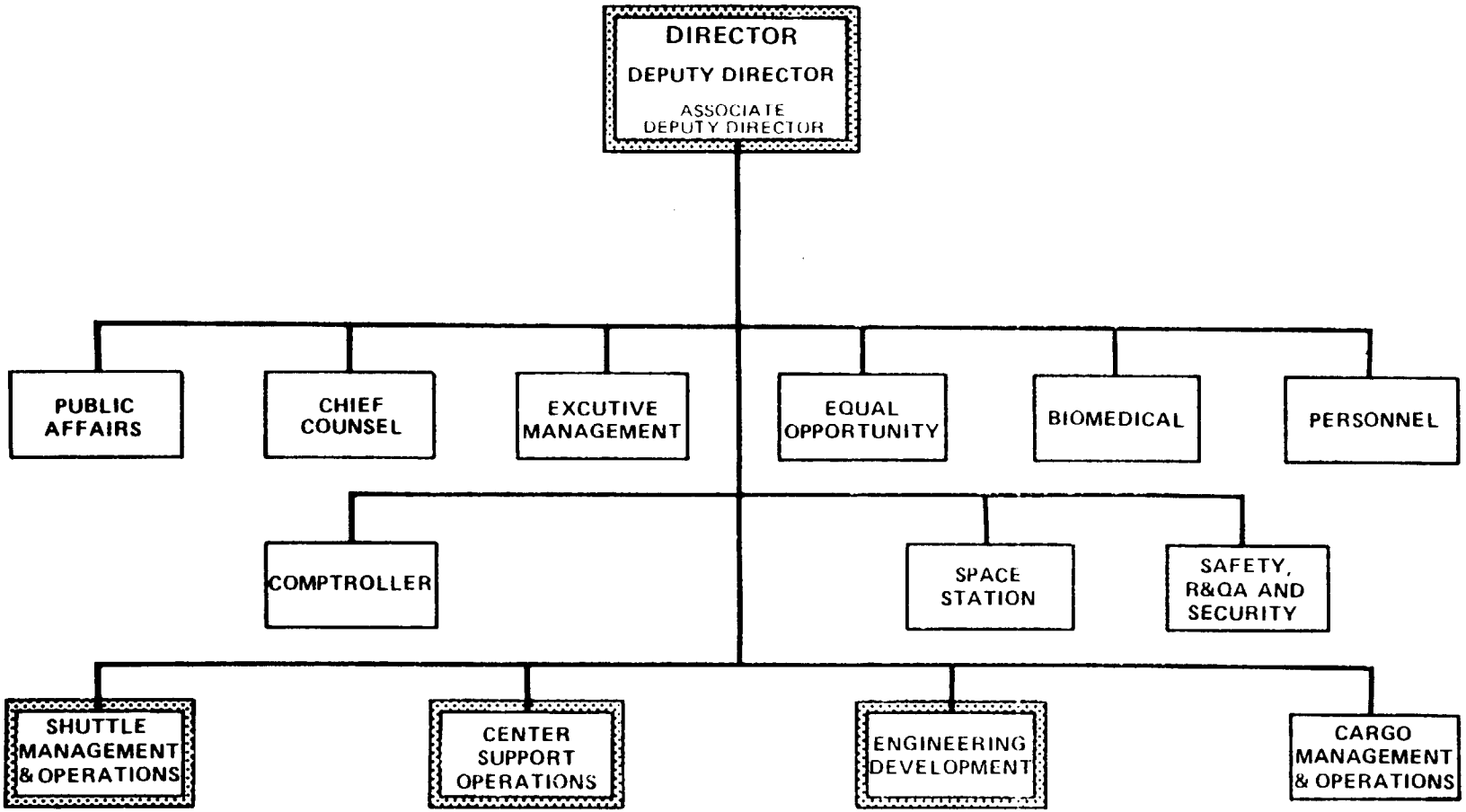
DESIGN AND DEVELOPMENT



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CARGO MANAGEMENT AND OPERATIONS ORGANIZATION

- CARGO MANAGEMENT AND OPERATIONS (CM)
  - RESPONSIBLE FOR THE MANAGEMENT OF KSC'S CARGO PROGRAMS, THE MANAGEMENT AND TECHNICAL DIRECTION OF LAUNCH SITE PREPARATIONS OF NASA-MANAGED STS CARGO AND EXPENDABLE VEHICLES, AND THE OPERATIONS AND MAINTENANCE OF CARGO FACILITIES AND EQUIPMENT.
- CARGO INTEGRATION OFFICE (CM-CIO)
  - PROVIDES THE LAUNCH SITE SUPPORT MANAGEMENT FOR ALL NON-DOD VERTICAL PAYLOADS FOR THE STS OR EXPENDABLE VEHICLES.
- STS CARGO OPERATIONS (CS)
  - PROVIDES ENGINEERING MANAGEMENT AND DIRECTION FOR INTEGRATION AND PROCESSING OF SPACELAB, VERTICAL PAYLOADS, AND CARGO CARRIERS.
  - PROVIDES THE CARGO MANAGER FOR INTEGRATION.

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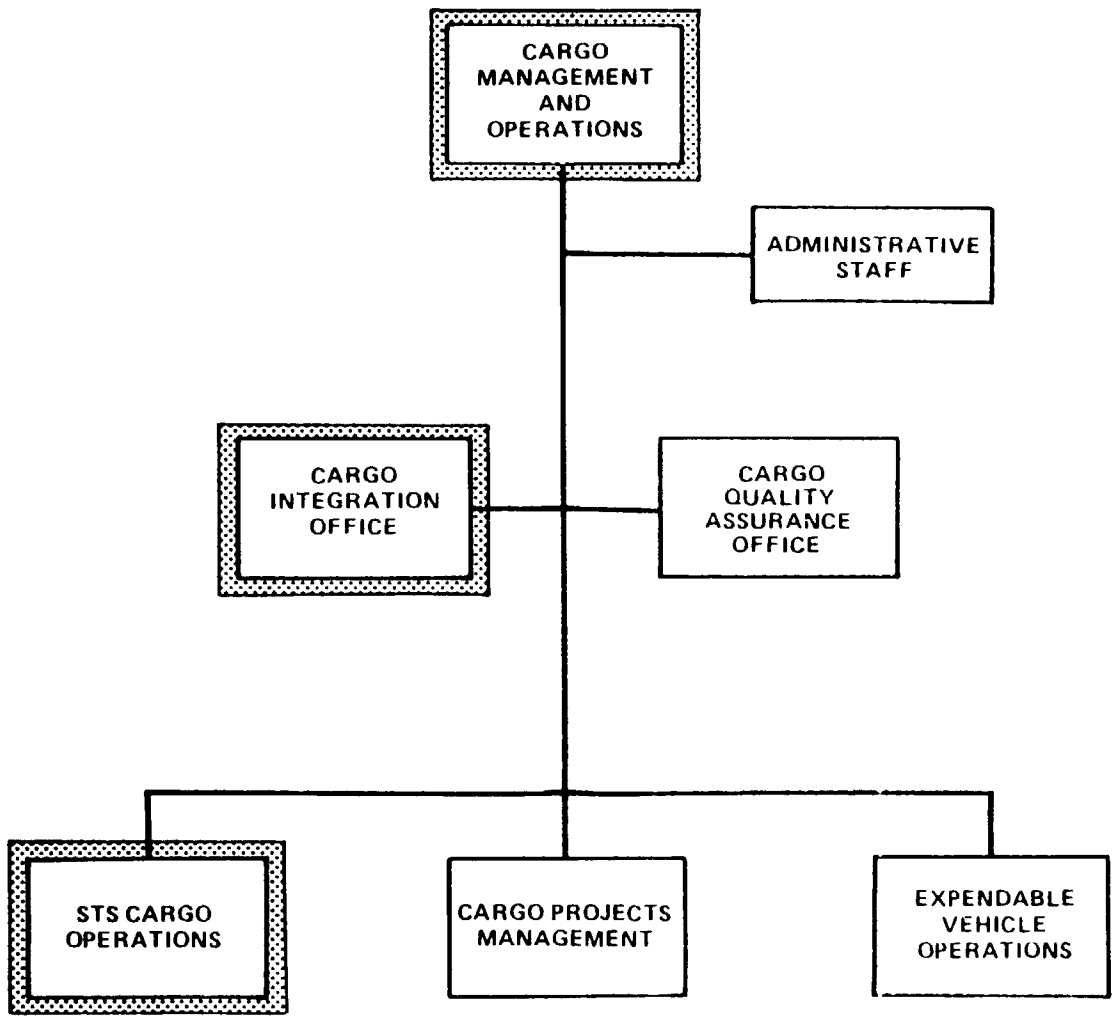
DESIGN AND DEVELOPMENT



CARGO MANAGEMENT AND OPERATIONS DIRECTORATE

KSC FORM 4-588NS (6/84)

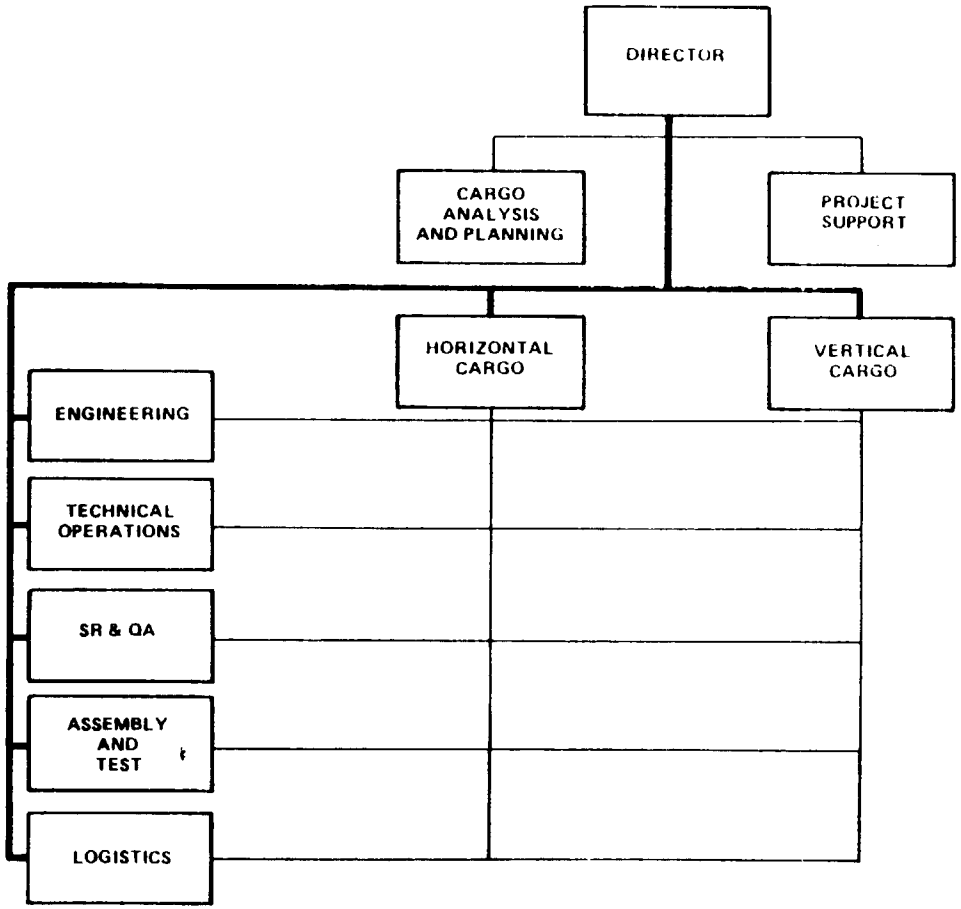
MDTSCO FUNCTIONS

MDTSCO, AS THE KSC CARGO INTEGRATION CONTRACTOR:

- OPERATES AND MAINTAINS THE VPF CARGO PROCESSING FACILITIES
  - I.E., GROUND SUPPORT EQUIPMENT, CRANES, AND CARGO INTEGRATION TEST EQUIPMENT (CITE)
- PERFORMS CARGO INTERFACE TESTING
  - CITE AND ORBITER
  - VERIFY SPACECRAFT AND UPPER STAGE READINESS
  - ON-LINE AND OFF-LINE TESTING
- OPERATES AND MAINTAINS PAYLOAD TRANSPORTER/CANISTER (TRANSCAN)
- PREPARES ALL CARGO RELATED SCHEDULES
- PREPARES, COORDINATES, AND PUBLISHES ALL CARGO OPERATIONS AND MAINTENANCE INSTRUCTIONS (OMI'S)

KSC FORM 4-588NS (6/84)

DESIGN AND DEVELOPMENT



KSC FORM 4-588NS (6/84)

OPERATIONAL PHASE PROCESSING FLOW

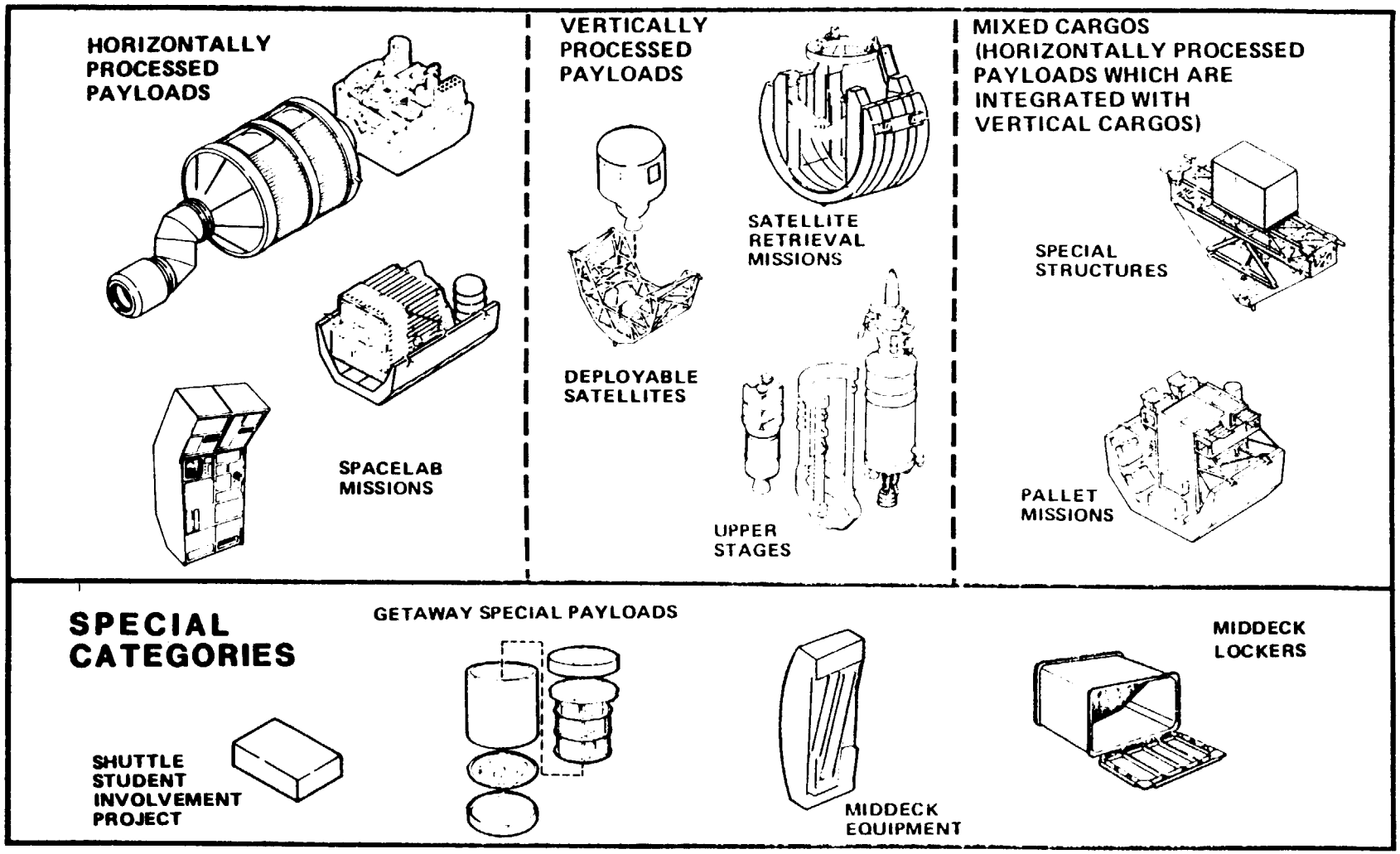
FOR ALL CLASSIFICATIONS

OF

STS PAYLOADS

KSC FORM 4-588NS (6/84)

DESIGN AND DEVELOPMENT



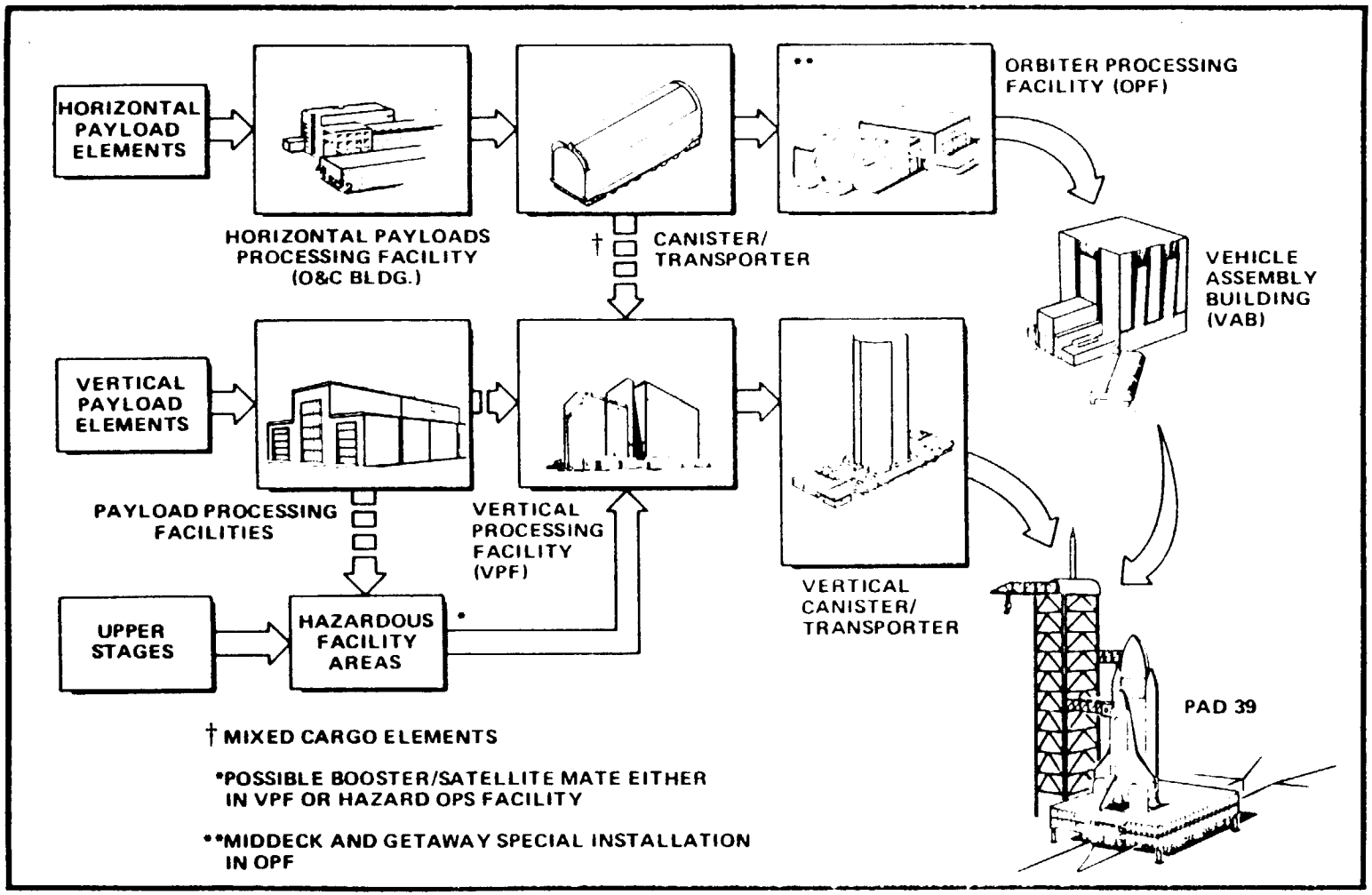
STS PAYLOADS PROCESSING CLASSIFICATIONS

KSC FORM 4-588NS (6/84)

PAYLOAD PROCESSING FLOWS AT KSC

- HORIZONTALLY PROCESSED PAYLOADS
  - PROCESSED AND INTEGRATED IN THE OPERATIONS AND CHECKOUT BUILDING
    - SPACELAB CORE AND EXPERIMENT MODULES
    - PALLETS, RACKS, SPECIAL STRUCTURES
    - SCIENCE AND APPLICATIONS EXPERIMENTS
- VERTICALLY PROCESSED PAYLOADS/UPPER STAGES
  - PROCESSED THROUGH THE PAYLOAD PROCESSING FACILITY AND THE HAZARDOUS PROCESSING FACILITY
  - INTEGRATED IN THE VERTICAL PROCESSING FACILITY
    - COMMERCIAL
    - SCIENTIFIC
    - PLANETARY
- INTEGRATED CARGO
  - TRANSPORTED BY PAYLOAD CANISTER TO ORBITER PROCESSING FACILITY OR PAYLOAD CHANGEOUT ROOM FOR INSTALLATION INTO THE ORBITER

KSC FORM 4-588NS (6/84)



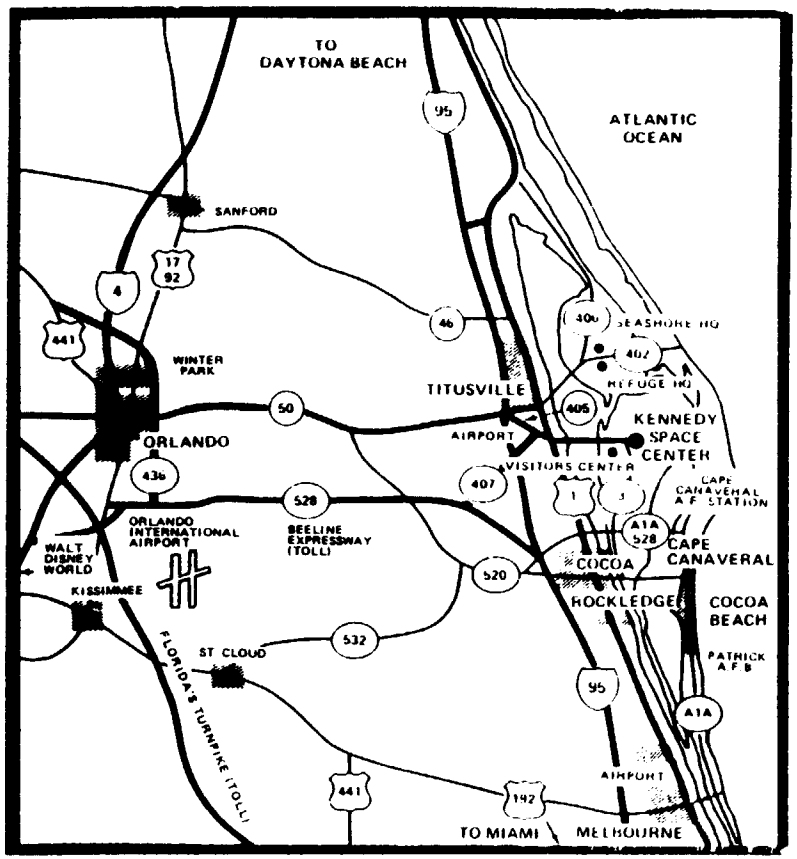
PAYLOAD PROCESSING FLOWS AT KSC

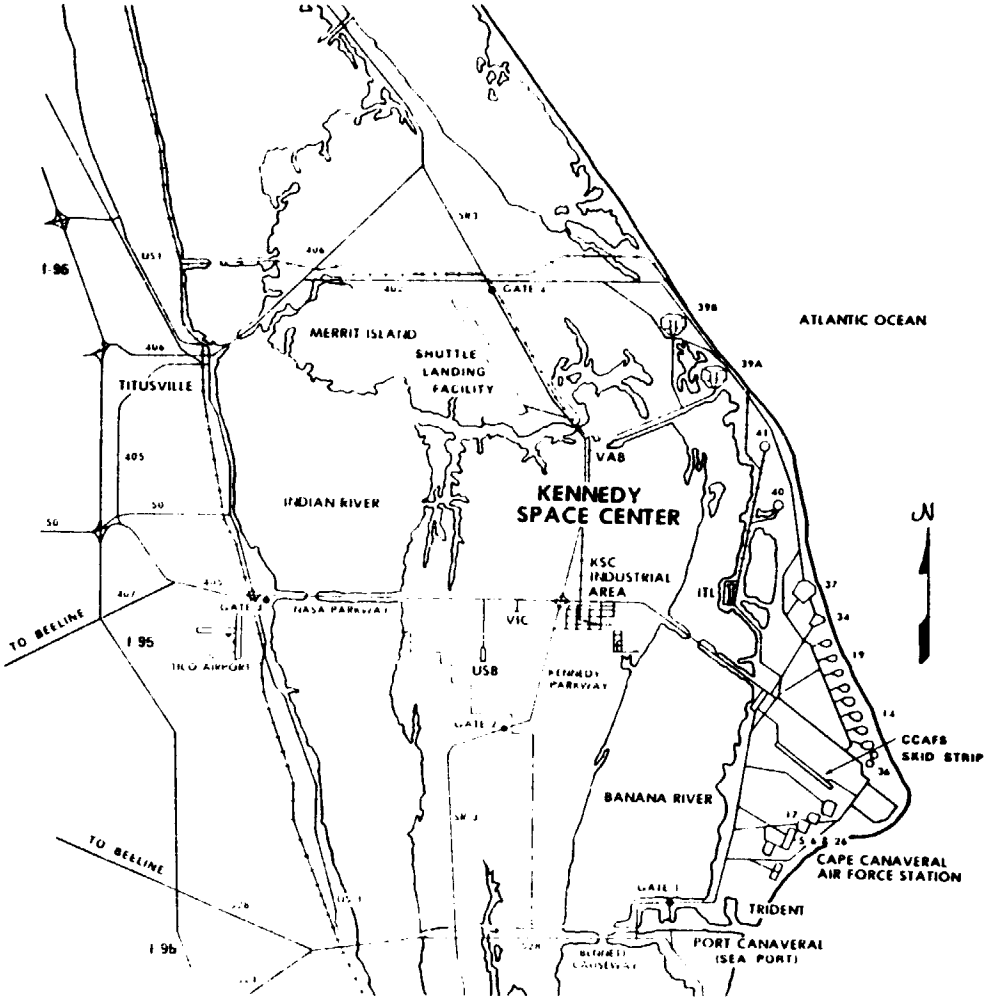
KSC FORM 4-588NS (6/84)

ARRIVAL

- YOUR PAYLOAD AND ATTENDANT GROUND SUPPORT EQUIPMENT CAN BE DELIVERED TO KSC VIA:
  - LAND: FLORIDA EAST COAST RAILWAY AND INTERSTATE HIGHWAY 95
  - AIR: ORLANDO INTERNATIONAL AIRPORT
    MELBOURNE REGIONAL AIRPORT
    KSC'S SHUTTLE LANDING STRIP
    CCAFS'S SKID STRIP
  - SEA: INTERNATIONAL SEAPORT OF ENTRY AT PORT CANAVERAL
    INTERCOASTAL WATERWAY

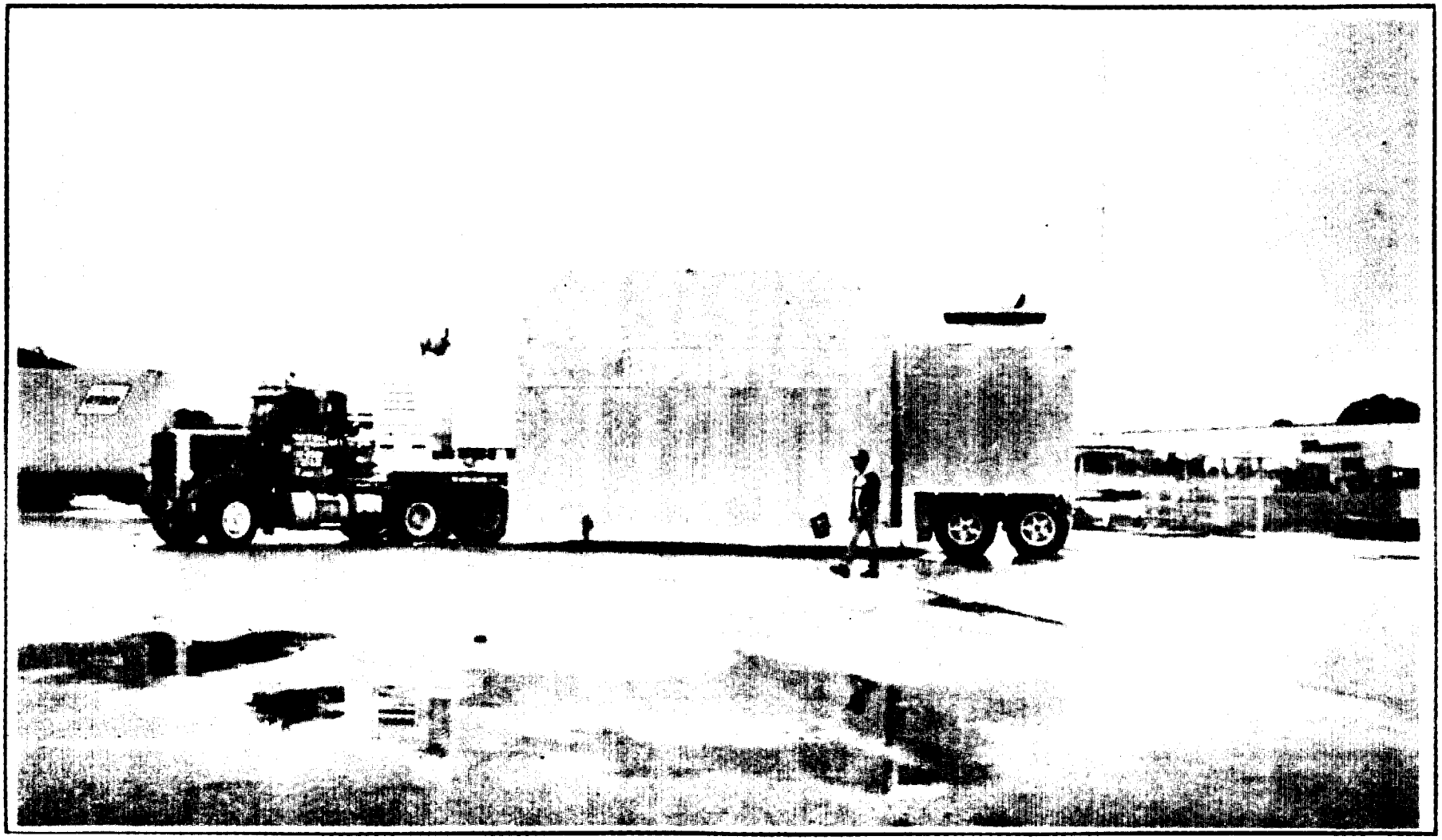
KSC FORM 4-588NS (6/84)





KENNEDY SPACE CENTER AREA MAP

KSC FORM 4-588NS (6/84)



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ARRIVAL BY PAYLOAD ENVIRONMENTAL TRANSPORTATION SYSTEM

KSC FORM 4-588NS (6/84)

ARRIVAL BY CUSTOMER LEASED SHIP

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UNLOADING/TRANSPORT TO PPF OR O&C

- KSC HAS LIMITED EQUIPMENT TO UNLOAD AIRCRAFT
  - CARGO LIFT TRAILER (CLT) AND K LOADER ACCOMMODATES C5A AND LOCKHEED L-100 TYPE AIRCRAFT
  - HAVE TO LEASE EQUIPMENT FROM MIAMI OR NEW YORK TO ACCOMMODATE BOEING 747-FREIGHTER AND OTHERS
- KSC WILL PROVIDE MANPOWER AND EQUIPMENT (FORKLIFTS, TRUCKS, ETC.) TO UNLOAD AND TRANSPORT PAYLOAD AND EQUIPMENT TO PPF OR O&C
- CUSTOMS AND IMMIGRATION SERVICE CAN BE ARRANGED

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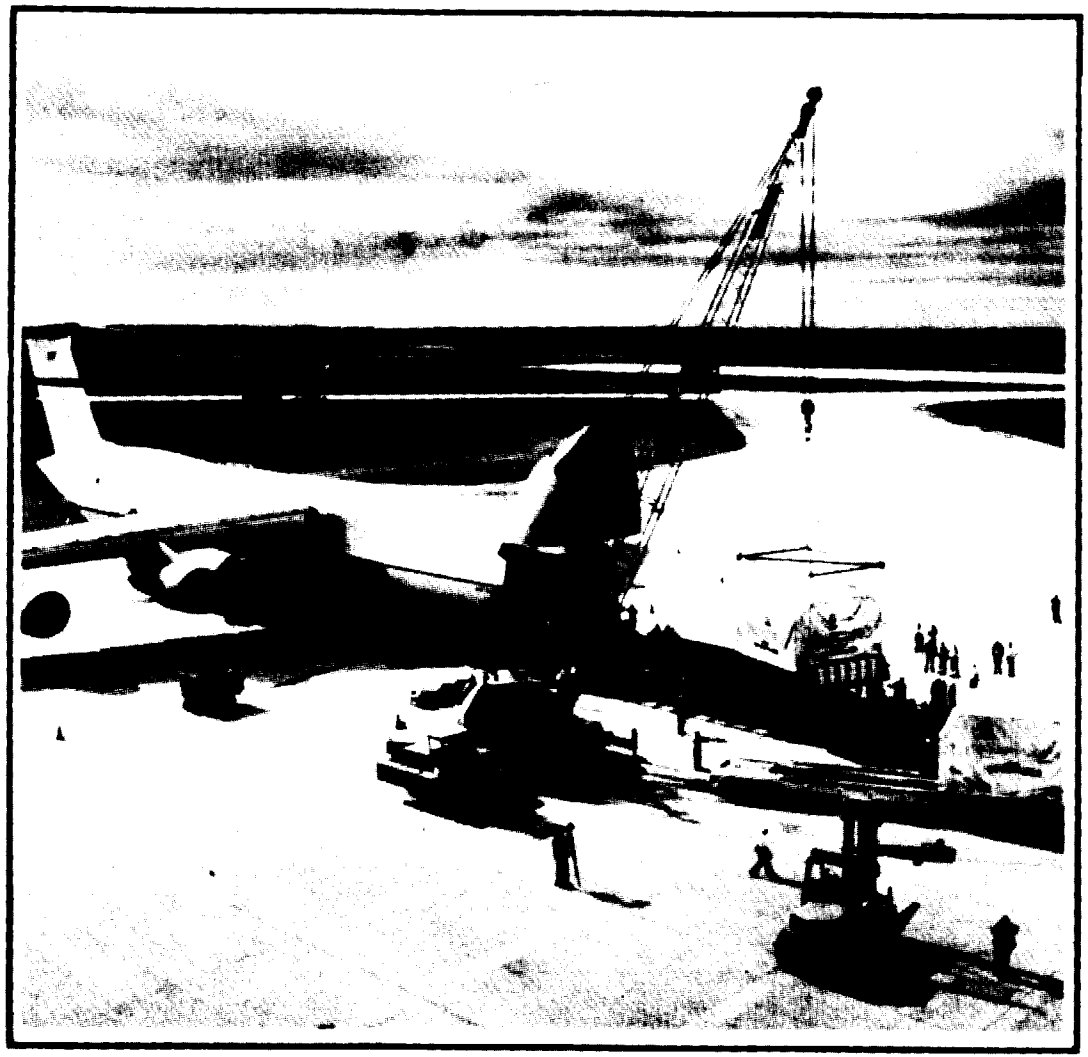


UNLOADING C5A AT KSC'S SHUTTLE LANDING STRIP

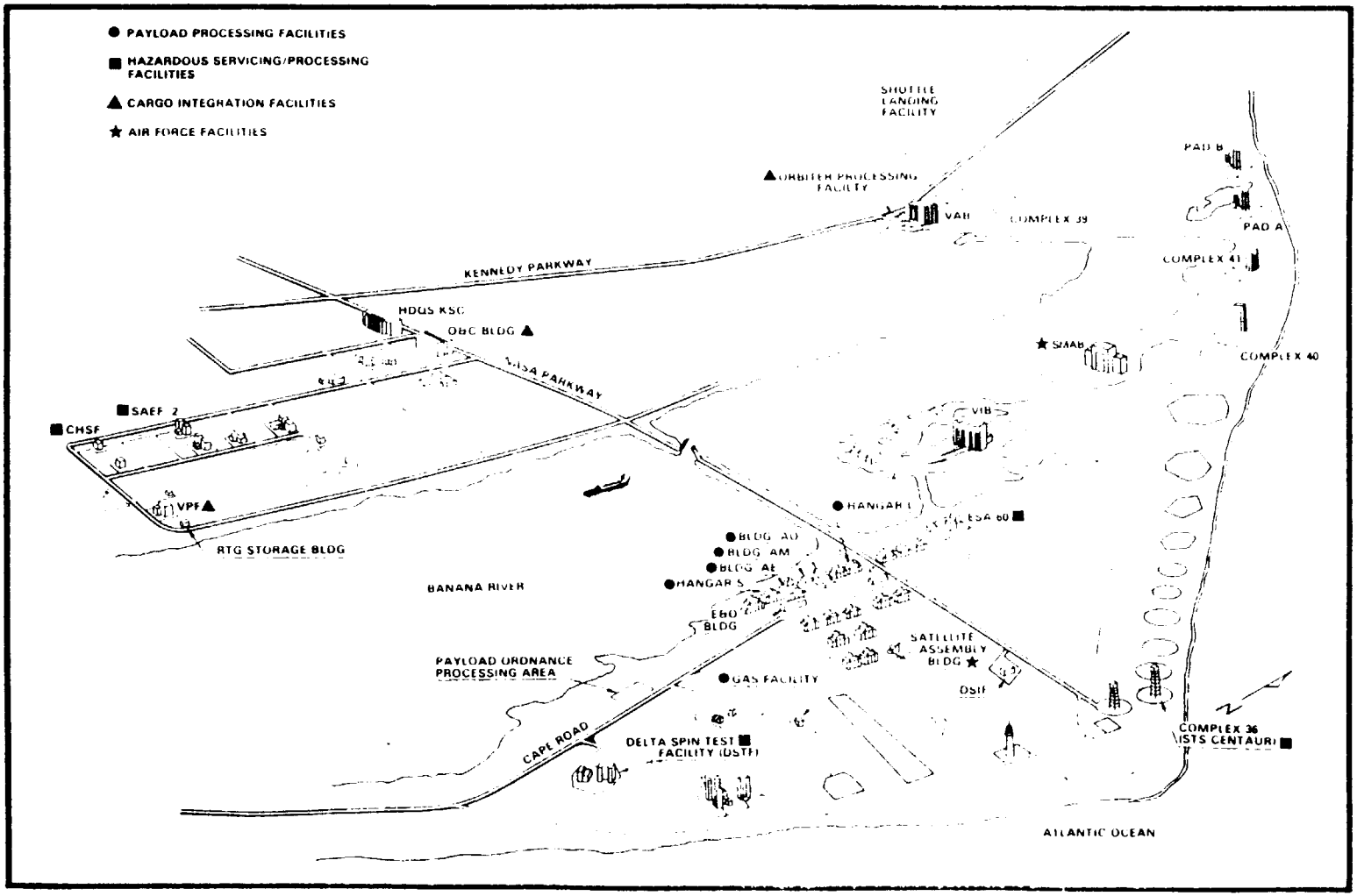
KSC FORM 4-588NS (6/84)

RECEIVING

- THE PROCESSING FLOW BEGINS WHEN YOUR PAYLOAD AND GROUND SUPPORT EQUIPMENT ARRIVE AT ONE OF THE EXISTING PAYLOAD PROCESSING FACILITIES OR THE O&C BUILDING.
  - RECEIVING AND INSPECTION
    - INITIAL INSPECTION COMPLETED TO IDENTIFY ANY VISIBLE SHIPPING DAMAGE.
    - PAYLOAD OWNER IS RESPONSIBLE FOR DETAILED INSPECTION AFTER EQUIPMENT IS UNPACKED.

KSC FORM 4-588NS (6/84)

DESIGN AND DEVELOPMENT



CARGO/PAYLOAD FACILITIES

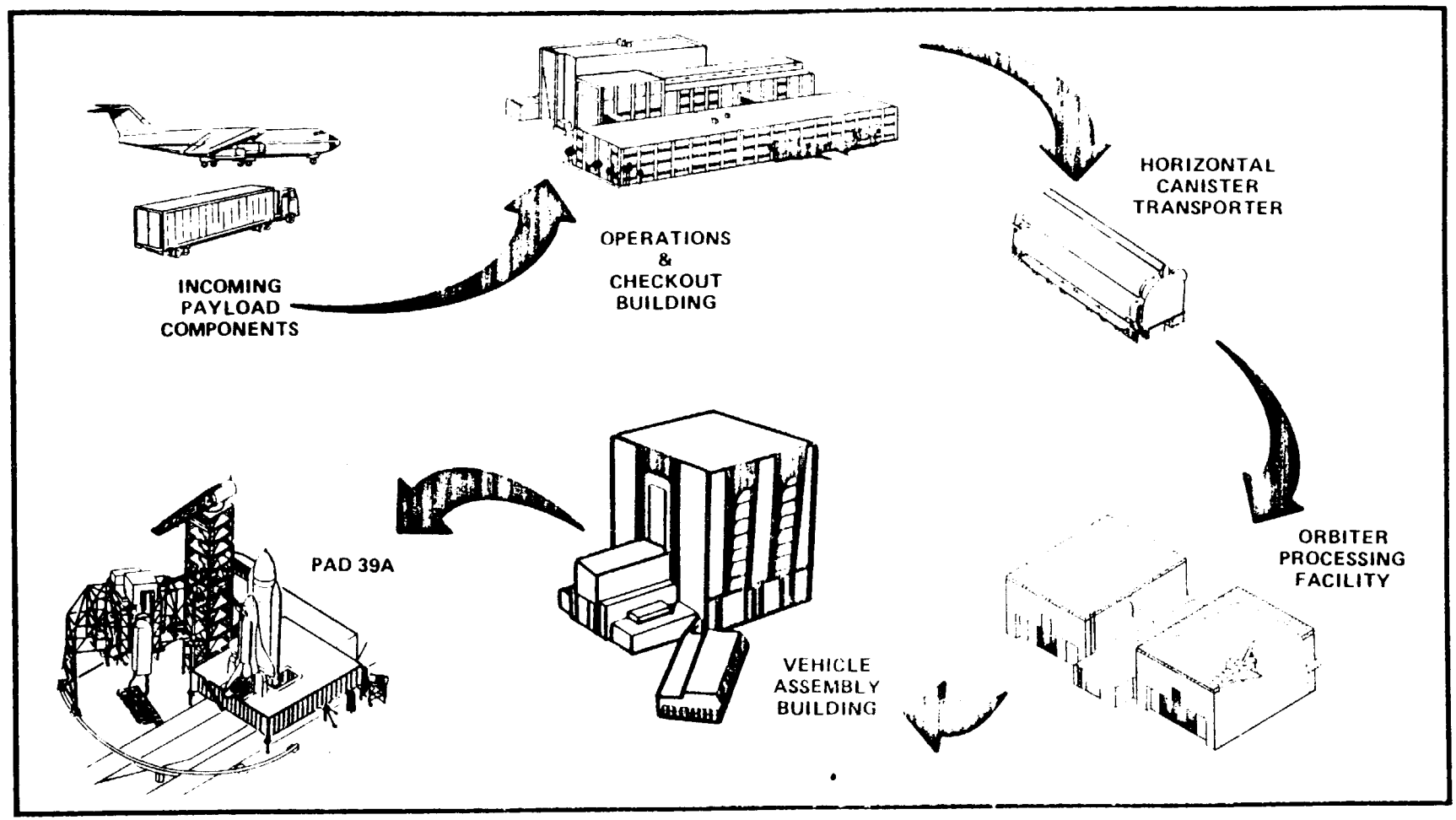
HORIZONTALLY PROCESSED PAYLOADS

SUCH AS SPACELAB MODULES, IGLOOS, AND PALLETS

AND MISSION PECULIAR EXPERIMENT SUPPORT STRUCTURES

KSC FORM 4-588NS (6/84)

DESIGN AND DEVELOPMENT



HORIZONTAL PAYLOAD PROCESSING FLOW

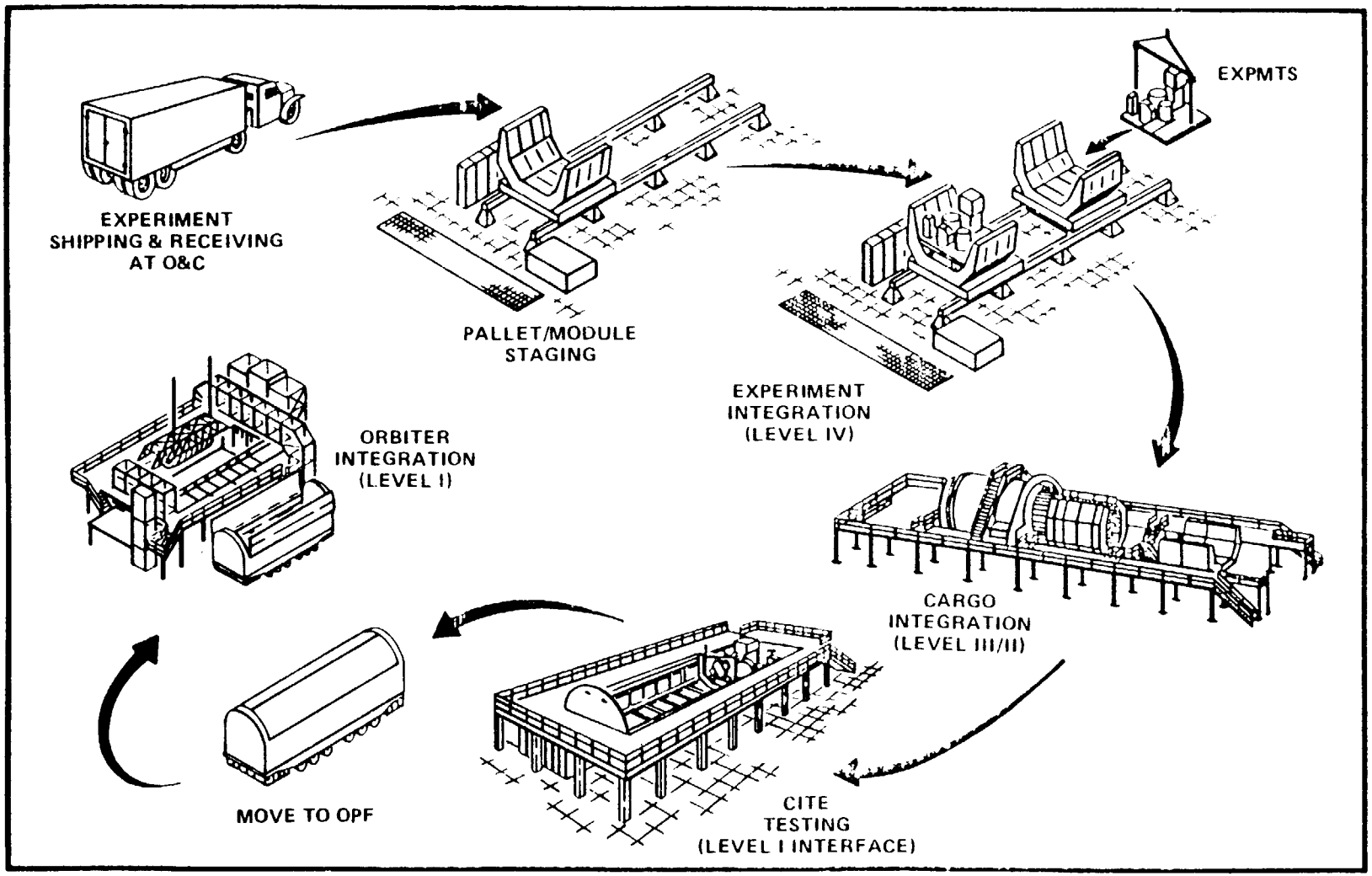
KSC FORM 4-588NS (6/84)

HORIZONTAL PAYLOAD ELEMENT PREPARATION

- STAGING
  - PREPARATION OF RACKS/RACK SETS/PALLETS, SPECIAL STRUCTURES, AFT BULKHEADS, AND SPECIAL EXPERIMENT SECTIONS FOR INTEGRATION
- EXPERIMENT INTEGRATION
  - INTEGRATION AND CHECKOUT OF EXPERIMENT EQUIPMENT WITH INDIVIDUAL EXPERIMENT MOUNTING ELEMENTS (E.G., RACKS, PALLET SEGMENTS, AND SPECIAL STRUCTURES)
- CARGO INTEGRATION
  - COMBINATION, INTEGRATION, AND CHECKOUT OF TOTAL COMPLEMENT OF PAYLOADS (ONE OR MORE) ON ANY FLIGHT
- CITE TESTING
  - VERIFICATION OF MECHANICAL AND ELECTRICAL PAYLOAD-TO-PAYLOAD AND CARGO-TO-ORBITER INTERFACES

KSC FORM 4-588NS (6/84)

DESIGN AND DEVELOPMENT



EXPERIMENT PROCESSING FLOW

KSC FORM 4-588NS (6/84)

HORIZONTAL PAYLOAD ELEMENT PREPARATION (CONTINUED)

- AFTER EXPERIMENT INTEGRATION, THE ELEMENT IS PLACED IN THE CARGO CANISTER ON THE TRANSPORTER AND MOVED:
  - TO THE ORBITER PROCESSING FACILITY FOR INTEGRATION INTO THE ORBITER

    OR
  - TO THE VERTICAL PROCESSING FACILITY TO JOIN THE REMAINDER OF THE CARGO

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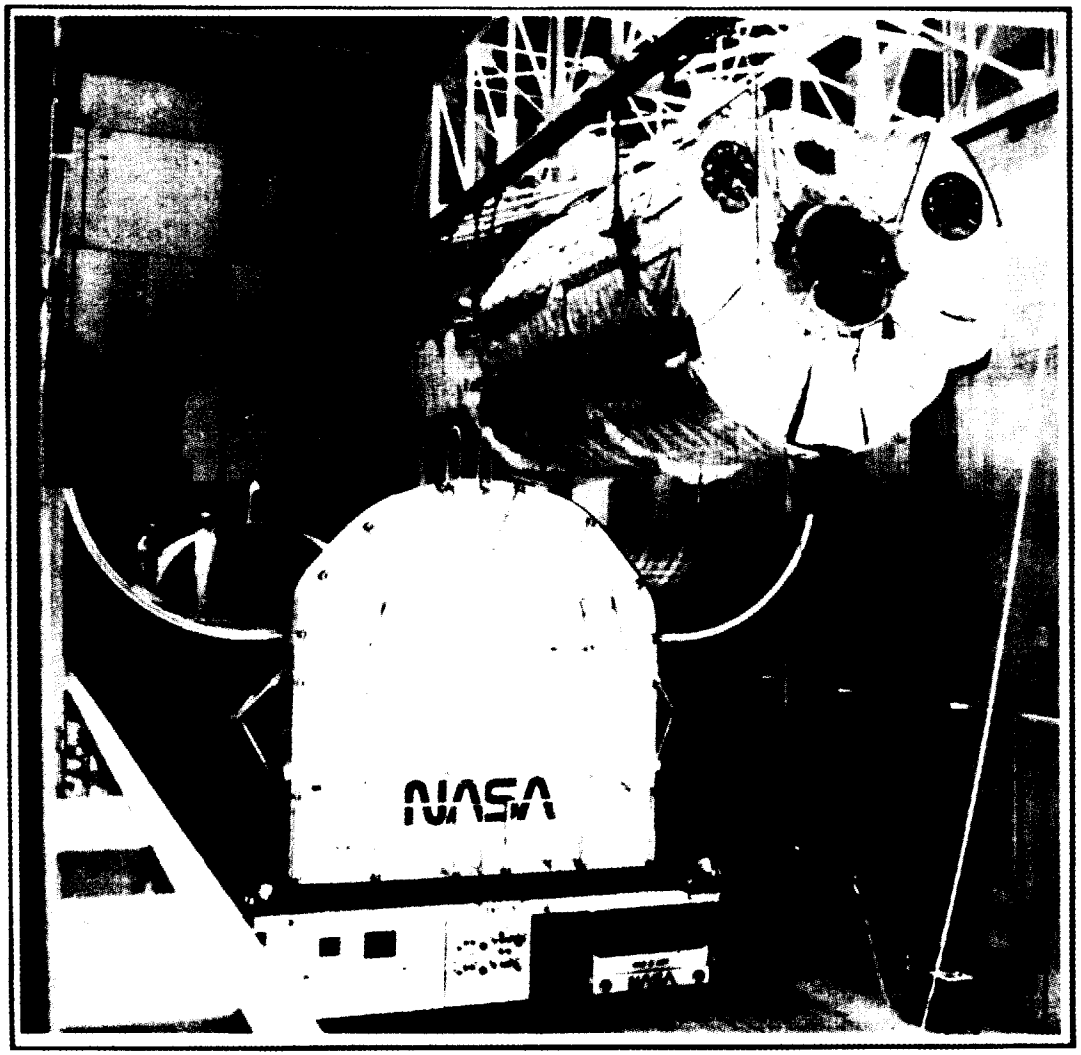

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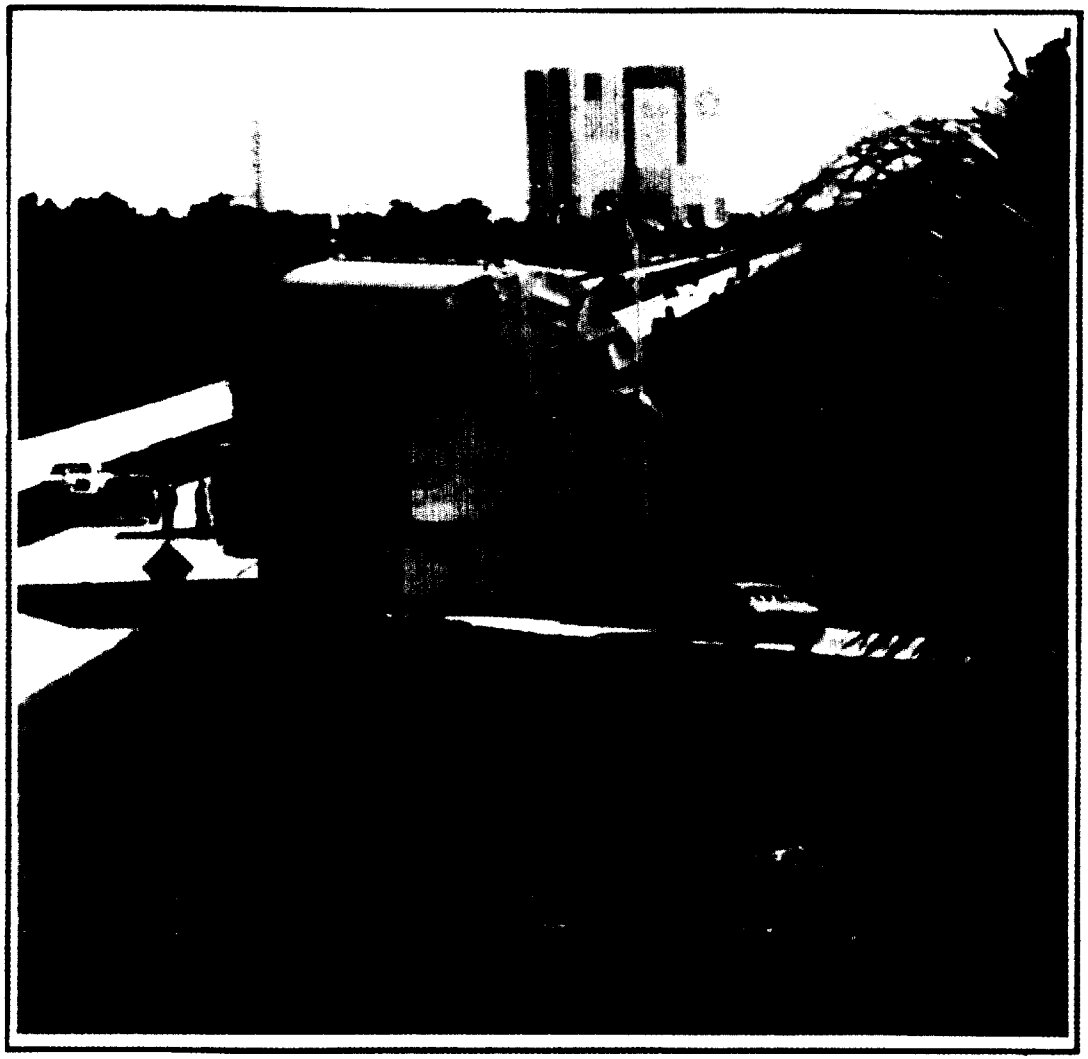
SPACELAB INSTALLATION INTO THE CANISTER

KSC FORM 4-588NS (6/84)



CANISTER ENROUTE TO THE ORBITER PROCESSING FACILITY

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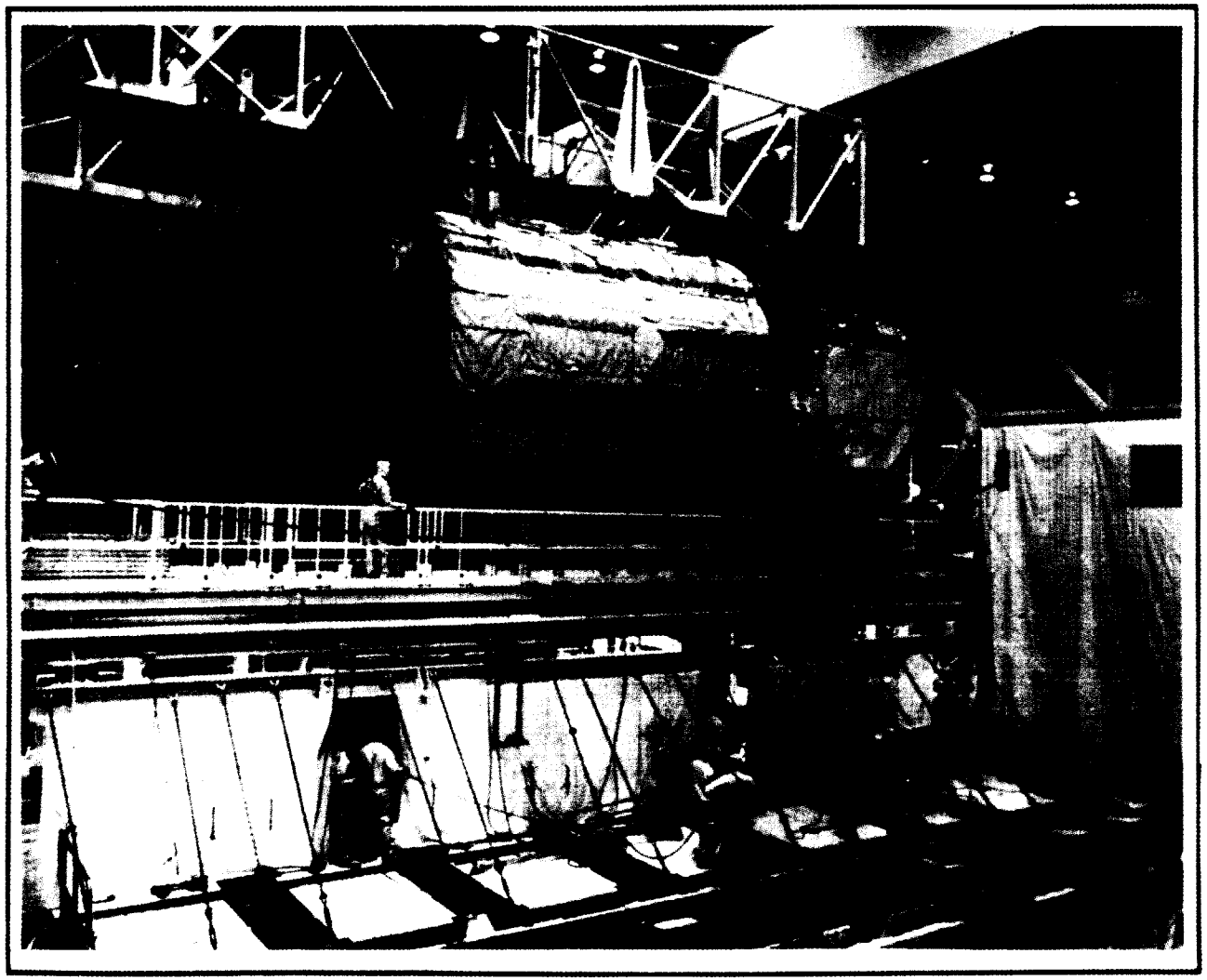

SPACELAB INSTALLATION INTO THE CARGO BAY

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KSC FORM 4-588NS (6/84)

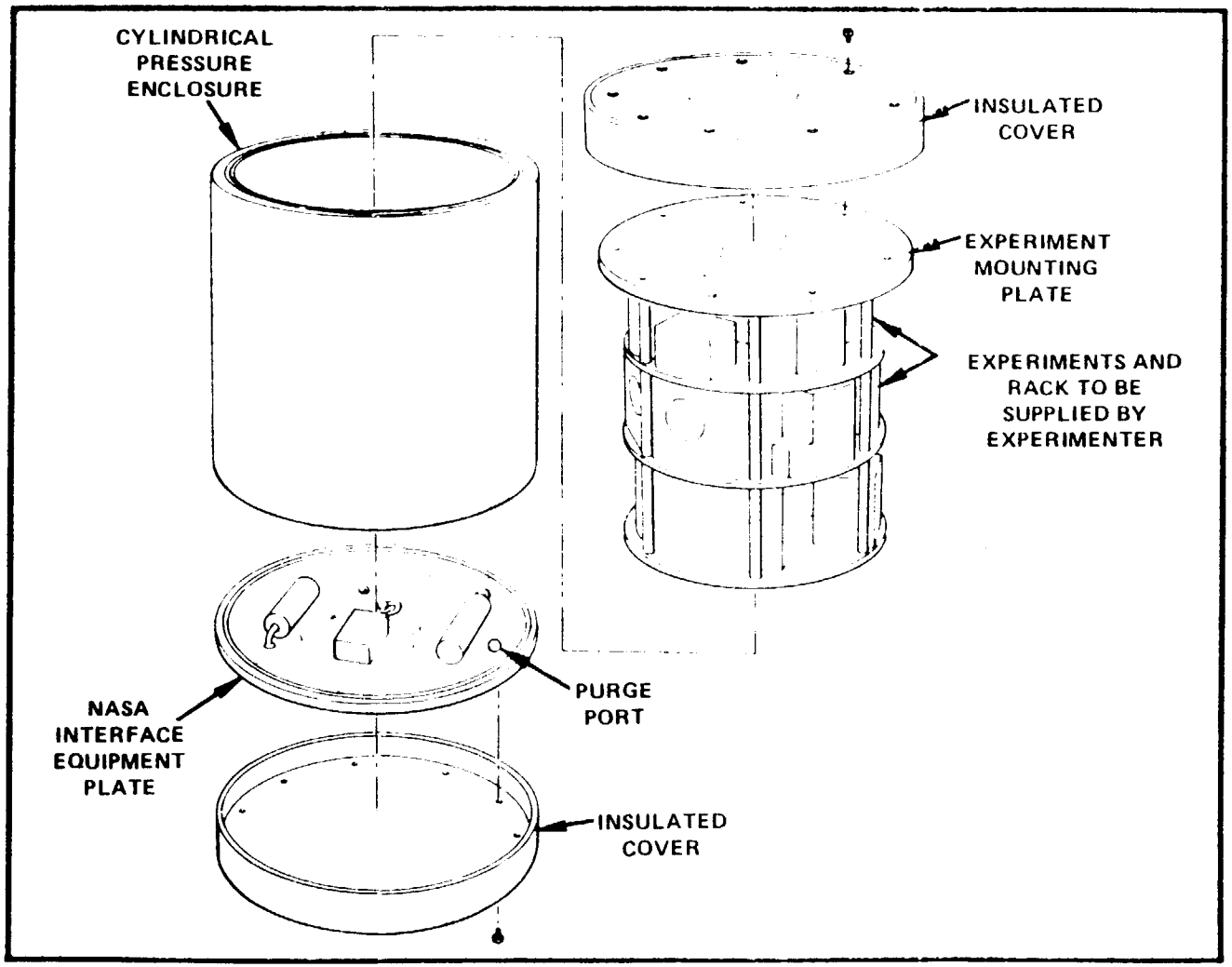
SMALL SELF-CONTAINED PAYLOADS

GETAWAY SPECIALS (GAS)

- PURPOSE:
  - ENCOURAGE THE USE OF SPACE BY ALL RESEARCHERS - PRIVATE INDIVIDUALS AND ORGANIZATIONS
  - FOSTER ENTHUSIASM IN YOUNGER GENERATION
  - INCREASE KNOWLEDGE OF SPACE
  - BE ALERT TO POSSIBLE GROWTH OF GAS INVESTIGATION INTO A PRIME EXPERIMENT
  - GENERATE NEW ACTIVITIES UNIQUE TO SPACE

KSC FORM 4-588NS (6/84)

DESIGN AND DEVELOPMENT



SMALL SELF-CONTAINED PAYLOADS

KSC FORM 4-588NS (6/84)

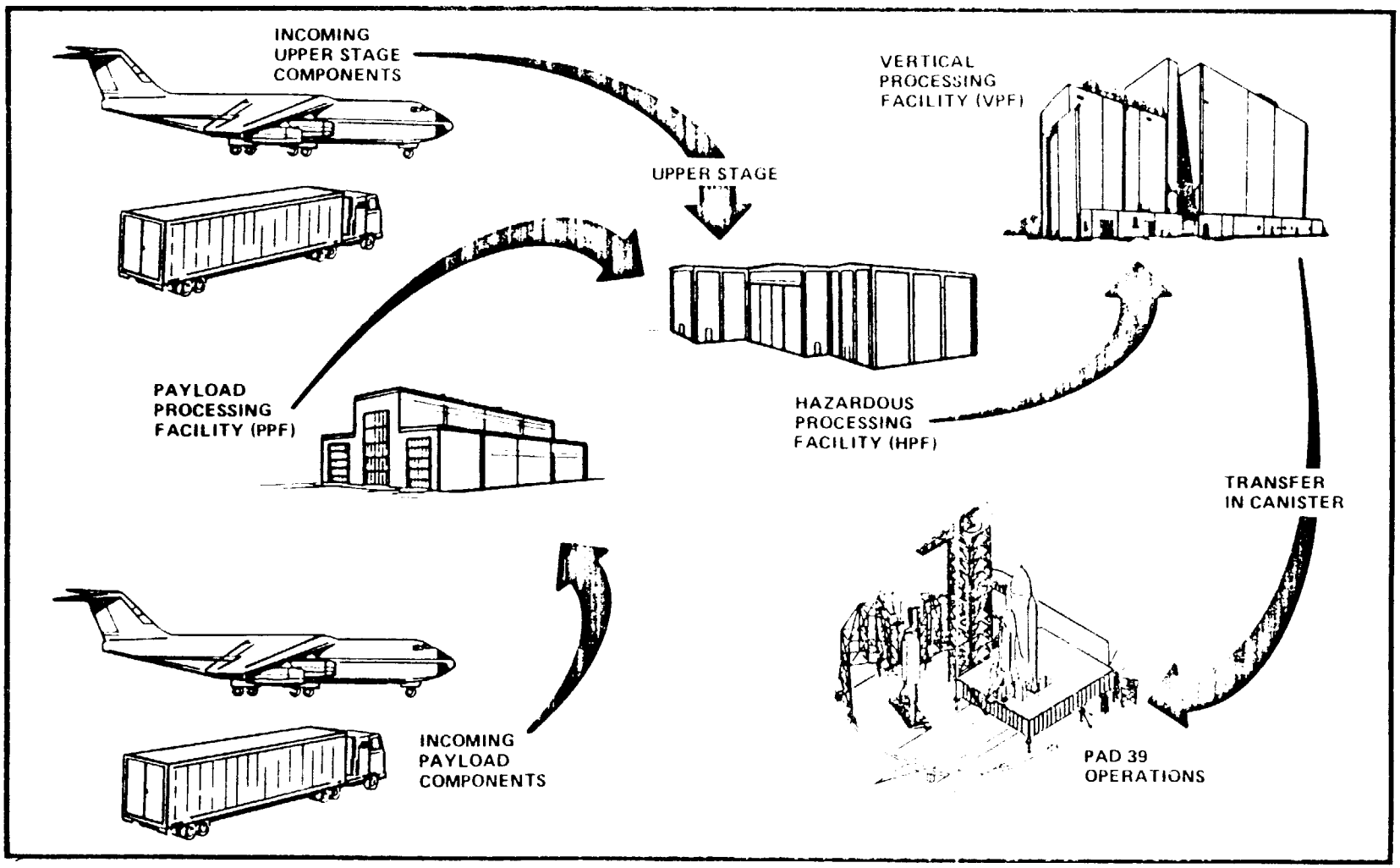
VERTICALLY PROCESSED PAYLOADS

SUCH AS SPACE TELESCOPE, SPAS 0-1,

SYNCOM, INTELSAT, ERBS, GALILEO, AND UPPER STAGES

KSC FORM 4-588NS (6/84)

DESIGN AND DEVELOPMENT



VERTICAL PAYLOAD PROCESSING FLOW

PAYLOAD PROCESSING FACILITY ACTIVITIES

- PAYLOAD PROCESSING BEGINS UPON ARRIVAL OF THE PAYLOAD AND GROUND SUPPORT EQUIPMENT AT ONE OF THE EXISTING PAYLOAD PROCESSING FACILITIES (PPF'S)
- SET UP ELECTRICAL GROUND SUPPORT EQUIPMENT STATION
  - TO MONITOR AND CONDUCT PAYLOAD CHECKOUT VIA HARDLINES AND OPEN LOOP RADIATION DURING THE ASSEMBLY AND VERIFICATION PROCESS
- FINAL ASSEMBLY/BUILDUP OF PAYLOAD TO LAUNCH CONFIGURATION
  - INITIAL PRESSURE AND PROPELLANT SYSTEMS LEAK TESTS
  - ASSEMBLY OF PAYLOAD SECTIONS
  - INSTALLATION OF SOLAR PANELS, ANTENNAS, INSULATION, ETC.
  - PAYLOAD FUNCTIONAL TESTING WITH PAYLOAD-UNIQUE GROUND SUPPORT EQUIPMENT

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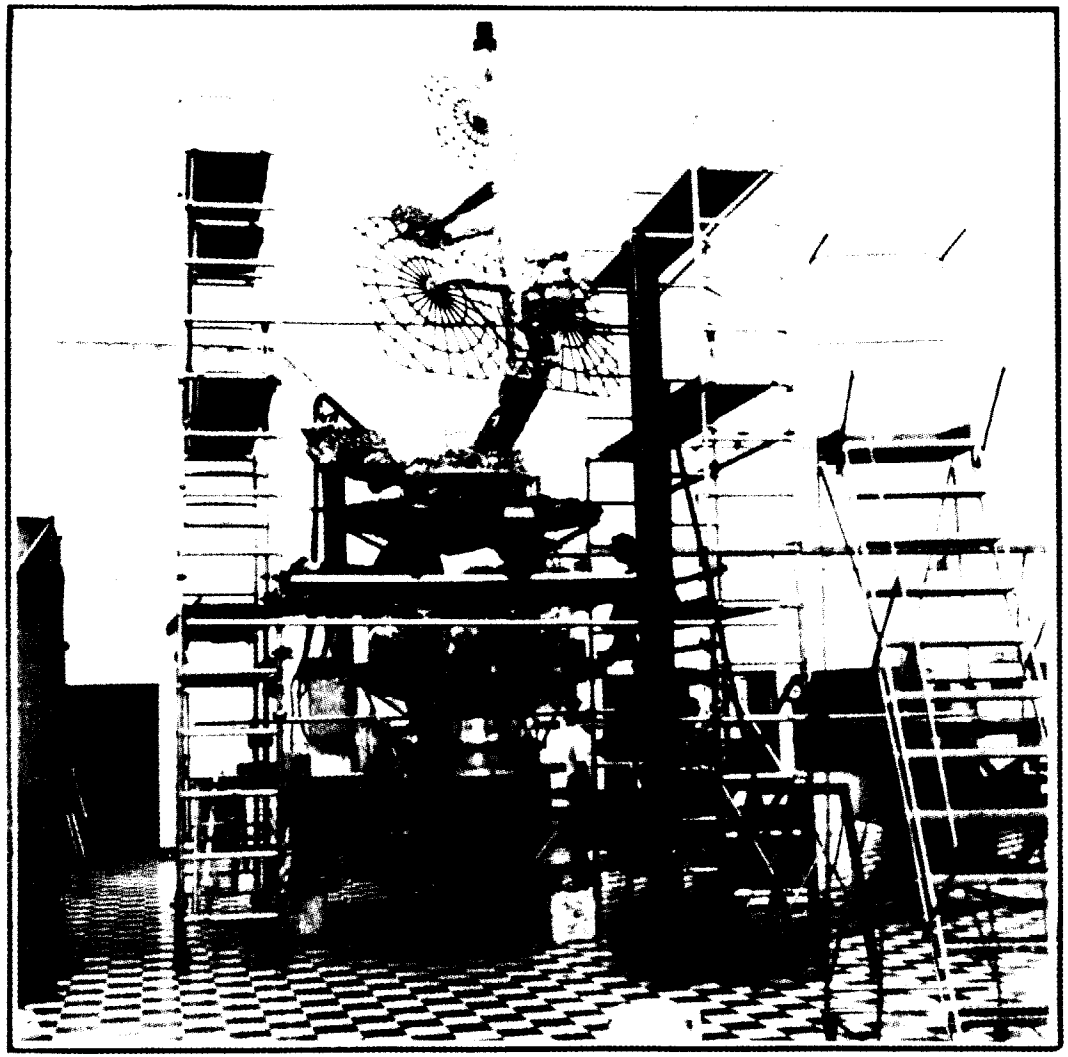

INTELSAT IV IN A PAYLOAD PROCESSING FACILITY

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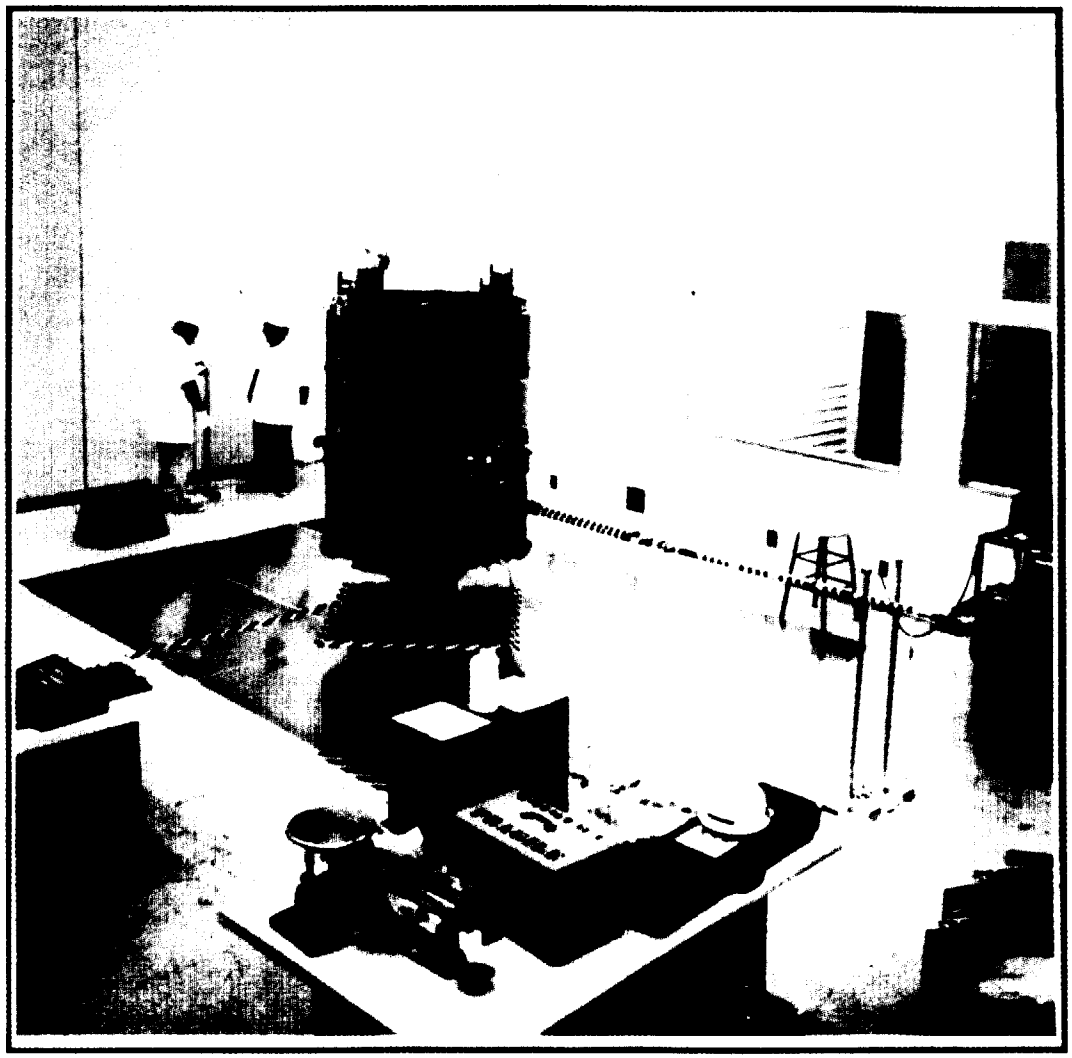

SCIENTIFIC PAYLOAD IN A PAYLOAD PROCESSING FACILITY

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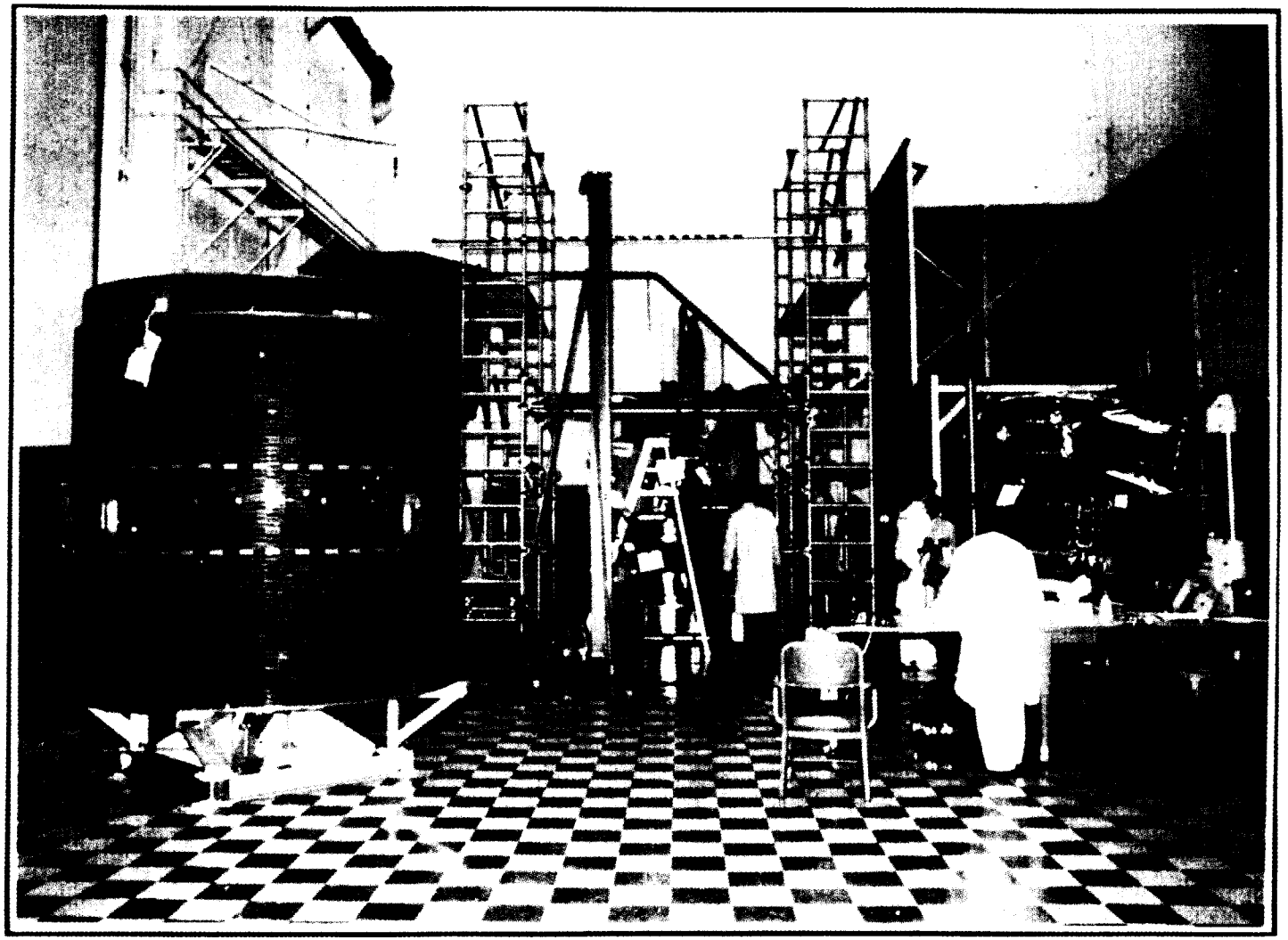

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COMMERCIAL PAYLOAD IN A PAYLOAD PROCESSING FACILITY

KSC FORM 4-588NS (6/84)

HAZARDOUS PROCESSING FACILITY ACTIVITIES

- PAYLOAD PROCESSING CONTINUES WITH THE TRANSFER OF THE PAYLOAD TO A HAZARDOUS PROCESSING FACILITY (HPF) FOR THE INSTALLATION AND SERVICING OF POTENTIALLY HAZARDOUS SYSTEMS (WHERE APPLICABLE).
- TYPICAL HAZARDOUS OPERATIONS INCLUDE:
  - SERVICING OF LIQUID PROPELLANT SYSTEMS:
    - HYDRAZINE
    - NITROGEN TETROXIDE AND MONOMETHYL HYDRAZINE
  - INSTALLATION OF:
    - SOLID PROPELLANT APOGEE MOTORS
    - ORDNANCE SEPARATION DEVICES
    - OTHER POTENTIALLY EXPLOSIVE OR HAZARDOUS ITEMS
- FINAL CLOSEOUT AND TESTS WITH REMOTE GROUND SUPPORT EQUIPMENT

KSC FORM 4-588NS (6/84)

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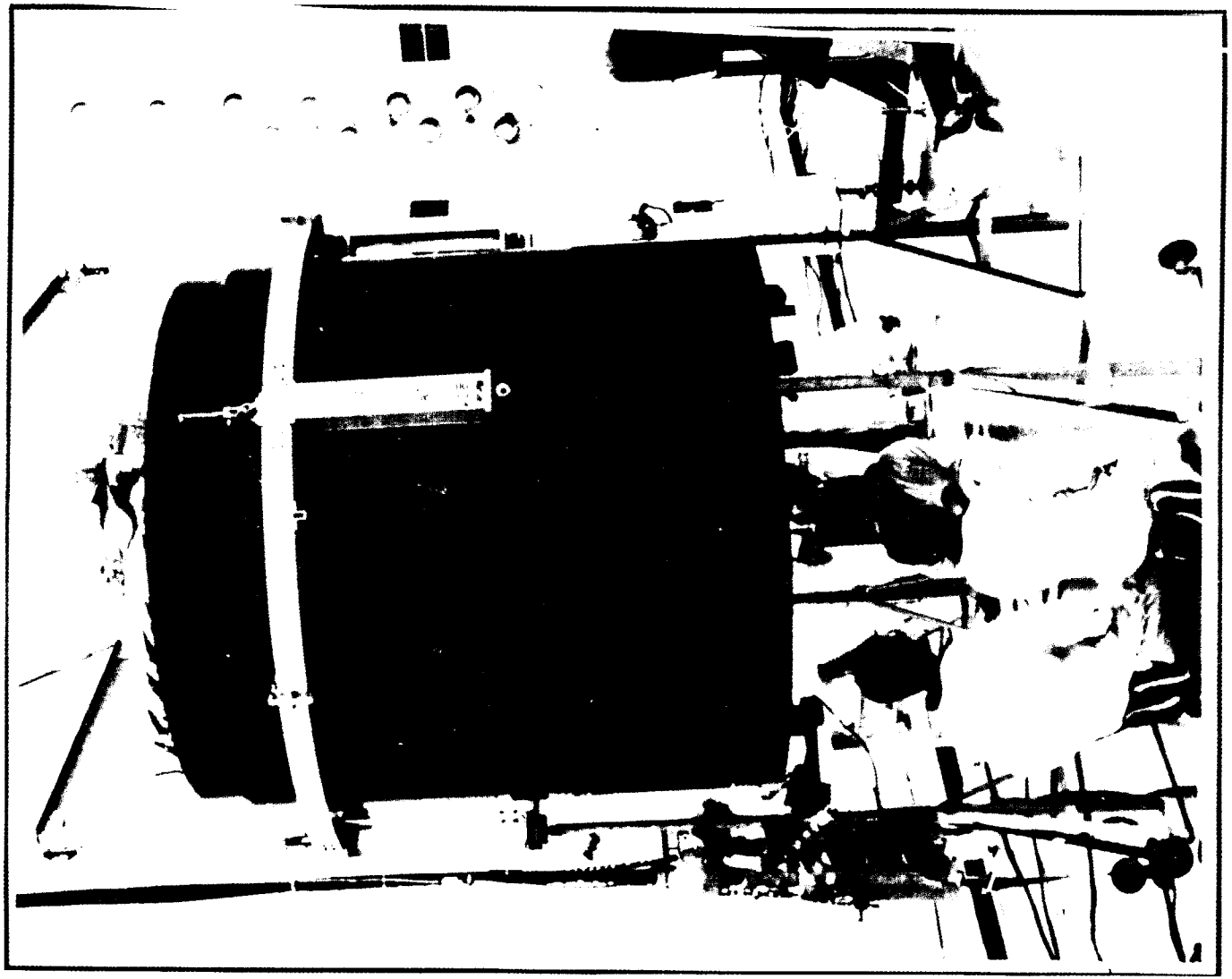


PREPARATION FOR AKM INSTALLATION

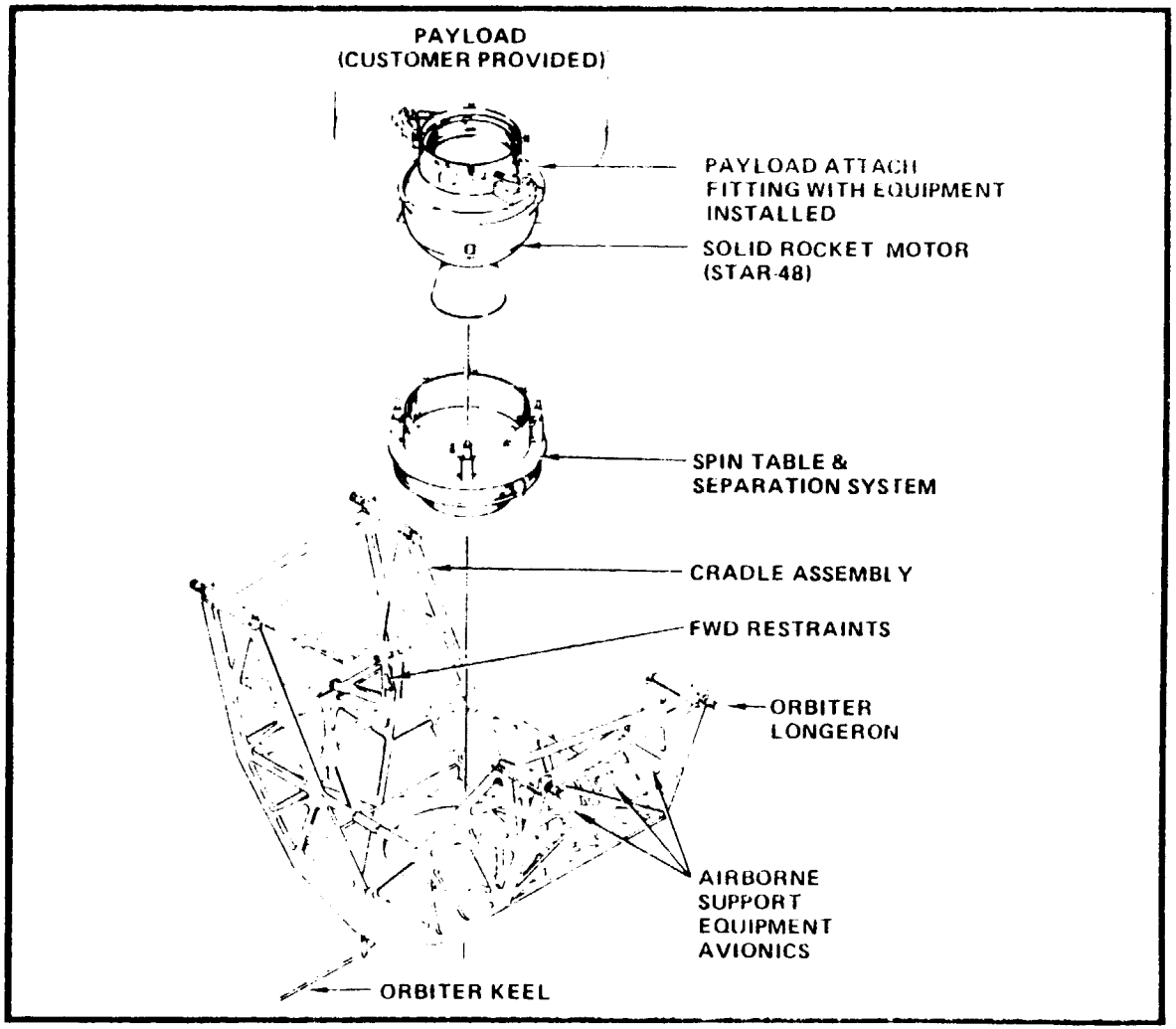
KSC FORM 4-588NS (6/84)

PAYLOAD ASSIST MODULE (PAM) UPPER STAGE PROCESSING OPERATIONS

- PAM PROCESSING INVOLVES DELIVERY OF THE SOLID MOTOR TO THE SOLID MOTOR STORAGE AREA AND THE TURNAROUND OF THE PAM CRADLE IN EXPLOSIVE SAFE AREA 60A (ESA-60A)
- SOLID MOTOR STORAGE AREA OPERATIONS:
  - STORAGE
  - COLD SOAK
  - X-RAY
  - BUILDUP TO FLIGHT CONFIGURATION
- DYNAMIC SPIN BALANCE OPERATIONS CONDUCTED IN THE DELTA SPIN TEST FACILITY
- ESA-60A OPERATIONS:
  - TEST AND RECERTIFY CRADLE
  - MATE PAM MOTOR TO CRADLE
  - TEST FINAL PAM/CRADLE ASSEMBLY
  - MATE PAM WITH PAYLOAD
  - INSTALL SUNSHIELDS
  - PERFORM PAM/PAYLOAD INTERFACE VERIFICATION
- TRANSPORT TO VERTICAL PROCESSING FACILITY

KSC FORM 4-588NS (6/84)

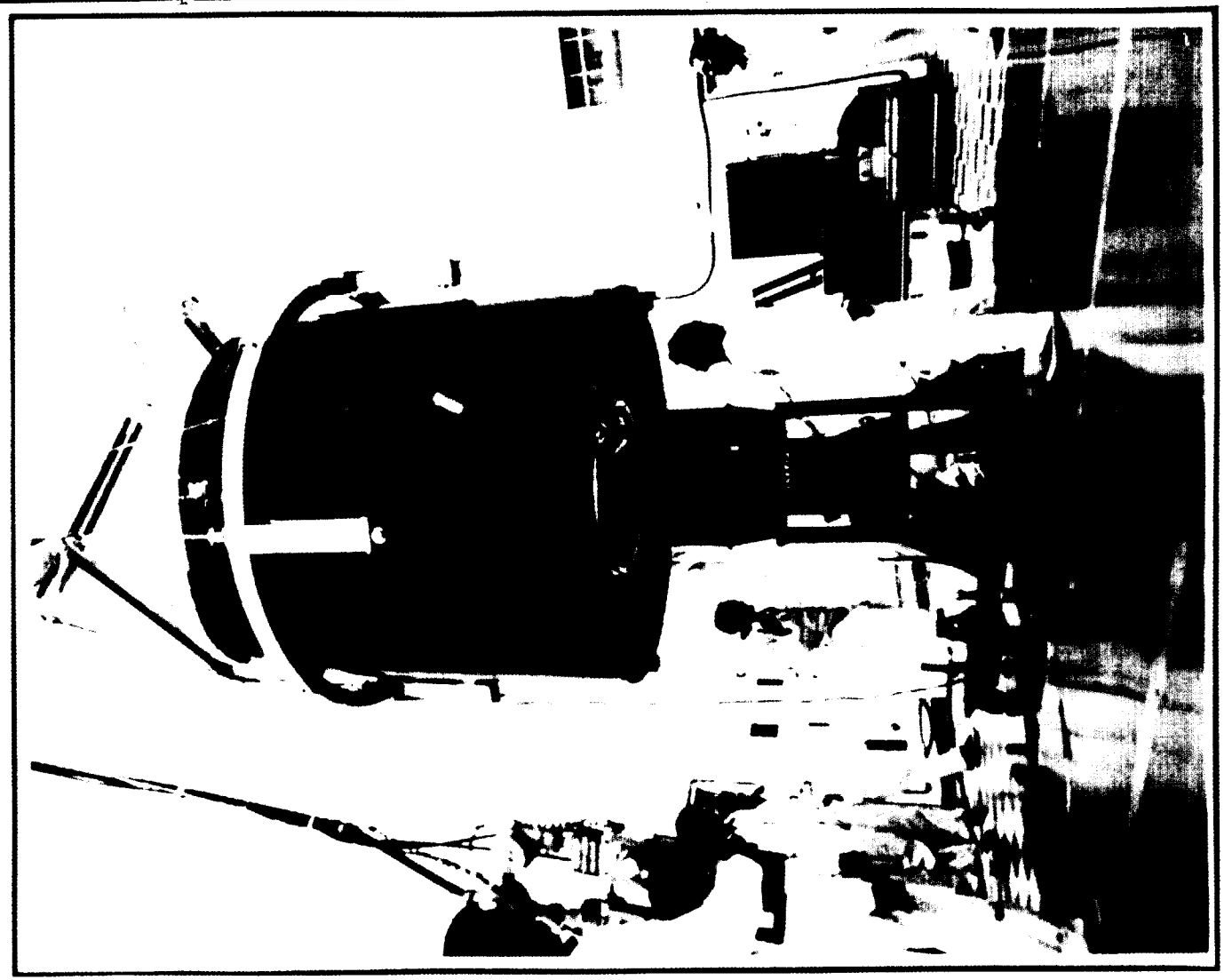
DESIGN AND DEVELOPMENT



STS PAM-D

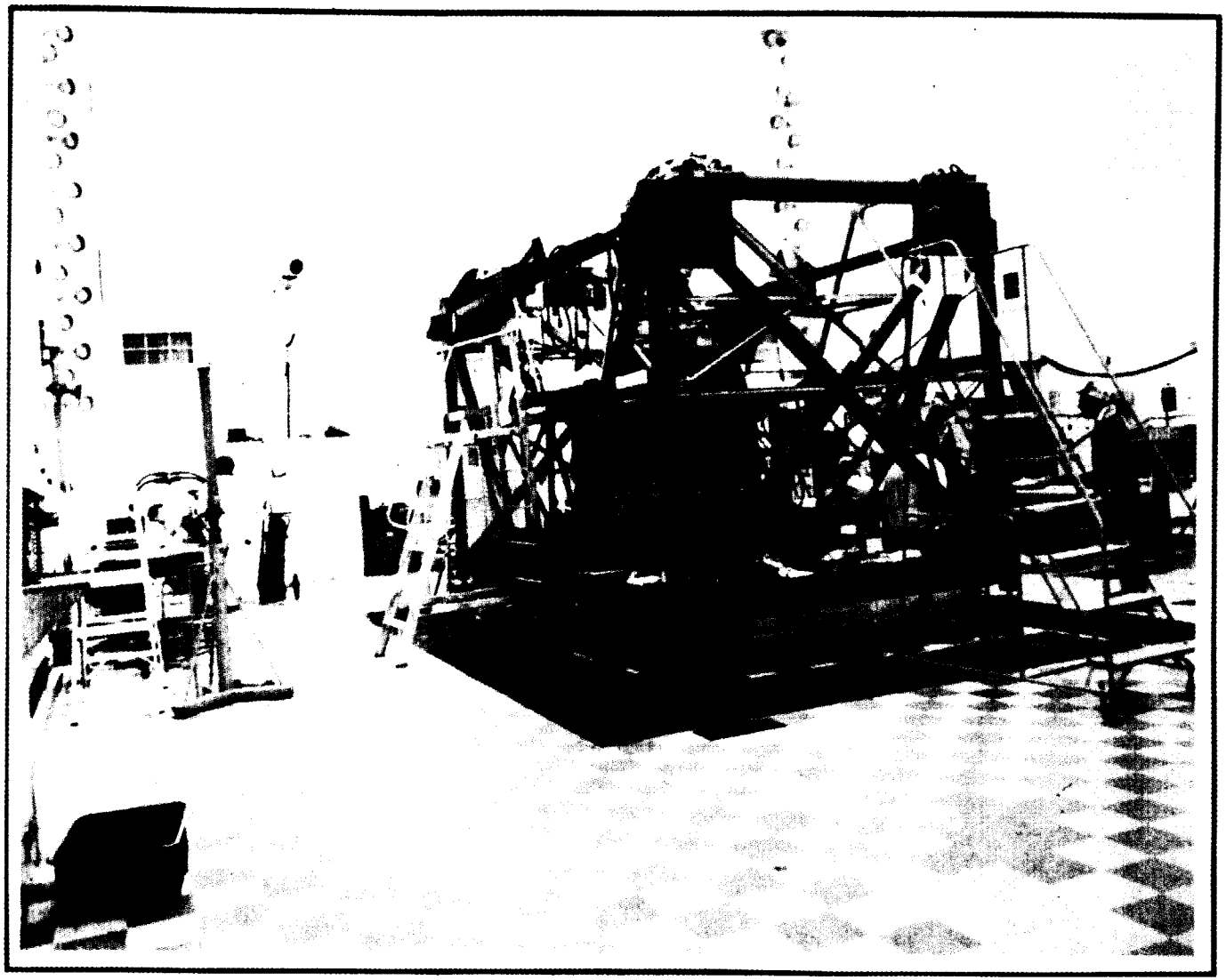
KSC FORM 4-588NS (6/84)

DESIGN AND DEVELOPMENT



AKM INSTALLATION

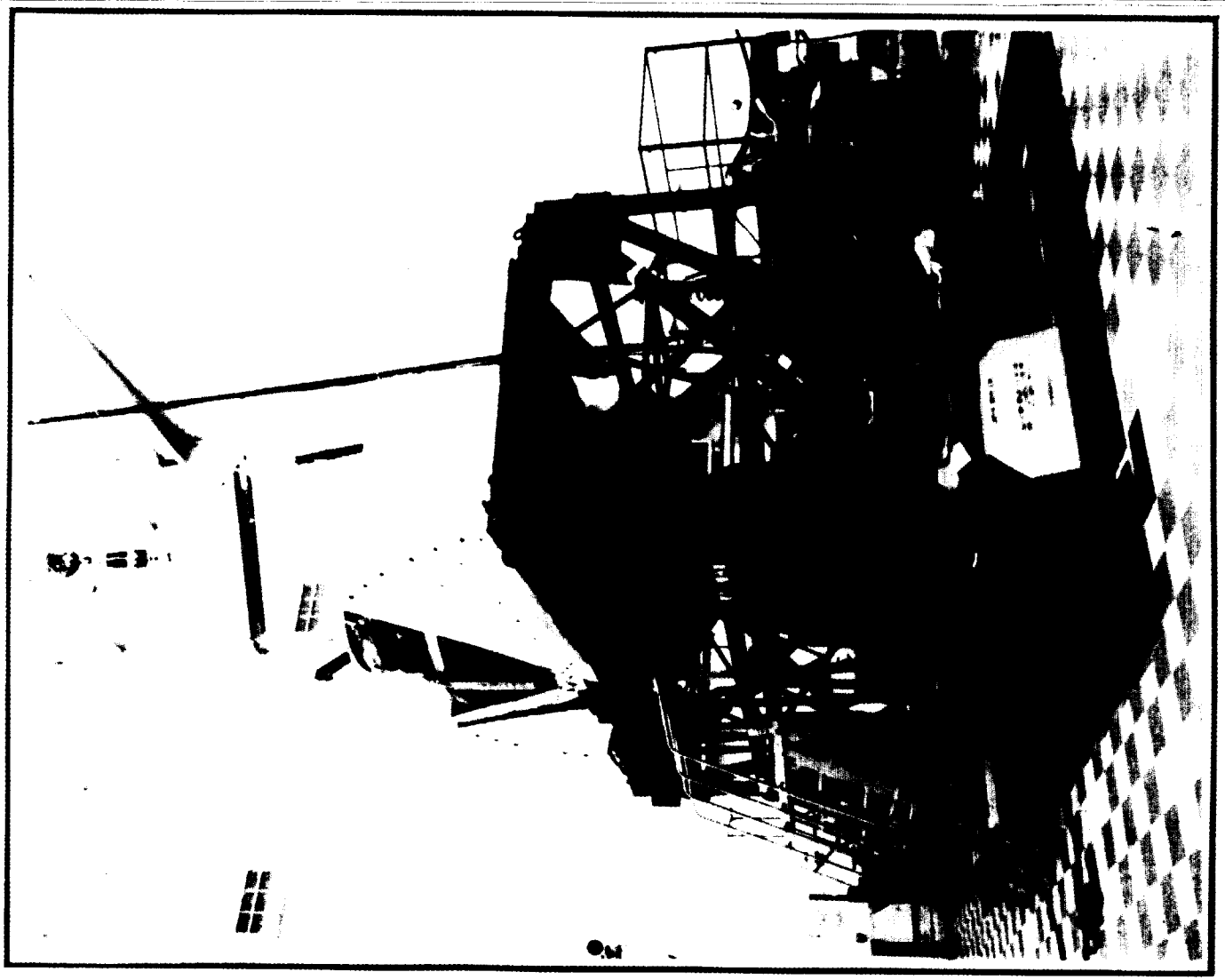
KSC FORM 4-588NS (6/84)



PAM-D AND CRADLE FINAL PREPS

KSC FORM 4-588NS (6/84)

DESIGN AND DEVELOPMENT



SPACECRAFT MATE TO PAM-D

KSC FORM 4-588NS (6/84)

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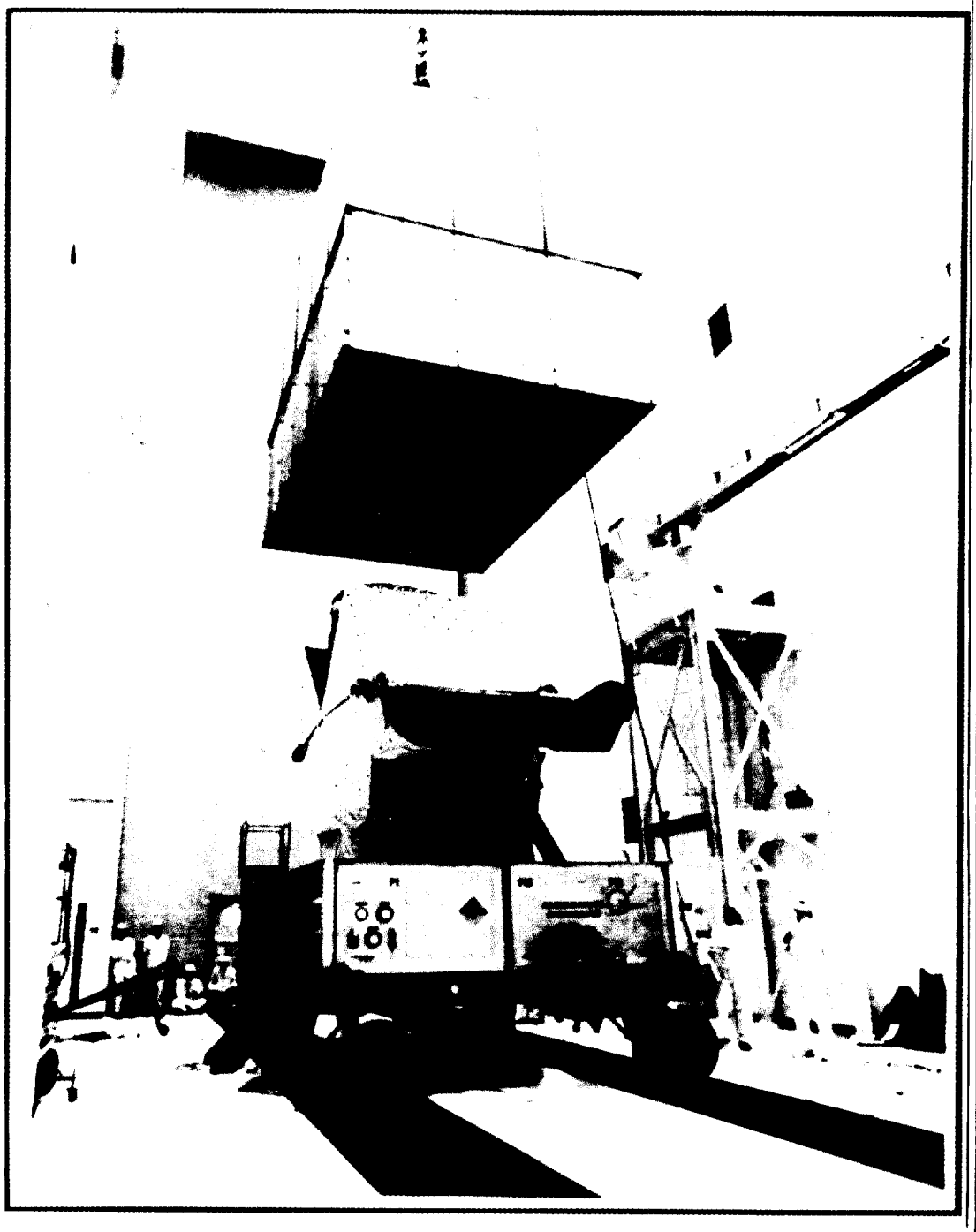

SPACECRAFT/PAM-D BEING RECEIVED IN VPF

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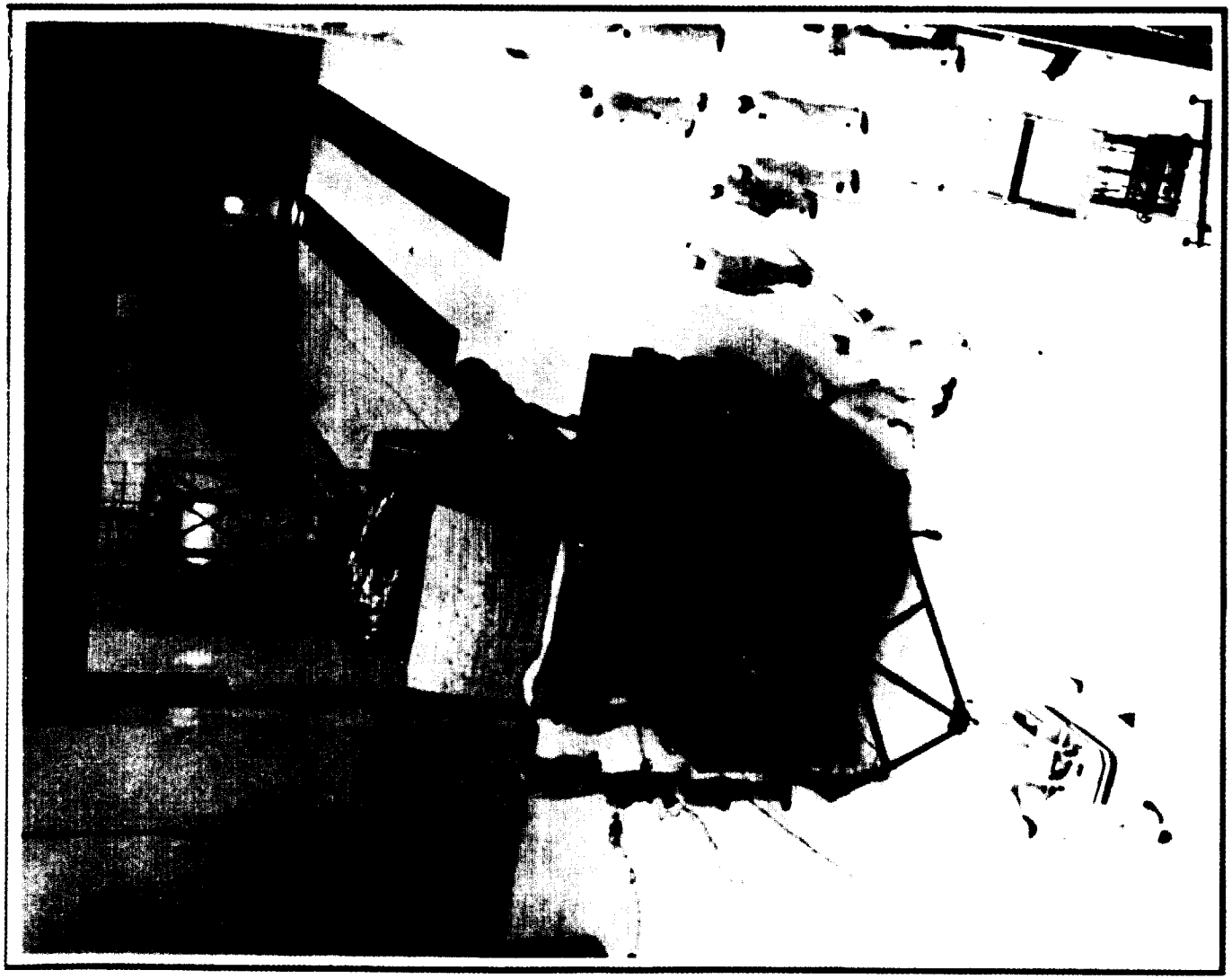

SPACECRAFT/PAM-D REMOVAL PREPARATIONS IN VPF

KSC FORM 4-588NS (6/84)

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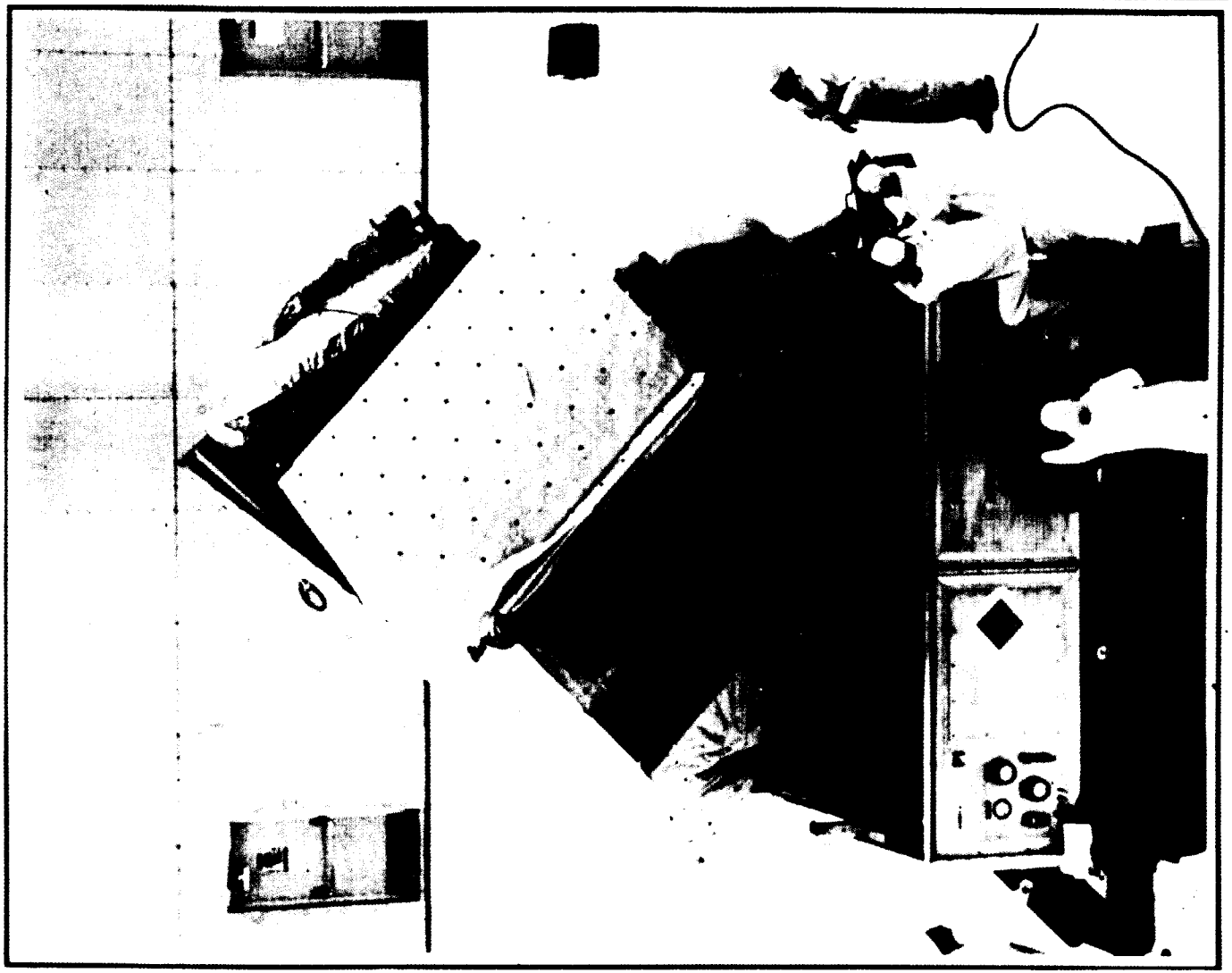
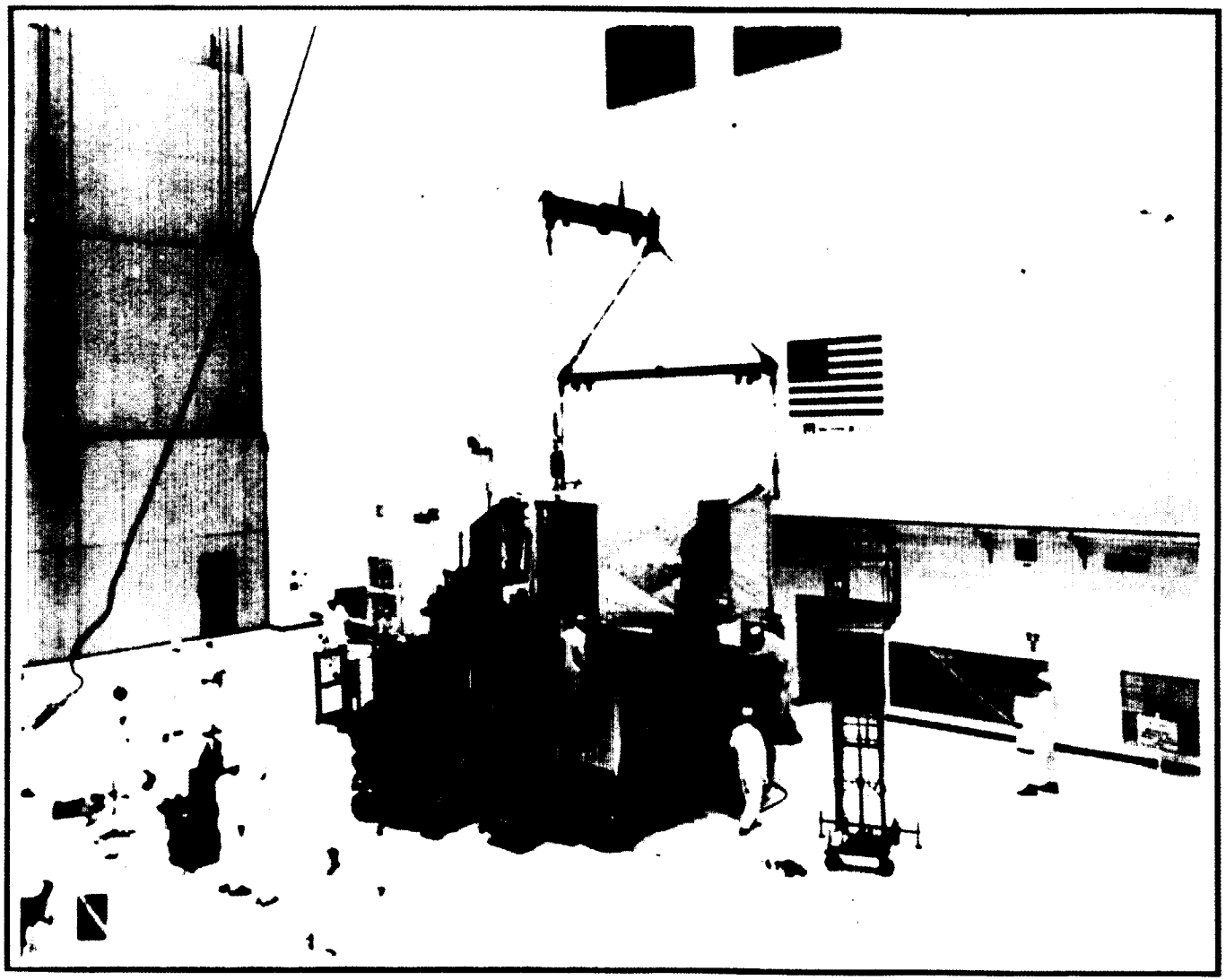


SPACECRAFT/PAM-D ROTATION IN VPF

KSC FORM 4-588NS (6/84)



SPACECRAFT/PAM-D REMOVAL FROM TRANSPORTER IN VPF

KSC FORM 4-588NS (6/84)

DESIGN AND DEVELOPMENT

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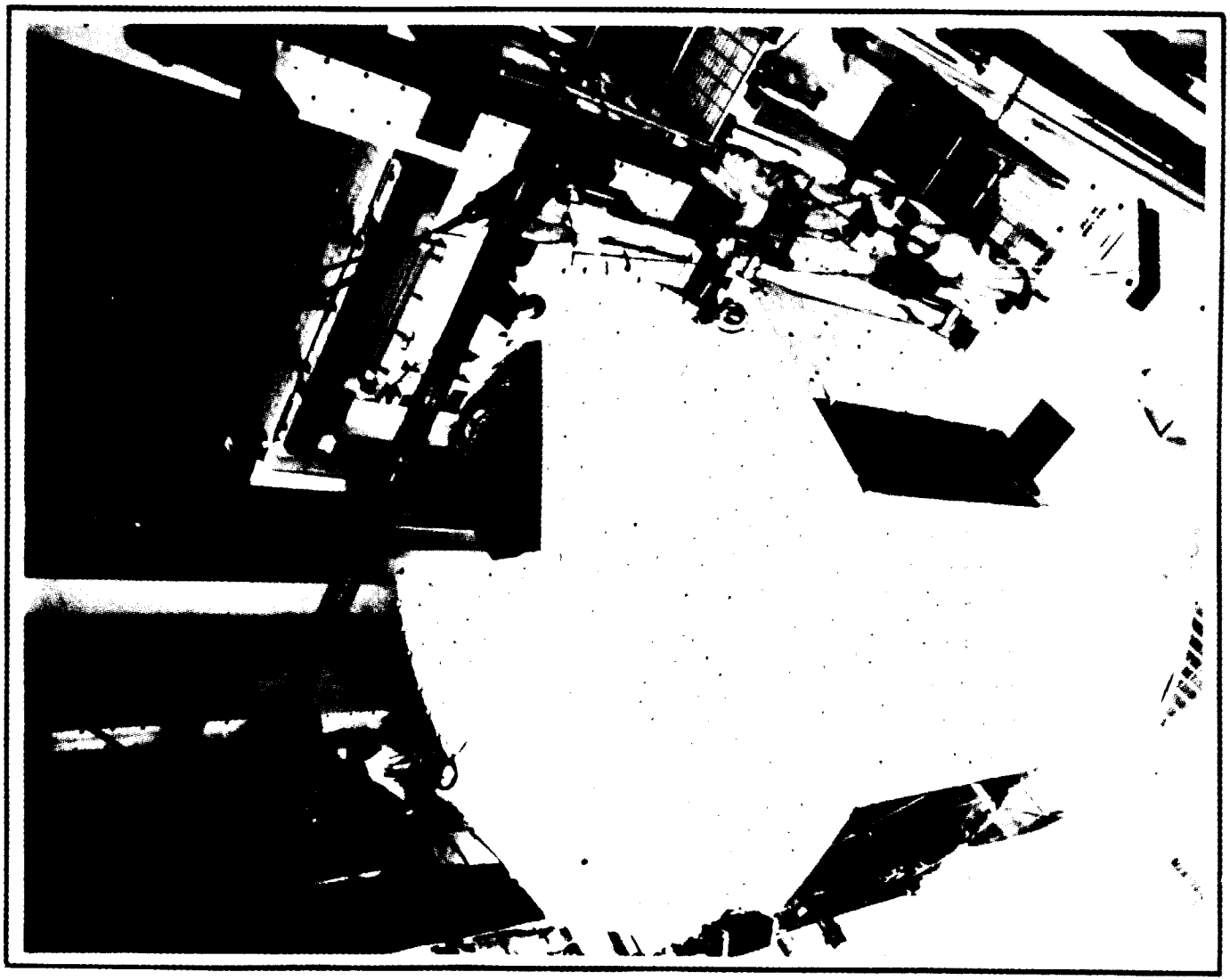


SPACECRAFT/PAM-D BEING INSTALLED IN A VPF WORKSTAND

KSC FORM 4-588NS (6/84)

VERTICAL PROCESSING FACILITY ACTIVITIES

- VERTICAL PAYLOAD INTEGRATION WITH ORBITER SYSTEMS AND OTHER PAYLOADS TAKES PLACE IN THE VERTICAL PROCESSING FACILITY (VPF)
- DELIVERY VARIES DEPENDING ON THE UPPER STAGE
  - PAM ALREADY MATED WITH PAYLOAD
  - IUS/CENTAUR AND PAYLOAD ARRIVE SEPARATELY
- CARGO STACKING AND TESTS INVOLVE:
  - MATE WITH UPPER STAGE AND INSTALLATION INTO WORKSTAND IN FLIGHT SEQUENCE
  - STANDALONE HEALTH AND STATUS TESTS
  - INTEGRATION TESTS
    - ORBITER-TO-PAYLOAD INTERFACE VERIFICATION WITH CARGO INTEGRATION TEST EQUIPMENT (CITE)
    - MISSION SEQUENCE TEST
    - END-TO-END TEST
    - ORDNANCE SYSTEMS TEST

KSC FORM 4-588NS (6/84)

DESIGN AND DEVELOPMENT

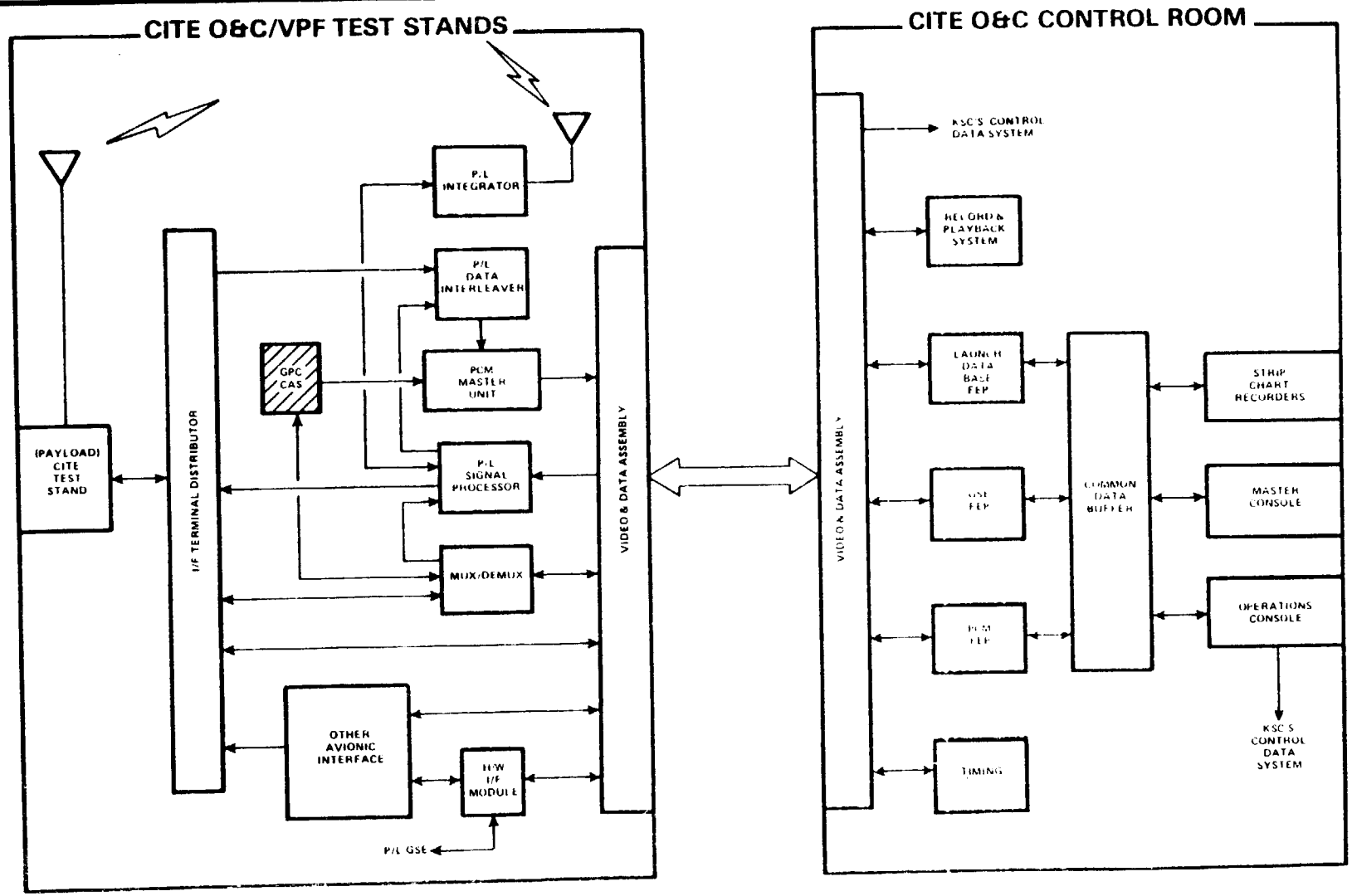
PAYLOAD AND UPPER STAGE INSTALLED IN A VPF WORK STAND

CARGO-TO-ORBITER INTERFACE VERIFICATION

- INTERFACE VERIFIED ON-LINE WITH CARGO IN THE ORBITER
- INTERFACE VERIFIED OFF-LINE WITH CARGO INTERFACE TEST EQUIPMENT (CITE):
  - LOCATED IN THE O&C BUILDING (HORIZONTAL CARGO) AND IN THE VERTICAL PROCESSING FACILITY (VERTICAL CARGO)
  - CONTAINS OVER 100 RACKS OF ELECTRONIC/COMPUTER EQUIPMENT TO PROVIDE HIGH FIDELITY SIMULATION OF THE CARGO-TO-ORBITER INTERFACE
  - VERIFIES ORBITER AFT FLIGHT DECK CONTROL OF PAYLOADS
  - PROVIDES ORBITER POWER FOR PAYLOADS
  - ENABLES FAULT DETECTION/CAUTION AND WARNING
  - VERIFIES PAYLOAD ENGINEERING AND SCIENCE DATA AND COMMAND/CONTROL

KSC FORM 4-588NS (6 '84)

DESIGN AND DEVELOPMENT



CARGO INTERFACE TEST EQUIPMENT SCHEMATIC

KSC FORM 4--588NS (6/84)

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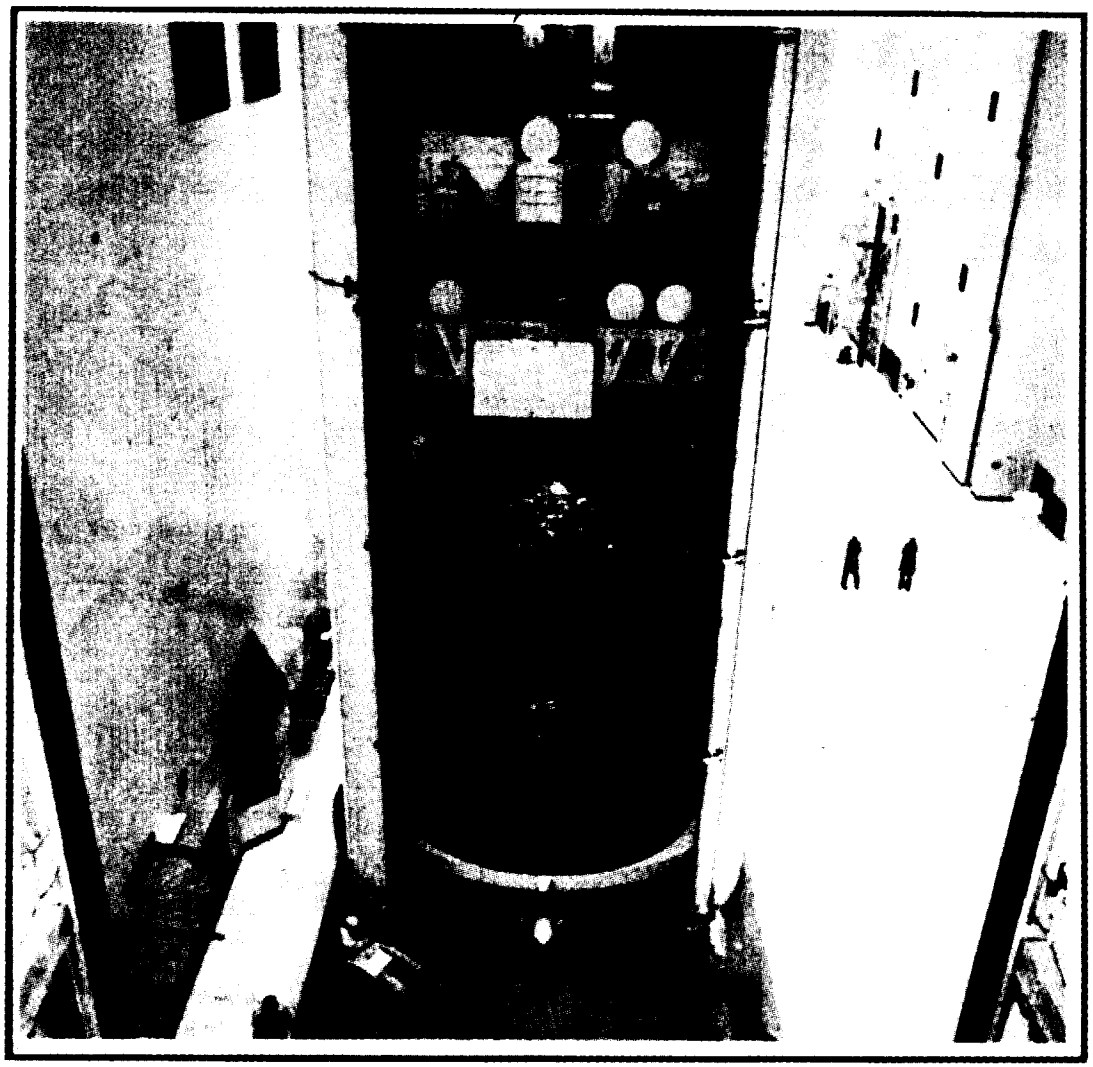
CLOSEOUT ACTIVITIES ON THE ENTIRE CARGO ARE PERFORMED PRIOR TO TRANSFER INTO THE CARGO CANISTER

KSC FORM 4-588NS (6/84)

DESIGN AND DEVELOPMENT

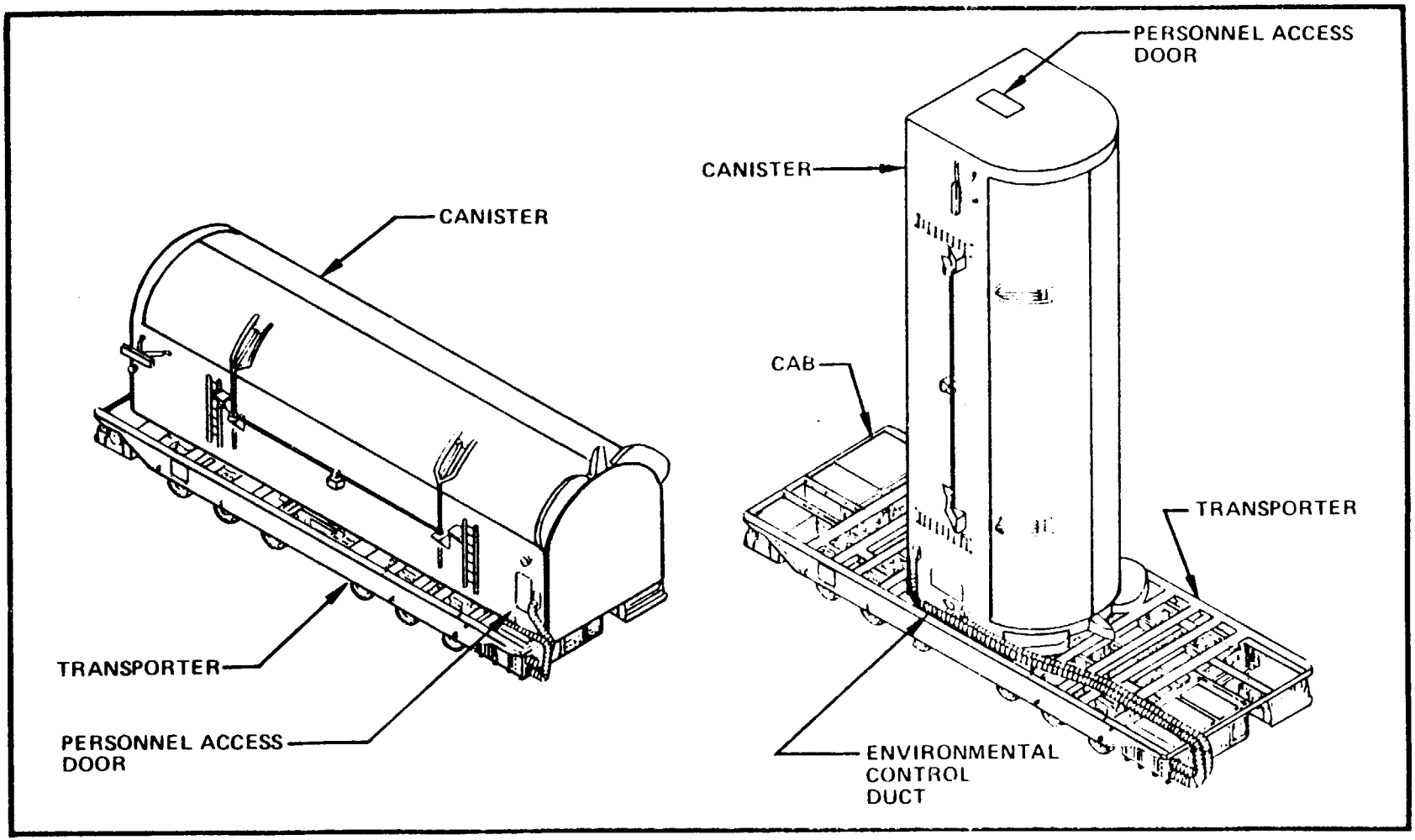


PAYLOAD ELEMENTS AFTER TRANSFER INTO THE CANISTER AT THE VPF

CARGO CANISTER/TRANSPORTER

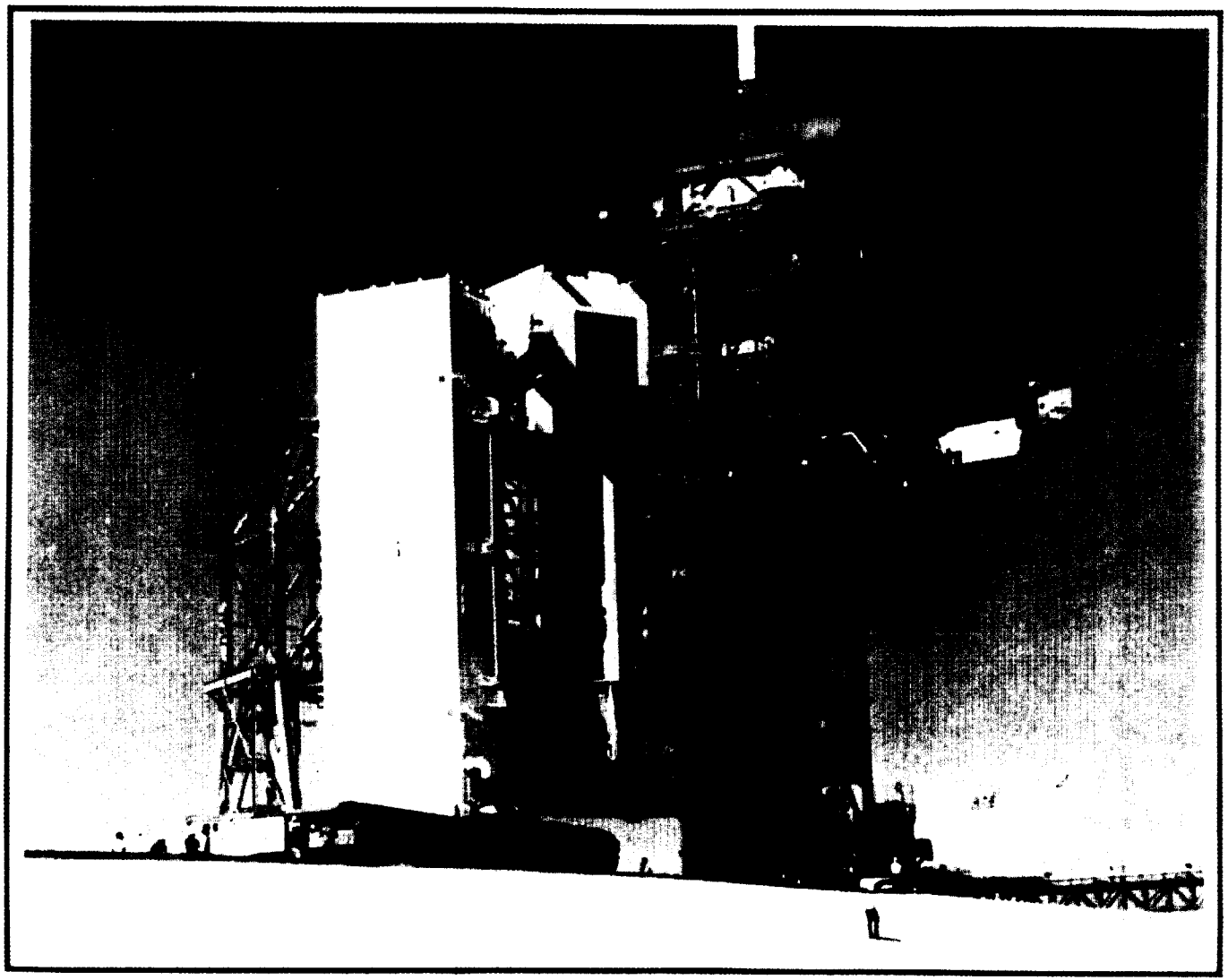
- AN ENVIRONMENTALLY CONTROLLED, TRANSPORTATION CONTAINER FOR ALL SHUTTLE PAYLOADS BETWEEN FACILITIES
- WEIGHS APPROXIMATELY 107,000 POUNDS
- MOUNTED ON THE TRANSPORTER IN THE VERTICAL OR HORIZONTAL POSITION
- PROVIDES ESSENTIALLY THE SAME MECHANICAL SUPPORT TO PAYLOAD ELEMENTS AS THE ORBITER
- DESIGNED TO SUPPORT A 65,000 POUND PAYLOAD ASSEMBLY

KSC FORM 4-588NS (6/84)



CANISTER/TRANSPORTER CONFIGURATIONS

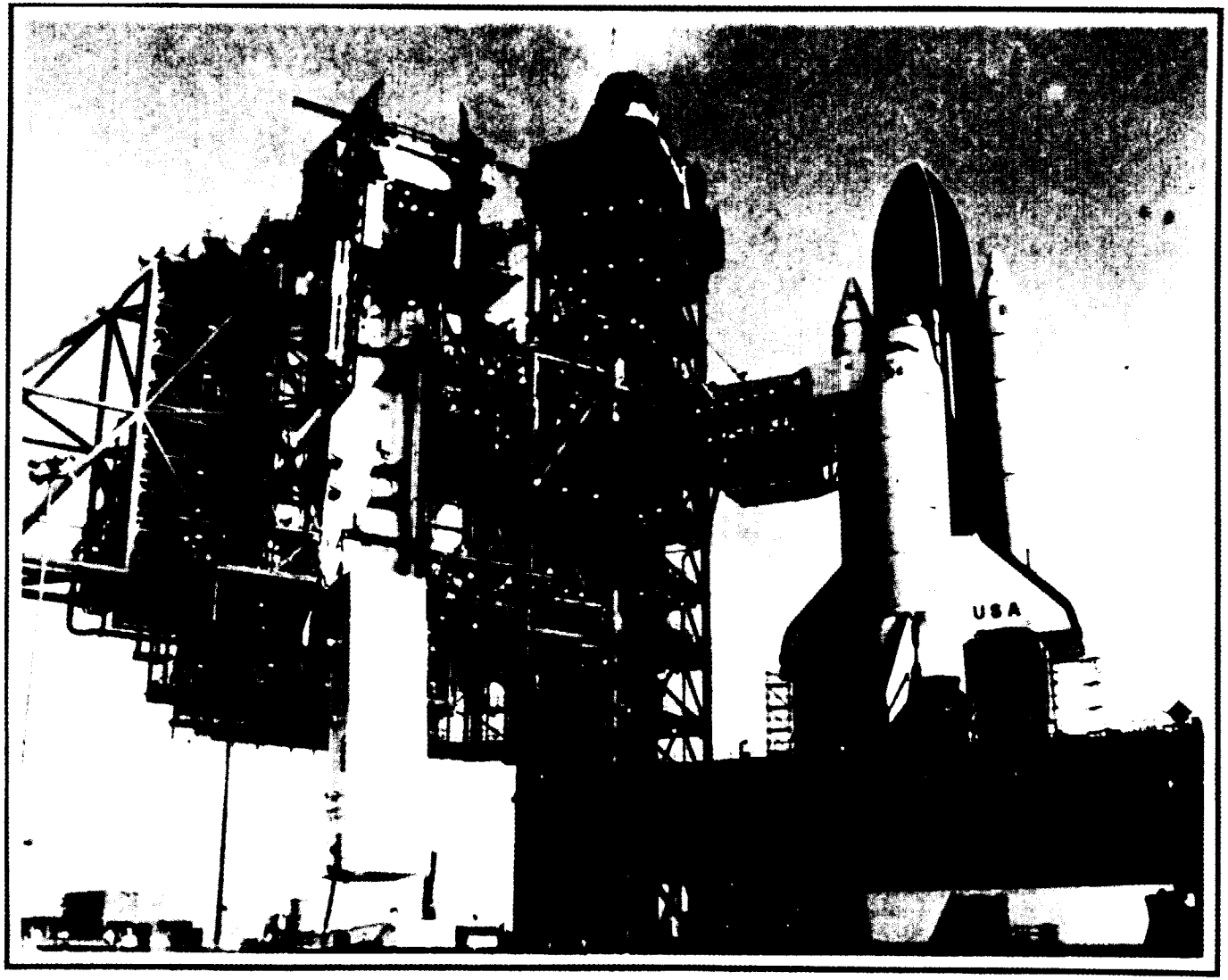
KSC FORM 4-588NS (6/84)



CANISTER/TRANSPORTER ON PAD

KSC FORM 4-588NS (6/84)

DESIGN AND DEVELOPMENT



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CANISTER BEING RAISED TO PCR

KSC FORM 4-588NS (6/84)

PAYLOAD CHANGEOUT ROOM OPERATIONS

- ENVIRONMENTAL MONITORING
- CARGO INSTALLATION IN PAYLOAD GROUND HANDLING MECHANISM (PGHM)
- CARGO STAND ALONE ACTIVITIES
- ORDNANCE OPERATIONS
- PREPARATIONS FOR ORBITER INSTALLATION
- CARGO INSTALLATION INTO ORBITER

KSC FORM 4-588NS (6/84)

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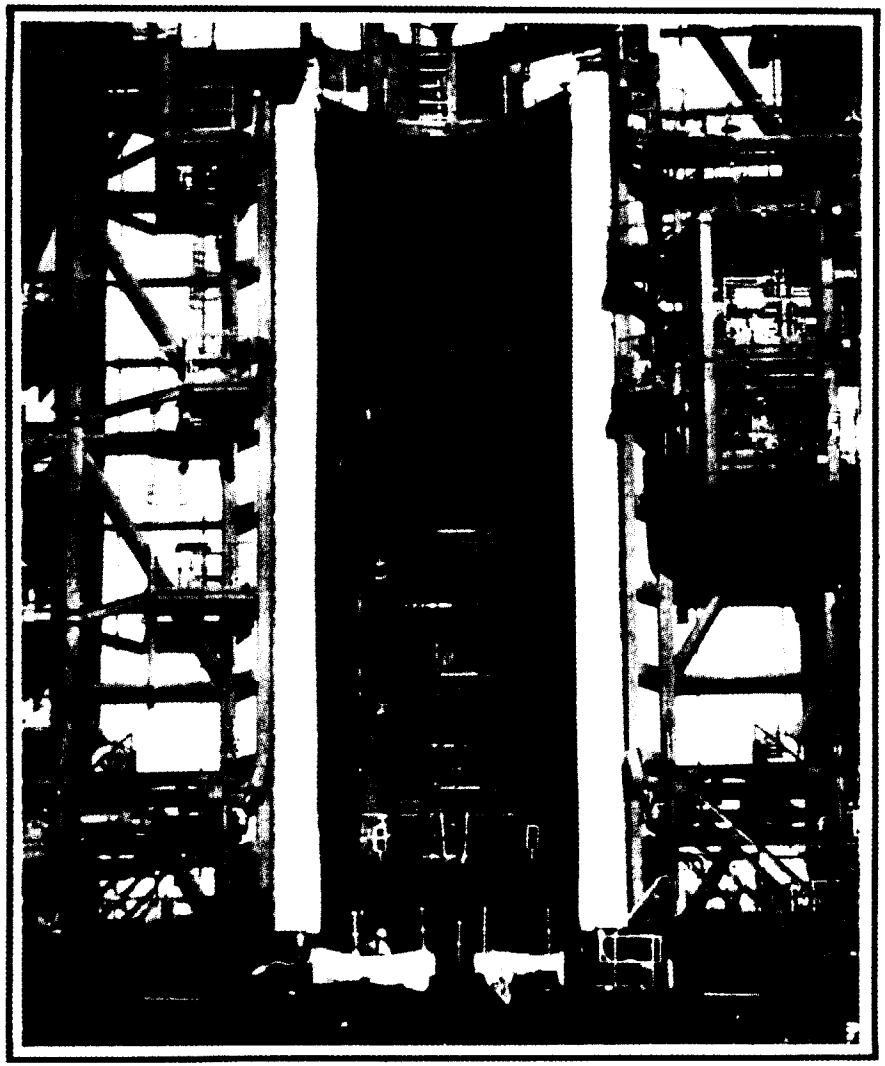


PAYLOAD CHANGEOUT ROOM IN THE ROTATING SERVICE STRUCTURE AT THE LAUNCH PAD

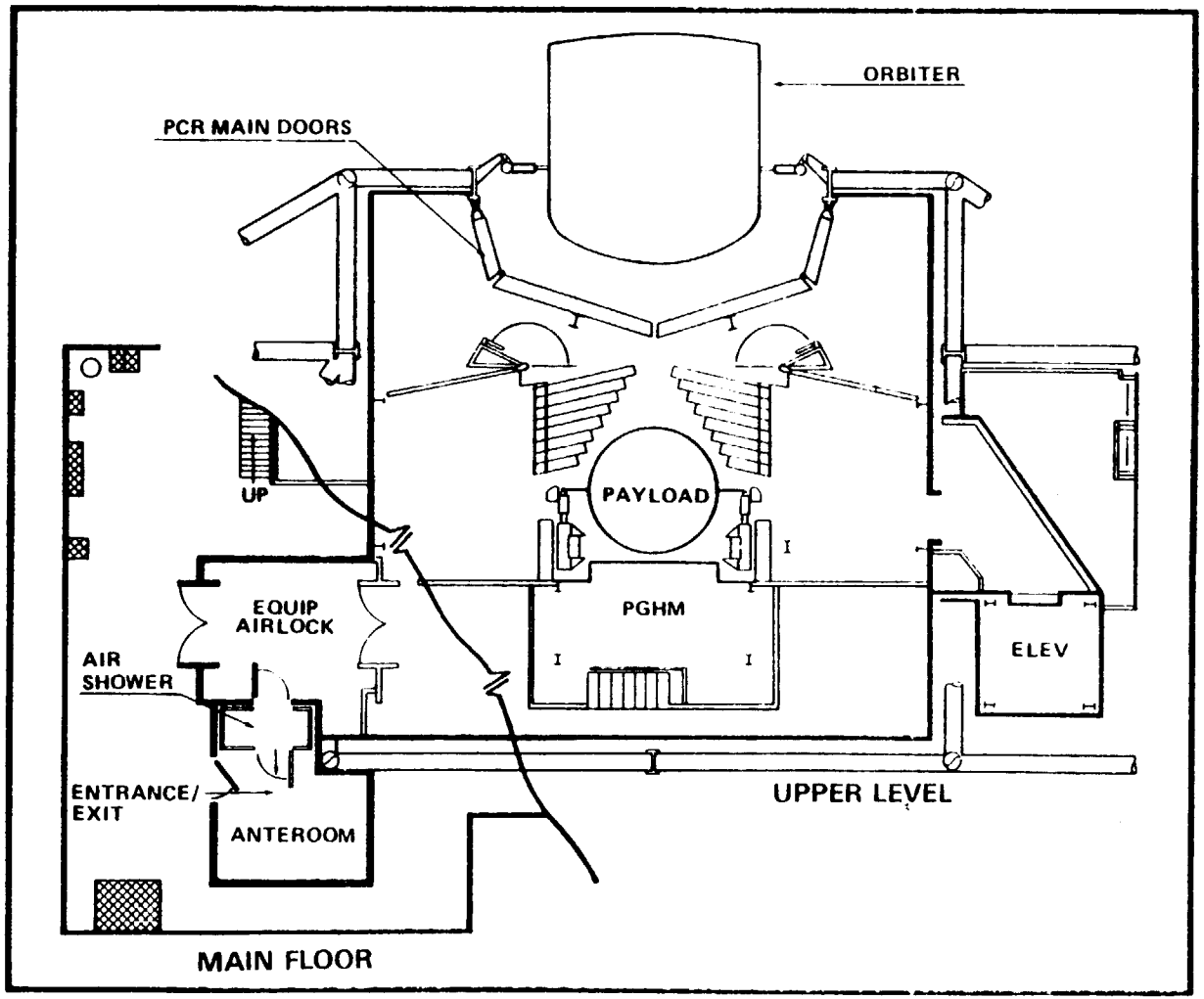
KSC FORM 4-588NS (6/84)

ROTATING SERVICE STRUCTURE

- ROTATING SERVICE STRUCTURE (RSS)
  - MOVABLE, GANTRY-LIKE STRUCTURE LOCATED ON THE LAUNCH PAD
  - CONTAINS THE PAYLOAD CHANGEOUT ROOM
- PAYLOAD CHANGEOUT ROOM (PCR)
  - FUNCTIONS AS A CLEAN WORK AREA FOR CARGO AND CARGO BAY OPERATIONS
  - FUNCTIONS AS AN AIRLOCK WHEN CARGO IS INSERTED OR REMOVED FROM ORBITER WITH THE PAYLOAD GROUND HANDLING MECHANISM
- PAYLOAD GROUND HANDLING MECHANISM (PGHM)
  - INTEGRAL PART OF THE PCR
  - HANDLES ALL CARGO MOVEMENTS FROM CANISTER TO PCR AND FROM PCR TO ORBITER

KSC FORM 4-588NS (6/84)

DESIGN AND DEVELOPMENT



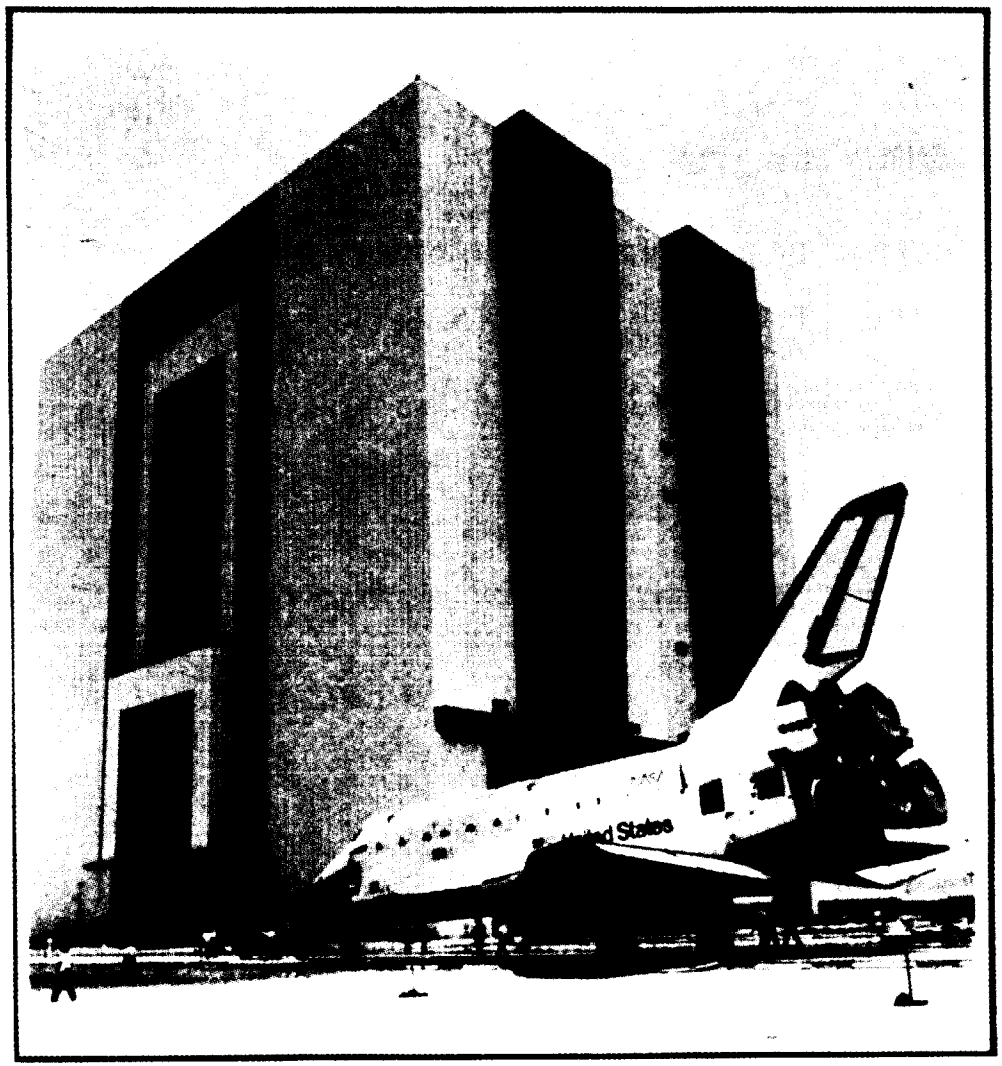
PLAN VIEW OF THE PCR

KSC FORM 4-588NS (6/84)

ORBITER OPERATIONS

- ORBITER PROCESSING FACILITY
  - POST FLIGHT DESERVICING OF CONSUMABLES
  - REMOVAL OF PAYLOADS AND/OR PAYLOAD AEROSPACE SUPPORT EQUIPMENT
  - CORRECT PREVIOUS FLIGHT ANOMALIES
  - REMOVAL/INSTALLATION OF FLIGHT KITS
  - ROUTINE MAINTENANCE
  - ORBITER SYSTEMS TEST AND VERIFICATION
  - SERVICING OF CONSUMABLES
  - INSTALL PAYLOADS AS APPLICABLE
  - WEIGH AND DETERMINE CENTER OF GRAVITY
  - DISCONTINUE PAYLOAD BAY ENVIRONMENTAL CONTROL DURING ROLL OVER TO VERTICAL ASSEMBLY BUILDING

KSC FORM 4-588NS (6/84)



ORBITER MOVE TO THE VAB

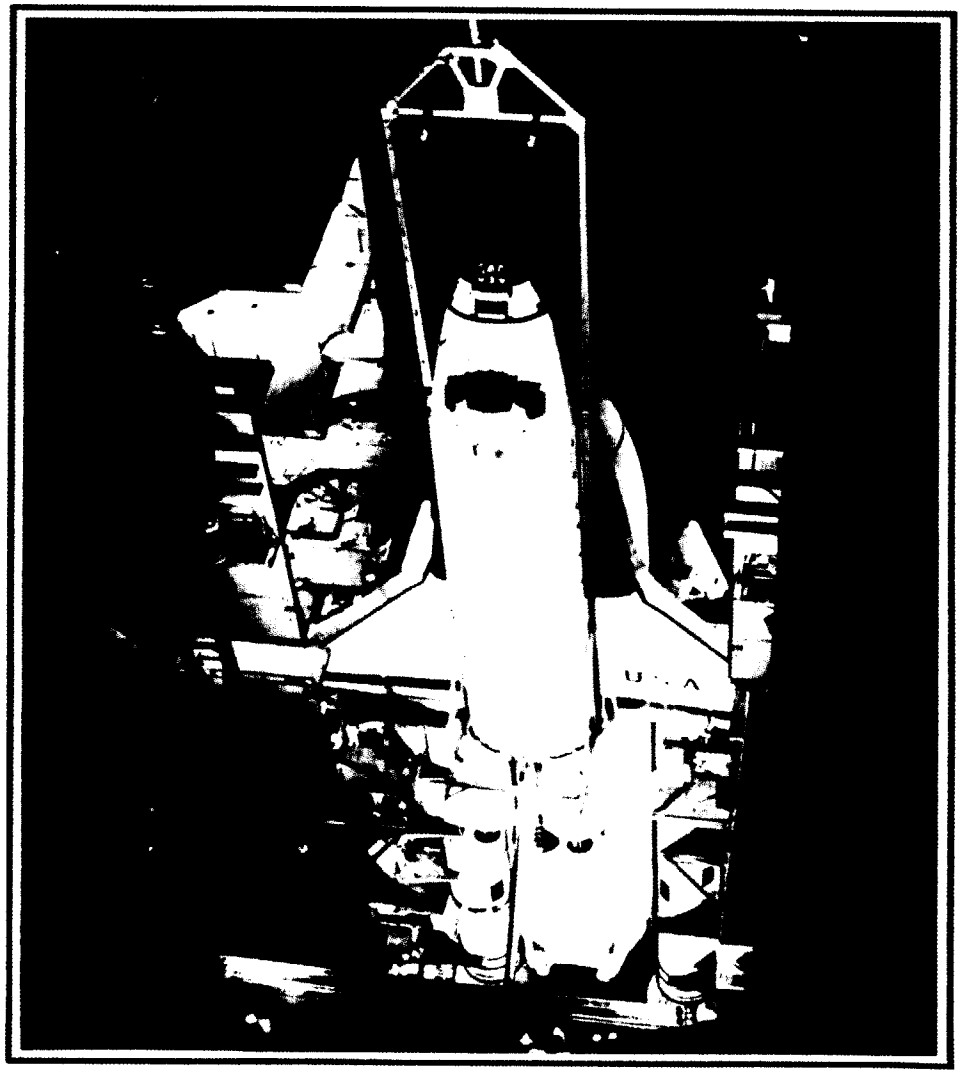
KSC FORM 4-588NS (6/84)

ORBITER OPERATIONS (CONT)

- VEHICLE ASSEMBLY BUILDING
  - MATE ORBITER WITH EXTERNAL TANK (ET) AND SOLID ROCKET BOOSTERS (SRB's) ON THE MOBILE LAUNCHER PLATFORM (MLP)
  - VERIFY ORBITER CONNECTIONS TO THE MLP AND INTERFACES WITH ET AND SRB
  - NO PAYLOAD OPERATIONS PERFORMED
  - PAYLOAD BAY ENVIRONMENTAL CONTROL REESTABLISHED
- TRANSPORT TO LAUNCH PAD 39 ON CRAWLER

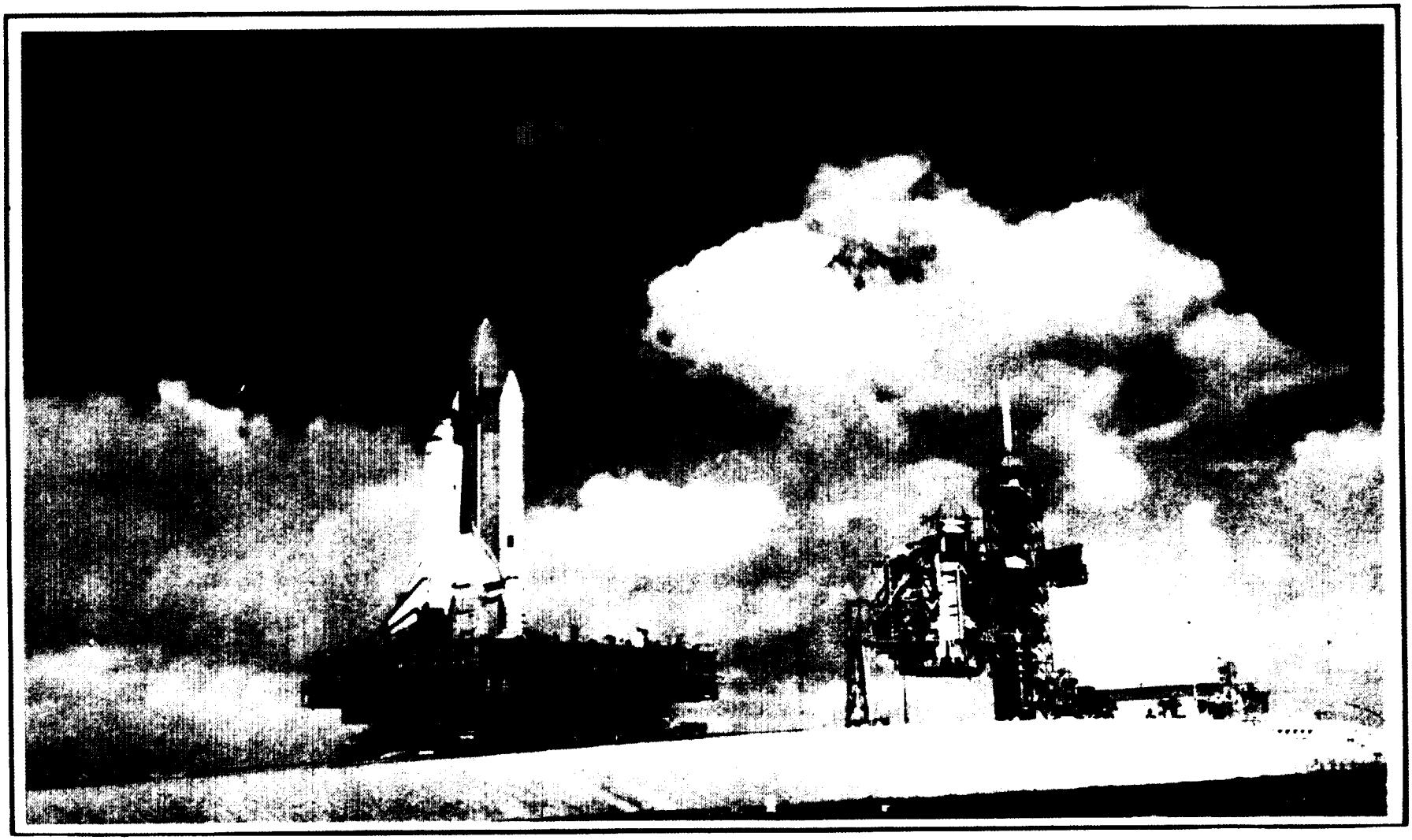
KSC FORM 4-588NS (5 '84)

DESIGN AND DEVELOPMENT



ORBITER MATER MATE IN THE VAB TO THE ET AND SRBS

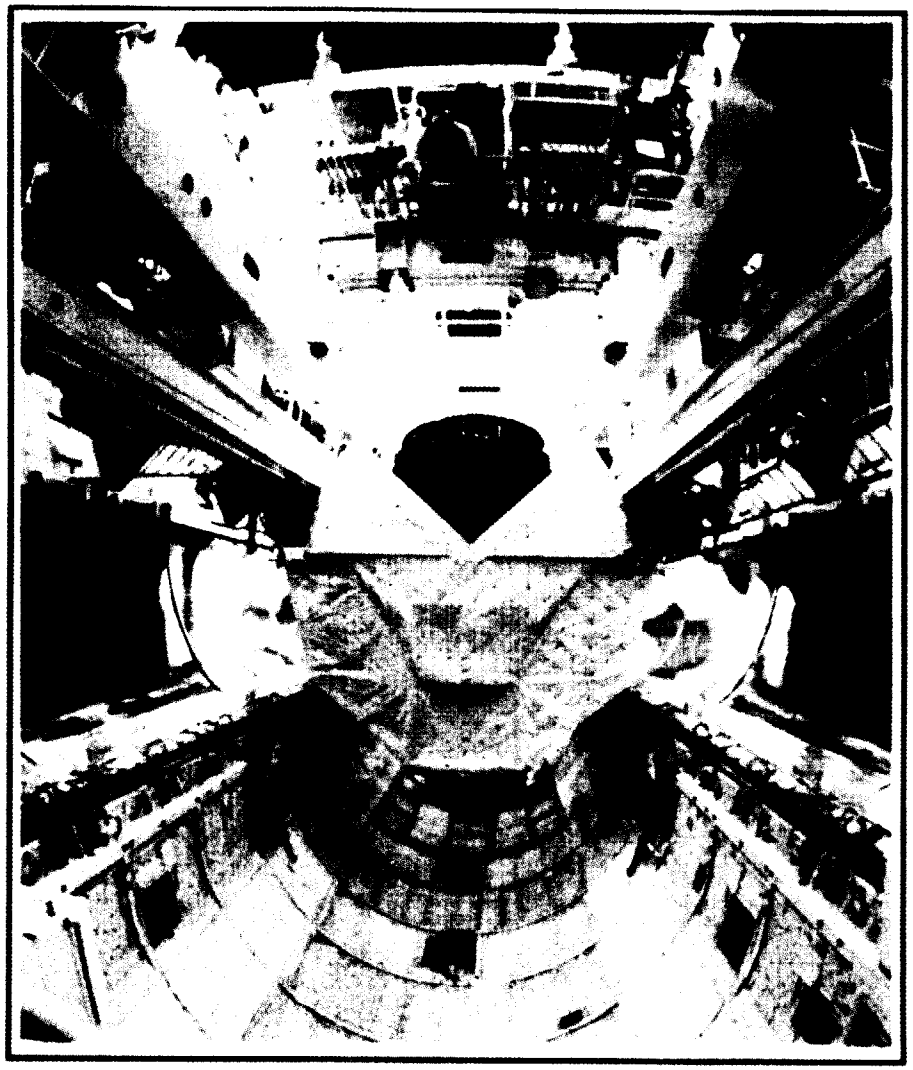
KSC FORM 4-588NS (6/84)



SHUTTLE ROLLOUT TO THE LAUNCH PAD

KSC FORM 4-588NS (6/84)

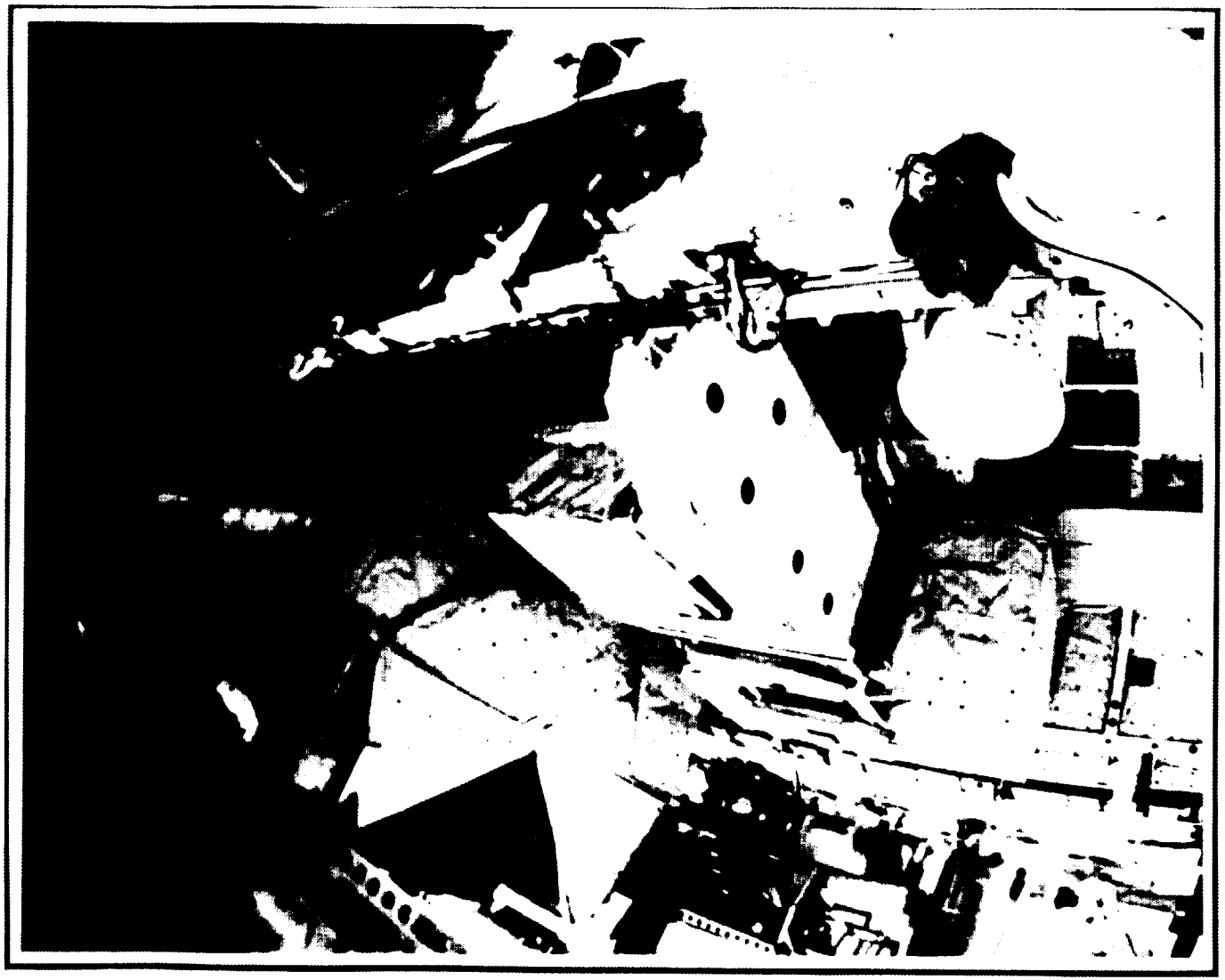
DESIGN AND DEVELOPMENT



PAYLOAD ELEMENTS BEING TRANSFERRED FROM THE PCR INTO THE SHUTTLE CARGO BAY

KSC FORM 4-588NS (6/84)

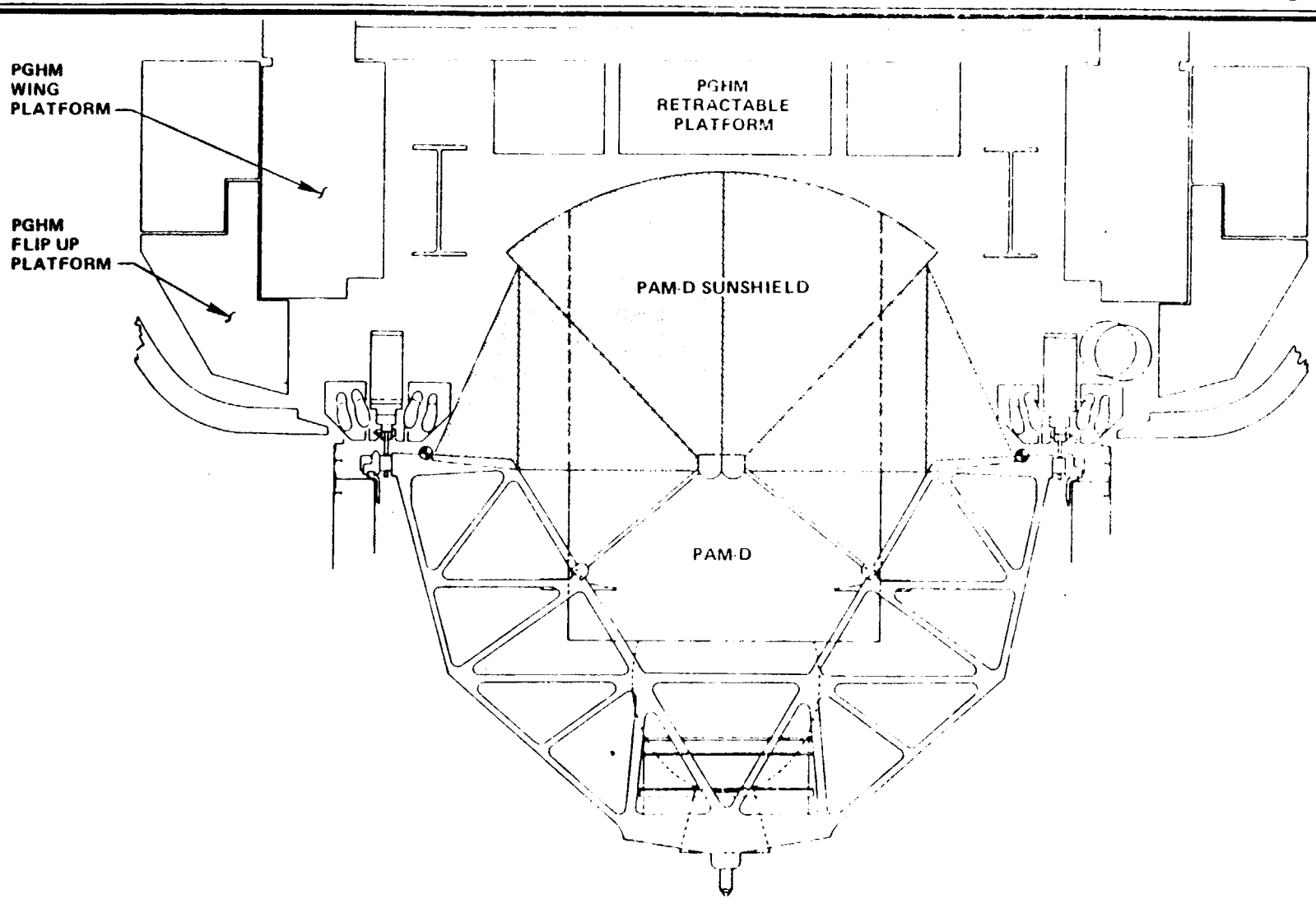
DESIGN AND DEVELOPMENT



SPACECRAFT/PAM-D BEING LOADED INTO ORBITER BAY

KSC FORM 4-588NS (6/84)

DESIGN AND DEVELOPMENT



SPACECRAFT/PAM-D ORBITER BAY ACCESS

KSC FORM 4-588NS (6/84)

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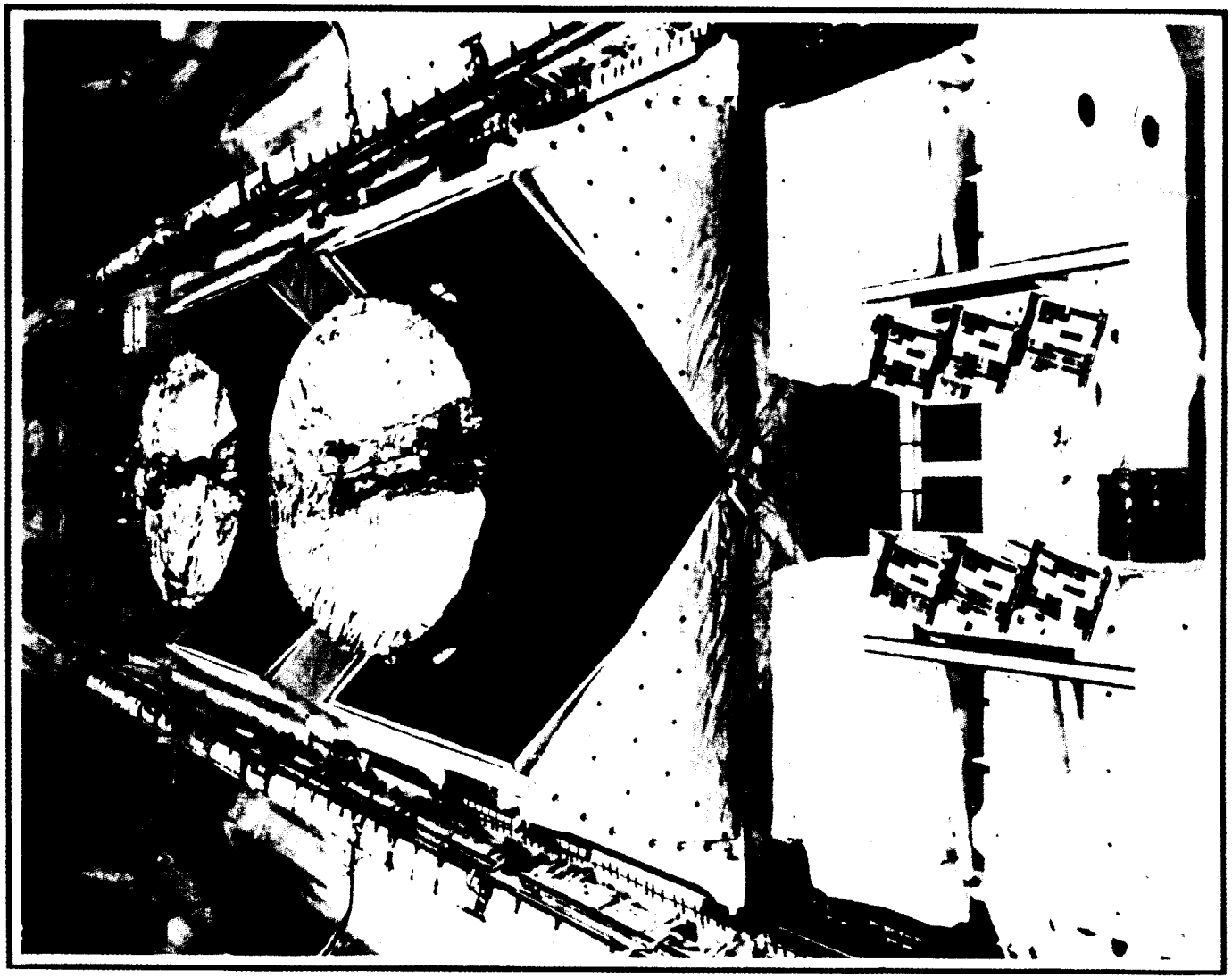

FINAL CARGO CLOSEOUT PRIOR TO PAYLOAD BAY DOOR CLOSING

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KSC FORM 4-588NS (6/84)

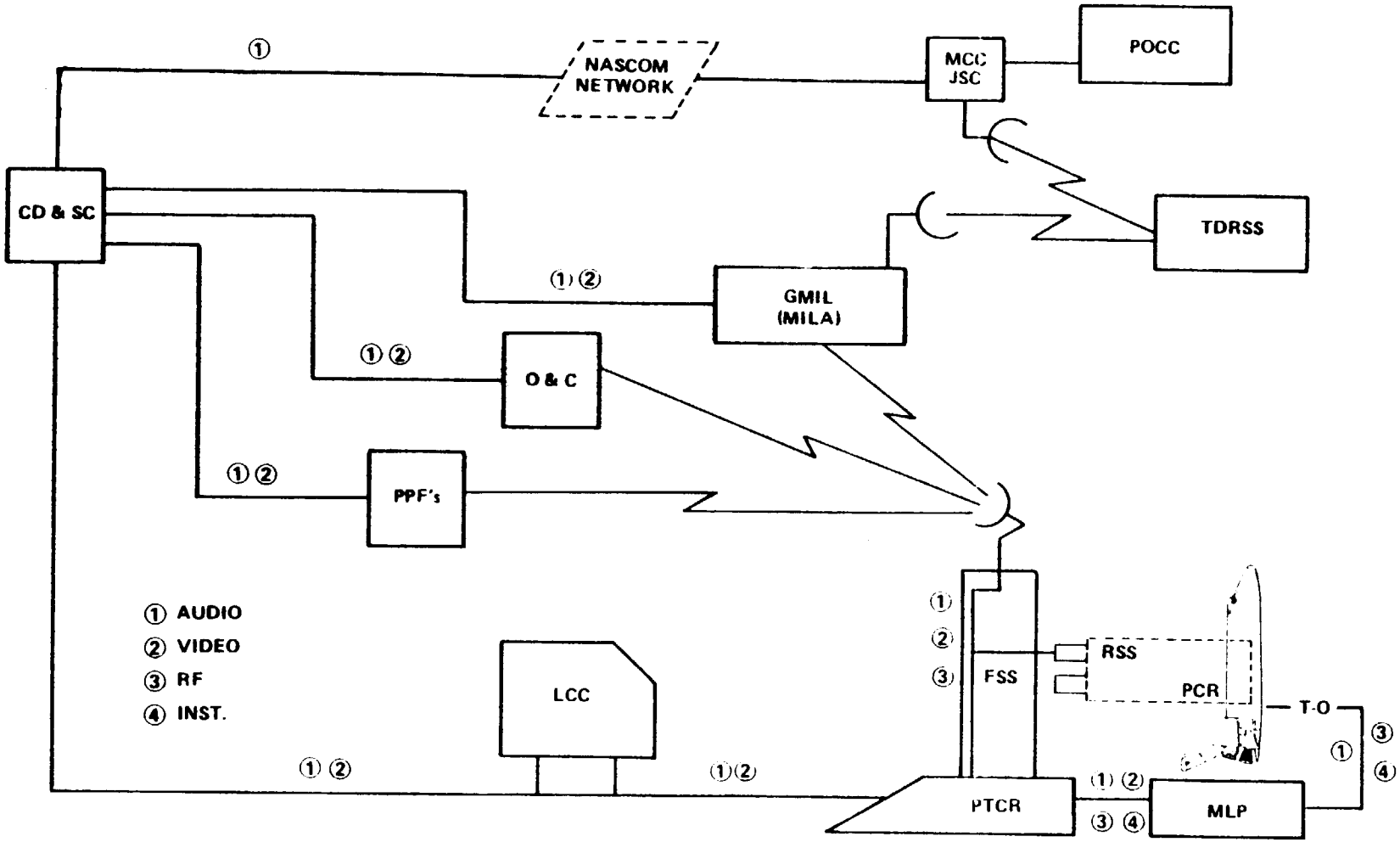
ORBITER INTEGRATION

0 AFTER CARGO INSTALLATION IN ORBITER CARGO BAY IN THE OPF OR THE PCR:

- CARGO CABLES TO ORBITER ARE CONNECTED AND THE INTERFACE IS VERIFIED FROM FIRING ROOM AT LAUNCH CONTROL CENTER (LCC)
- END-TO-END AND MISSION SEQUENCE TESTS WILL BE PERFORMED (IF REQUIRED)
- FINAL ORDNANCE CONNECTIONS ARE MADE AND SAFING IS COMPLETED
- ALL CLOSEOUT PREPARATIONS FOR FLIGHT ARE PERFORMED AND VERIFIED
- CARGO BAY DOORS ARE CLOSED
- LATE SERVICING, SUCH AS BATTERY CHARGING, WILL BE ACCOMPLISHED THROUGH THE ORBITER UMBILICALS AS PART OF THE SHUTTLE COUNTDOWN
- ACCESS IS EXTREMELY LIMITED AFTER INSTALLATION OF CARGO AT THE VPF AND PCR

KSC FORM 4-588NS (6/84)

DESIGN AND DEVELOPMENT



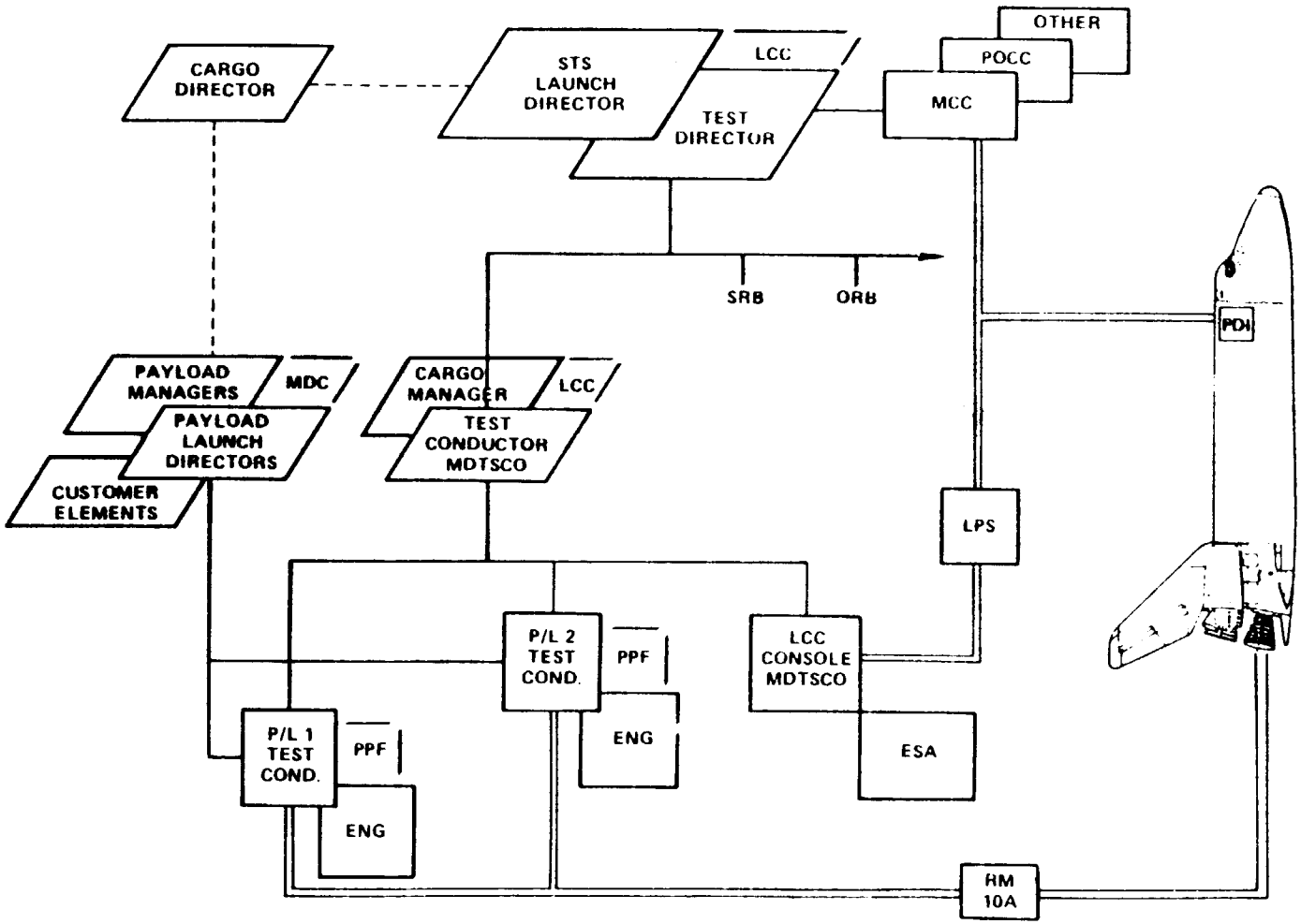
OVERALL DATA LINKS DURING ORBITER INTEGRATION AND LAUNCH

KSC FORM 4-588NS (6/84)

CARGO LAUNCH OPERATIONS CONTROL LOCATIONS

- LAUNCH CONTROL CENTER (LCC)
  - SHUTTLE COUNTDOWN AND LAUNCH CONTROL
  - KSC CARGO MANAGEMENT AND TEST CONTROL
  - CUSTOMER ENGINEERING SUPPORT AREA (LPS DATA MONITORING)
- MISSION DIRECTOR'S CENTER (VERTICAL PAYLOADS)
  - CUSTOMER MANAGEMENT LAUNCH DIRECTION
  - COMMUNICATIONS TO ALL LOCATIONS
- O&C CONTROL ROOM (HORIZONTAL PAYLOADS)
  - CUSTOMER MANAGEMENT LAUNCH DIRECTION
  - COMMUNICATIONS TO ALL LOCATIONS
- CUSTOMER'S PAYLOAD CONTROL STATION (VERTICAL PAYLOADS)
  - PAYLOAD COMMAND AND DATA EVALUATION
  - VOICE AND DATA COMMUNICATIONS TO LCC
- OFF-SITE CONTROL
  - MISSION CONTROL AT JSC
  - PAYLOAD OPERATIONS CONTROL CENTER AT JSC
  - CUSTOMER'S MISSION CONTROL CENTER

KSC FORM 4-588NS (6/84)



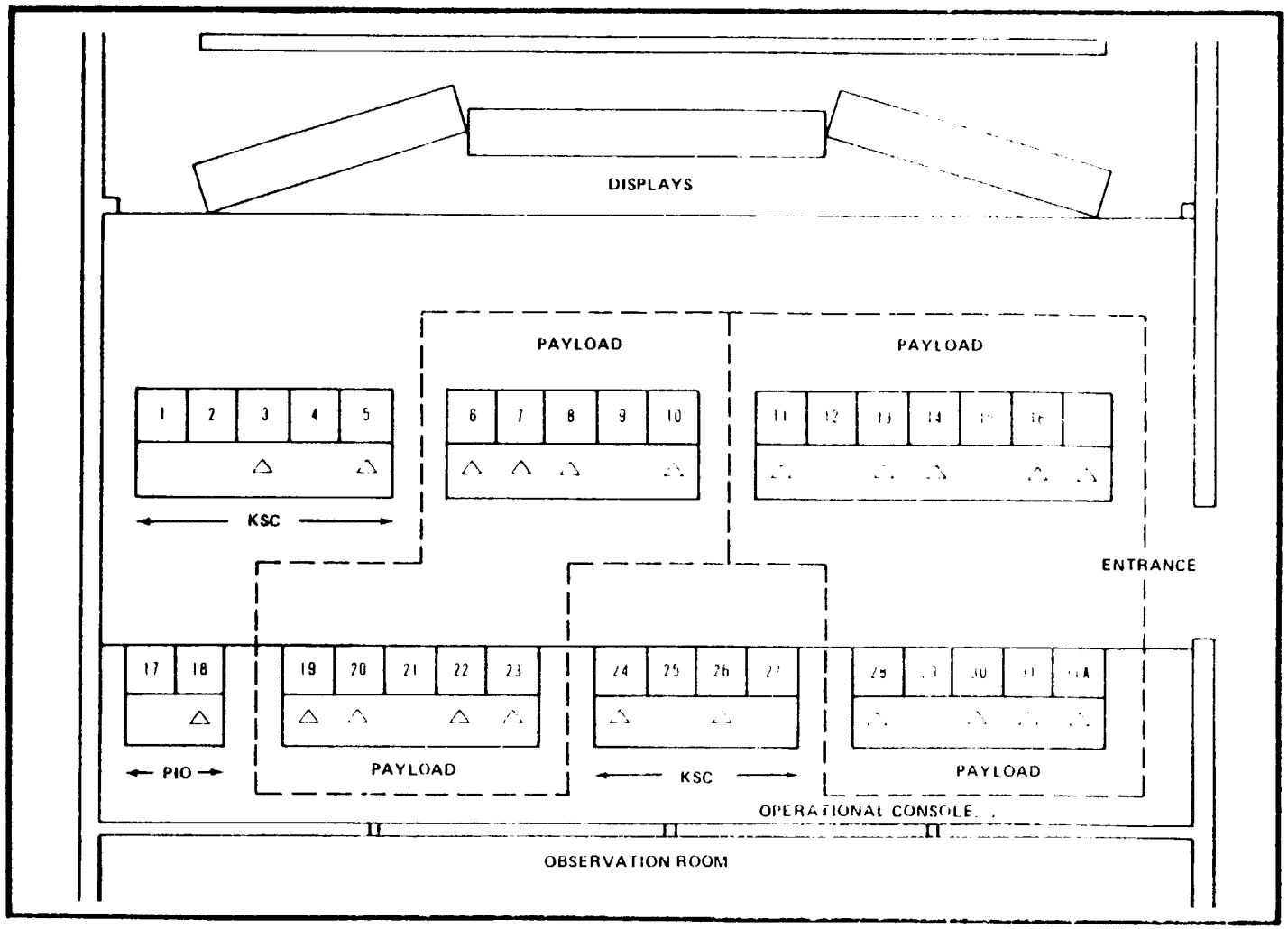
LAUNCH CONTROL PERSONNEL AND DATA LOCATIONS

KSC FORM 4-588NS (6/84)

PAYLOAD MISSION DIRECTOR'S CENTER

- EXPENDABLE LAUNCH VEHICLE MISSION DIRECTOR'S CENTER FOR LAUNCH OPERATIONS
- SPACE TRANSPORTATION SYSTEM PAYLOAD STATUS OR CONTROL CENTER FOR SHUTTLE LAUNCH OPERATIONS AS DETERMINED BY THE CUSTOMER
- ACCOMMODATES PAYLOAD PROGRAM MANAGEMENT AND SYSTEMS MANAGERS
- PROVIDES:
  - COUNTDOWN OPERATIONAL VOICE AND TELEVISION COMMUNICATIONS WITH THE LAUNCH CONTROL CENTER
  - POINT-TO-POINT VOICE COMMUNICATIONS TO JOHNSON SPACE CENTER AND OTHER POINTS AS DETERMINED BY THE CUSTOMER
- ALSO SERVES AS THE PRIMARY OR BACKUP PAYLOAD OPERATIONS CONTROL CENTER FOR THE INITIAL PHASES OF THE MISSION

KSC FORM 4-588NS (6/84)



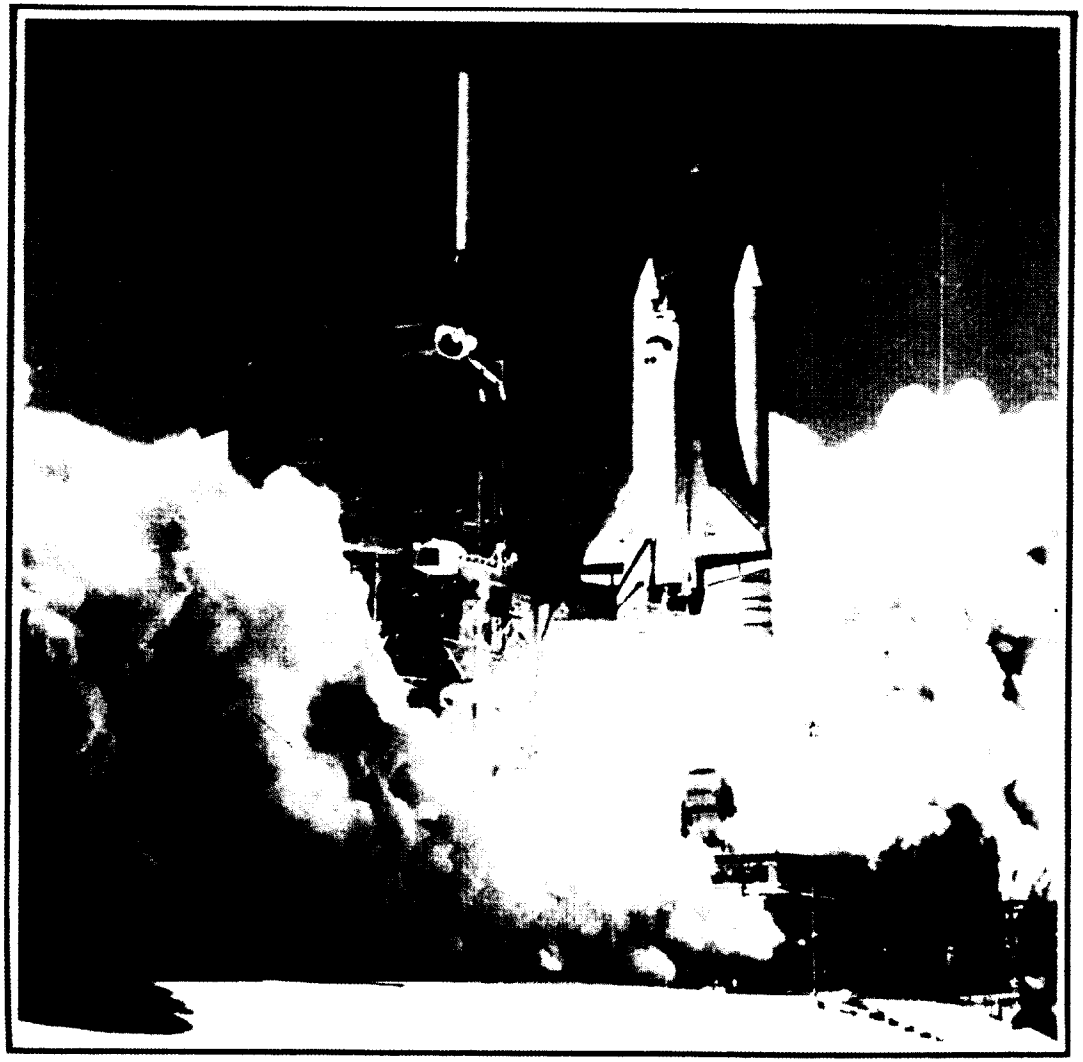
MISSION DIRECTOR'S CENTER, CCAFS

KSC FORM 4-588NS (6/84)

LAUNCH AND MISSION

- FROM LIFTOFF THROUGH LANDING:
  - ALL ELEMENTS OF STS CONTROL ARE TRANSFERRED TO MISSION CONTROL CENTER AT JSC IN HOUSTON
  - CARGO-RELATED DATA IS TELEMETERED TO THE CUSTOMER'S POCC VIA JSC

JSC FORM 4-588NS (6/84)



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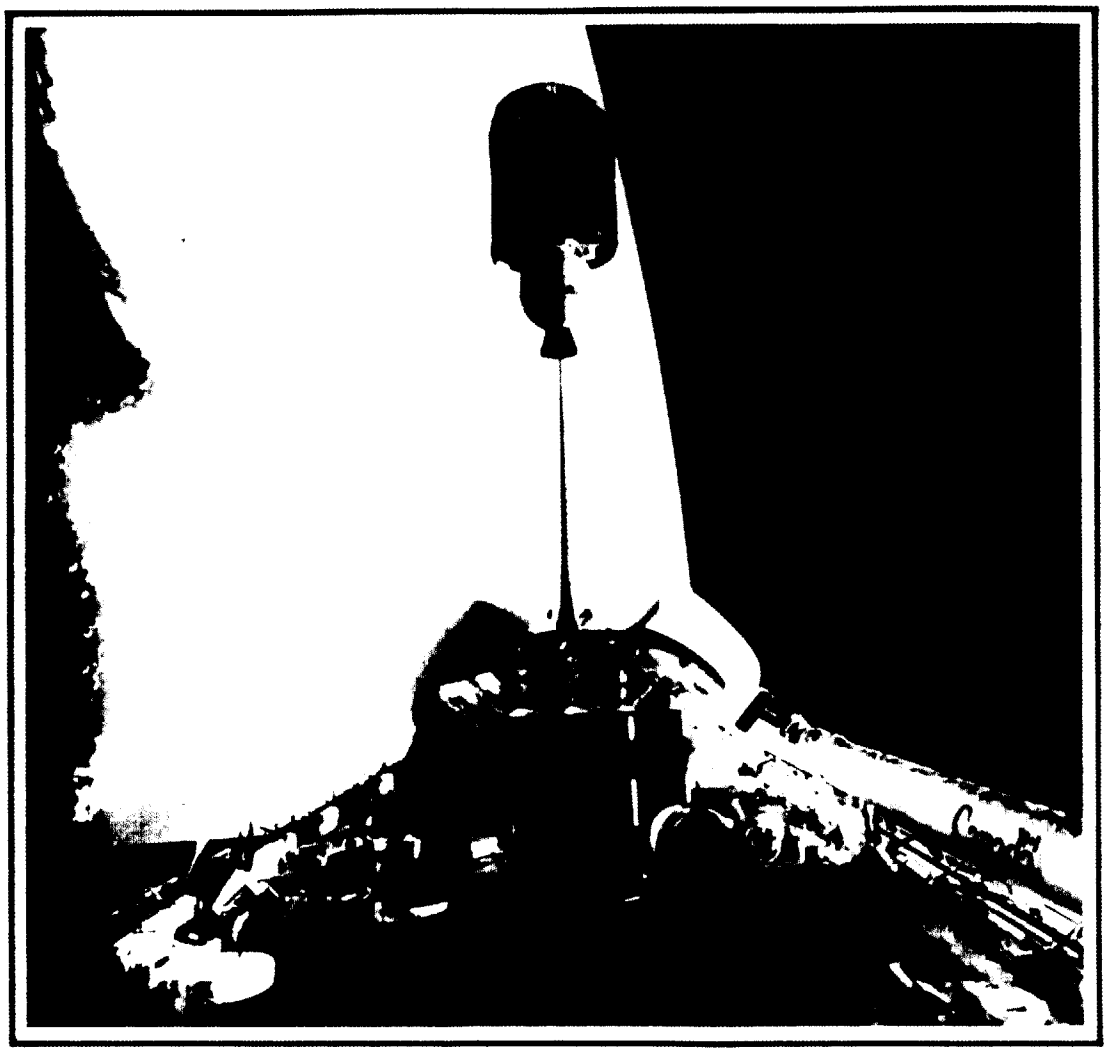
LAUNCH CONTROL PERSONNEL AND DATA LOCATIONS SHUTTLE LAUNCH

KSC FORM 4-588NS (6/84)



ON-ORBIT PAYLOAD DEPLOYMENT

KSC FORM 4-588NS (6/84)

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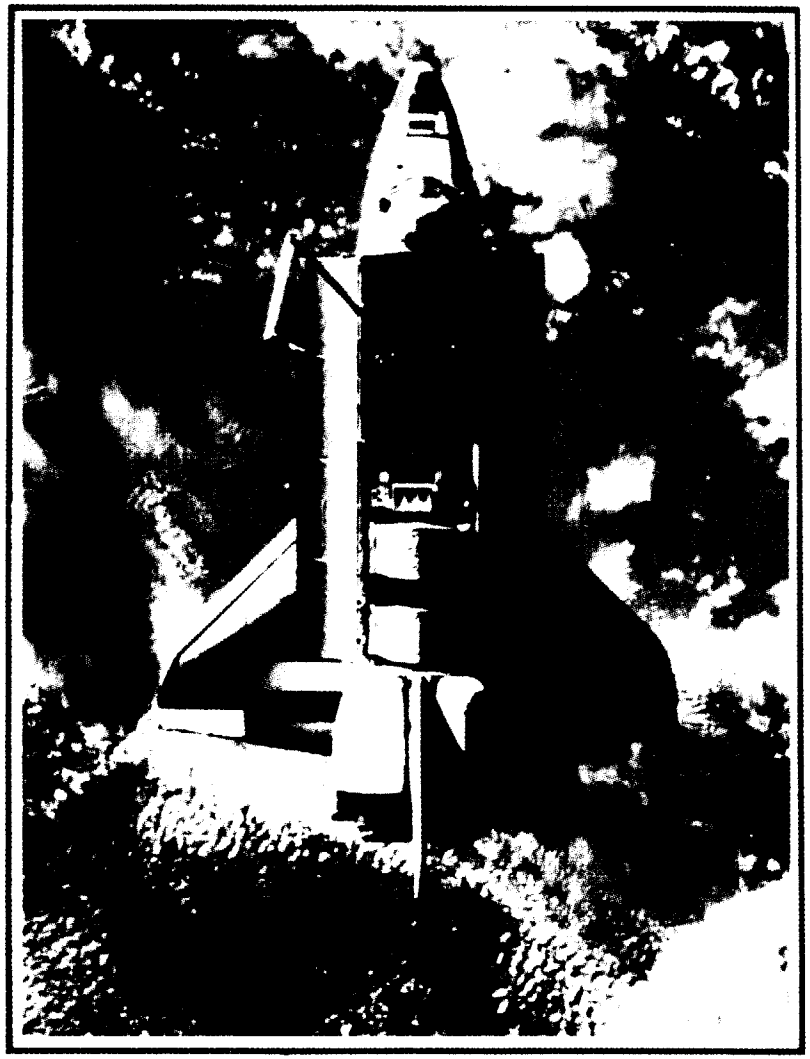


ORBITER AS VIEWED FROM THE SPAS-01

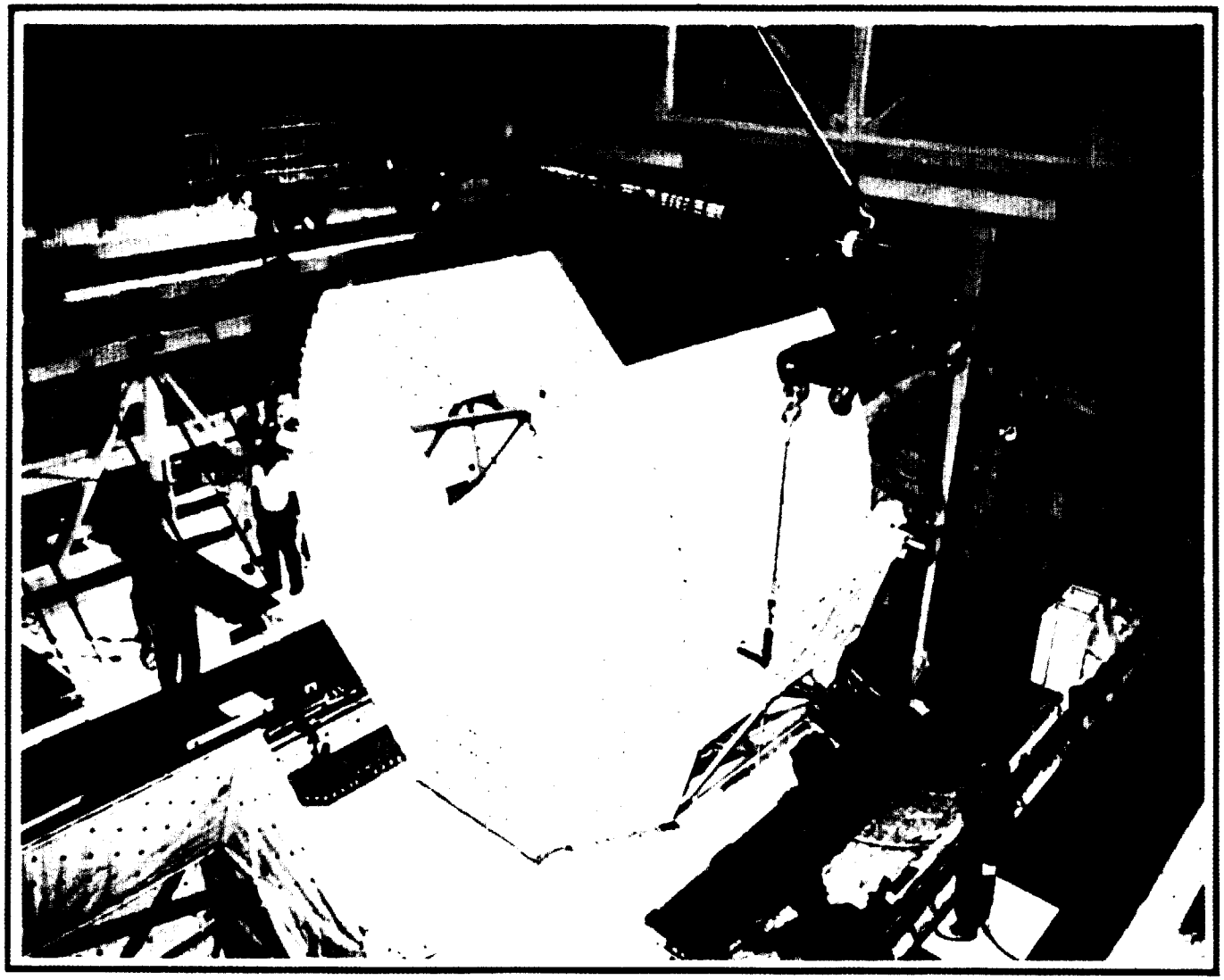
KSC FORM 4-588NS (6/84)

POSTLANDING OPERATIONS

- AFTER KSC LANDING AND CREW EGRESS:
  - CARGO BAY ENVIRONMENTAL LIMITS ARE MAINTAINED BY EXTERIOR UNITS
  - ORBITER IS TOWED TO THE ORBITER PROCESSING FACILITY FOR SAFING
  - REMOVAL OF RETURNING PAYLOADS AND AIRBORNE SUPPORT EQUIPMENT - APPROXIMATELY 2 DAYS AFTER LANDING
  - EQUIPMENT WILL BE TURNED OVER TO PAYLOAD OWNERS/OPERATORS AT THE ORBITER PROCESSING FACILITY, THE OPERATIONS AND CHECKOUT BUILDING, OR THE VERTICAL PROCESSING FACILITY

KSC FORM 4-588NS (6/84)

ORBITER LANDING AT KSC



DEINTEGRATION-REMOVING PAM-D CRADLE FROM ORBITER BAY

KSC FORM 4-588NS (6/84)

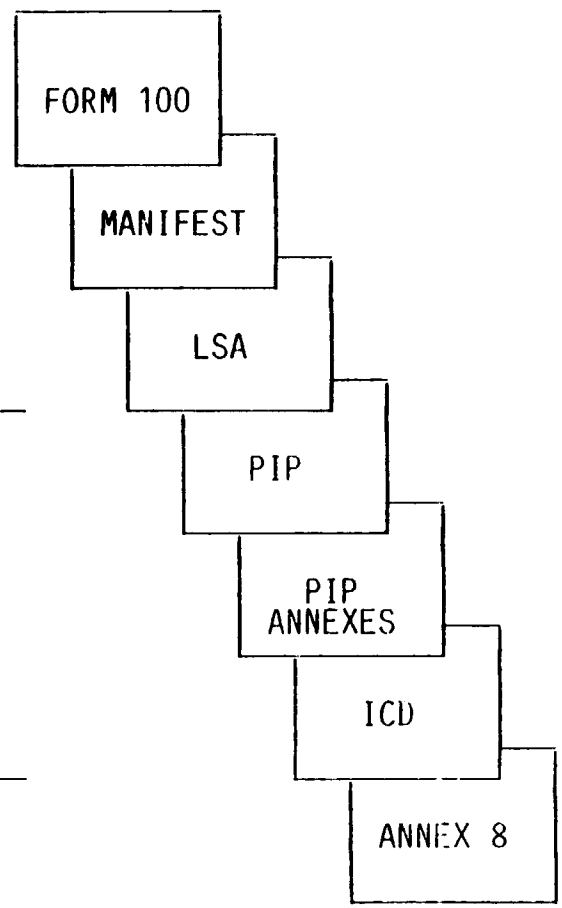
KSC'S HOST ROLE CONCEPT
"THE CUSTOMER'S AGENT"

- KSC HAS ESTABLISHED A HOST ROLE CONCEPT TO ACCOMMODATE THE CUSTOMER IN THE PROCESSING OF HIS PAYLOAD AT THE LAUNCH SITE. THE CUSTOMER'S PRIMARY CONTACT AND HOST IS THE LAUNCH SITE SUPPORT MANAGER.
- THE LSSM IS RESPONSIBLE FOR:
  - PROVIDING SUPPORT AND COORDINATION OF THE OPERATIONAL FLOW OF ALL PAYLOAD ACTIVITIES AT KSC
  - PROVIDING CUSTOMERS WITH:
    - FACILITIES
    - EQUIPMENT
    - SERVICES
    - SUPPLIES
  - PREPARING CARGO INTEGRATED ASSESSMENTS AND SCHEDULE INPUTS
    - CONTROLS PROCESSING MILESTONES

KSC FORM 4-588NS (6/84)

CUSTOMER INTERFACES

- WITH HEADQUARTERS
- WITH JOHNSON SPACE CENTER
- WITH KENNEDY SPACE CENTER



KSC FORM 4-588NS (6/84)

KENNEDY SPACE CENTER INTERFACES

- PIP ANNEX 8 - LAUNCH SITE SUPPORT PLAN (LSSP)
  - INPUTS FROM CUSTOMER REQUIREMENTS
  - PREPARED BY LAUNCH SITE SUPPORT MANAGER (LSSM), SIGNED BY CUSTOMER AND LSSM
  - DOCUMENTS PAYLOAD REQUIREMENTS AND PLANS
    - OPERATIONAL SCENARIO
      (BLOCK LEVEL FLOW AND DESCRIPTION)
    - CUSTOMER REQUIREMENTS ON KSC
      (GASES, FACILITIES, SECURITY, ETC.)
    - OPTIONAL SERVICES
      (BASIC SUPPORT PACKAGE PLUS END-TO-END, ETC.)
    - KSC REQUIREMENTS ON CUSTOMER
      (SAFETY, SECURITY, MEDICAL, ETC.)
  - DOCUMENTS RESPONSE TO CUSTOMER REQUIREMENTS AFTER STAFFING

KSC FORM 4-588NS (6/84)

KENNEDY SPACE CENTER INTERFACES (CONTINUED)

- GROUND OPERATIONS WORKING GROUP (GOWG)
  - CUSTOMER MEETING WITH KSC
  - CHAIRED BY LAUNCH SITE SUPPORT MANAGER (LSSM)
  - AGENDA USUALLY INCLUDES DISCUSSIONS ON OPERATIONS, REQUIREMENTS, INTERFACES, AND SCHEDULES
  - JSC PARTICIPATION RESOLVES FLIGHT/GROUND ISSUES
  - HEADQUARTERS PARTICIPATION RESOLVES POLICY ISSUES
- GROUND SAFETY REVIEW
  - CHAIRED BY KSC SAFETY
  - REVIEW COVERS GROUND SUPPORT EQUIPMENT (GSE) DESIGN AND KSC OPERATIONS
  - REVIEW TEAM INCLUDES LSSM, OPERATIONS, AND SAFETY PERSONNEL
  - HAZARD PROCEDURE REVIEW/APPROVAL COMPLETED PRIOR TO USE

KSC FORM 4-588NS (6/84)

KSC'S TEST TEAM CONCEPT

- KSC AND MDTSCO USE THE TEST TEAM CONCEPT IN THE PROCESSING OF ALL CARGO ELEMENTS AT KSC. THE TEST TEAM IS DIRECTED JOINTLY BY THE KSC AND MDTSCO CARGO MANAGERS AND IS COMPRISED OF THE LSSM, DESIGNATED REPRESENTATIVES FROM KSC, MDTSCO, AND EACH CUSTOMER ORGANIZATION.
- THE TEST TEAM IS USUALLY ASSEMBLED 6 MONTHS PRIOR TO LAUNCH AND REMAINS INTACT THROUGH LAUNCH, MISSION, AND DOWNLOAD OERATIONS. AT FIRST IT MEETS MONTHLY, THEN BIWEEKLY, AND THEN WEEKLY. THE TEST TEAM WILL MEET DAILY WHEN FIRST PAYLOAD ENTERS THE VPF, DURING THE REGULAR WORK WEEK, AND THROUGHOUT THE MISSION FLOW TO DISCUSS THE CURRENT SCHEDULE, IDENTIFY AND RESOLVE PROBLEMS AND CONFLICTS, AND GENERALLY ENSURE A SMOOTH PROCESSING FLOW.
- THE PRIMARY RESPONSIBILITIES OF THE CARGO MANAGER ARE TO:
  - PLAN, SCHEDULE, COORDINATE, AND MANAGE THE VERTICALLY INTEGRATED CARGO PROCESSING
  - PREPARE THE INTEGRATED PROCESSING TEST PROCEDURES (OMI'S) (CUSTOMER GENERATES HIS OWN "STAND ALONE" PROCEDURES)
  - ACT AS PRIMARY INTERFACE WITH THE SHUTTLE PROCESSING CONTRACTOR
  - CONDUCT DAILY TEST TEAM MEETINGS, PRETEST BRIEFINGS AND FORMAL CONSTRAINTS MEETINGS
  - ACT AS PRIMARY INTERFACE WITH CUSTOMER ORGANIZATIONS FOR INTEGRATION OF CARGO AND CARGO INTERFACE VERIFICATION

KSC FORM 4-588NS (6/84)

CUSTOMER AND KSC REQUIREMENTS

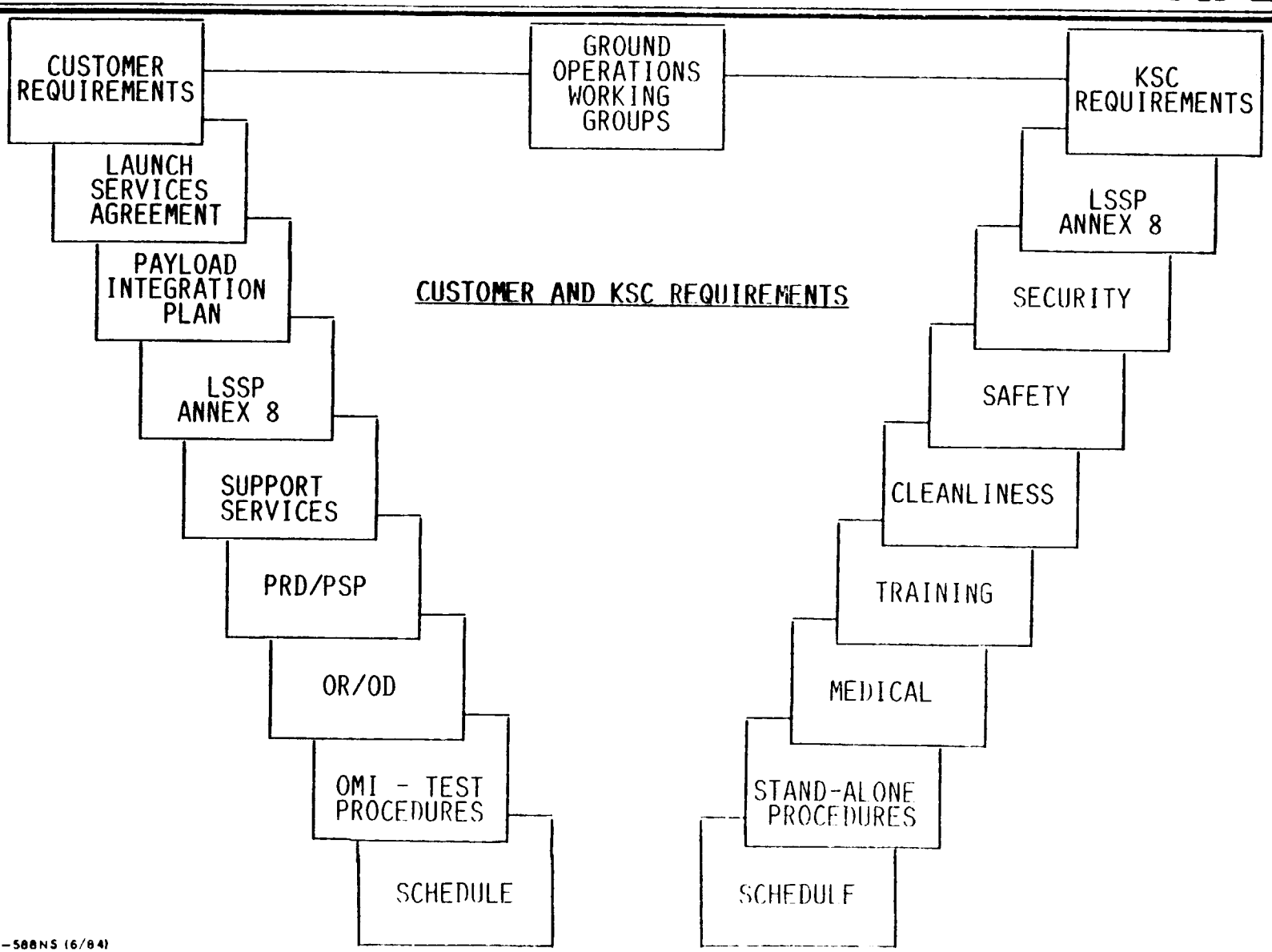
- CUSTOMER REQUIREMENTS
  - KSC HOST CONCEPT PROVIDES FACILITIES, EQUIPMENT, AND SUPPORT SERVICES TO THE CUSTOMER
  - CUSTOMER ESTABLISHES THESE REQUIREMENTS IN VARIOUS REQUIREMENTS DOCUMENTATION (LSA, PIP, LSSP, PIVR, OMRS)
  - KSC IMPLEMENTS THESE REQUIREMENTS BY DIRECTION (OR/OD), BY PROCEDURES (OMI), AND SCHEDULES
- KSC REQUIREMENTS
  - VARIOUS GOVERNMENT REGULATIONS REQUIRE KSC TO LEVY CERTAIN REQUIREMENTS ON THE CUSTOMER REGARDING SAFETY, SECURITY, AND SHUTTLE MISSION ASSURANCE
  - KSC ESTABLISHES THESE REQUIREMENTS IN VARIOUS REGULATORY DOCUMENTS (KHB'S, KMI'S, AND LSSP'S)

KSC FORM 4-588NS (6/84)

SPACE
SHUTTLE
PAYLOAD

DESIGN AND DEVELOPMENT

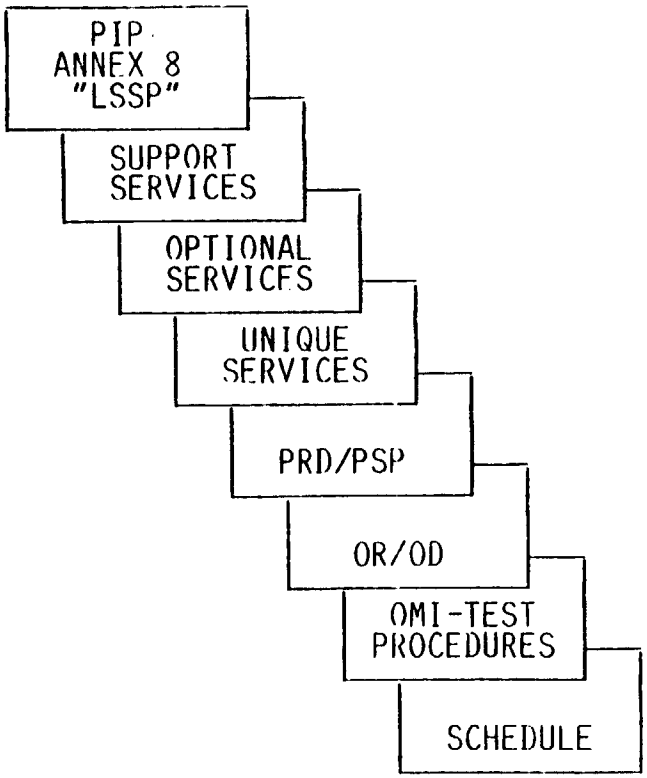
NASA



KSC FORM 4-588NS (6/84)

DESIGN AND DEVELOPMENT

- **CUSTOMER REQUIREMENTS**
  - DERIVED IN WORKING GROUP MEETINGS WITH THE LSSM

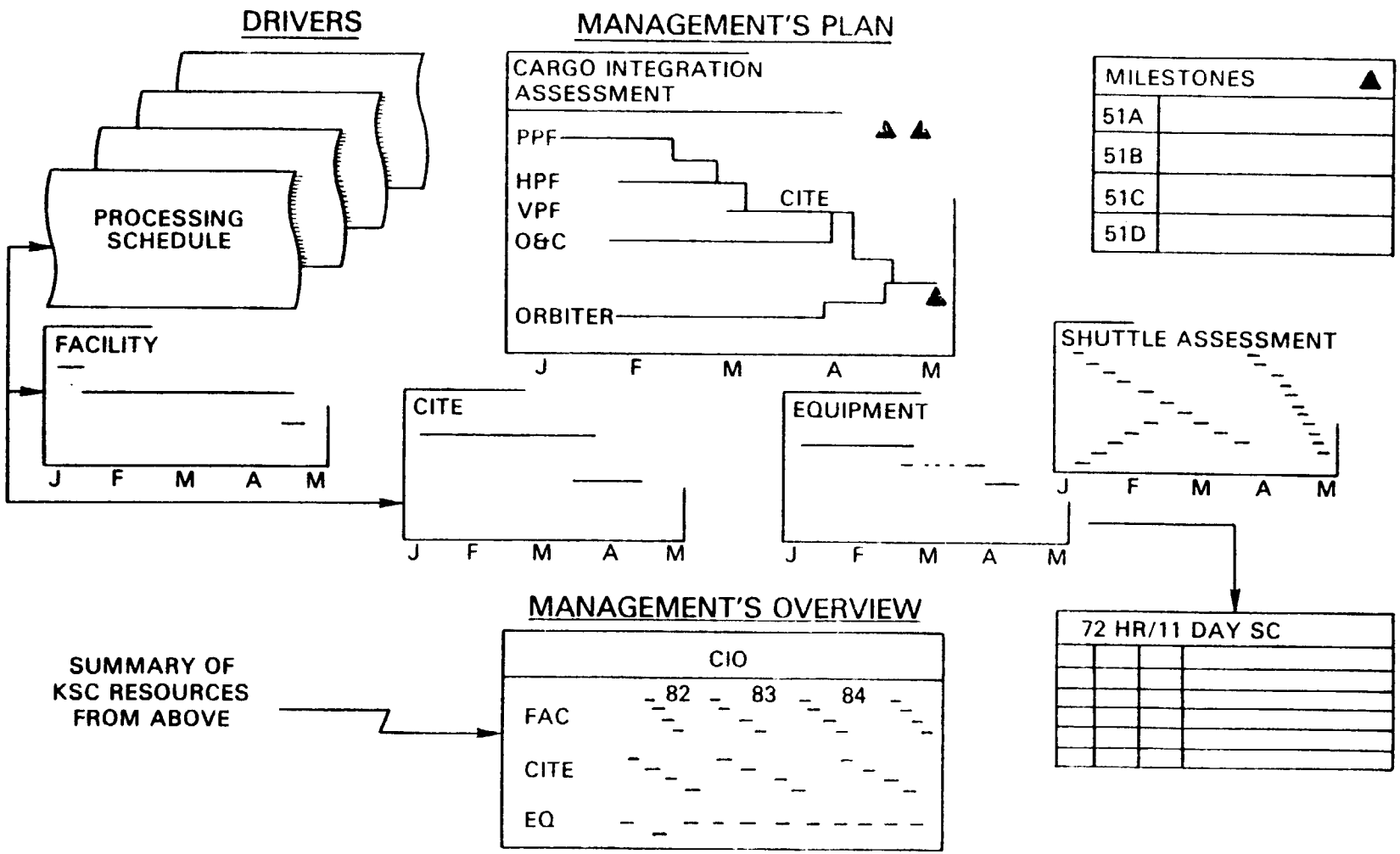


KSC FORM 4-588NS (6/84)

SPACE
SHUTTLE
PAYLOAD

DESIGN AND DEVELOPMENT

NASA



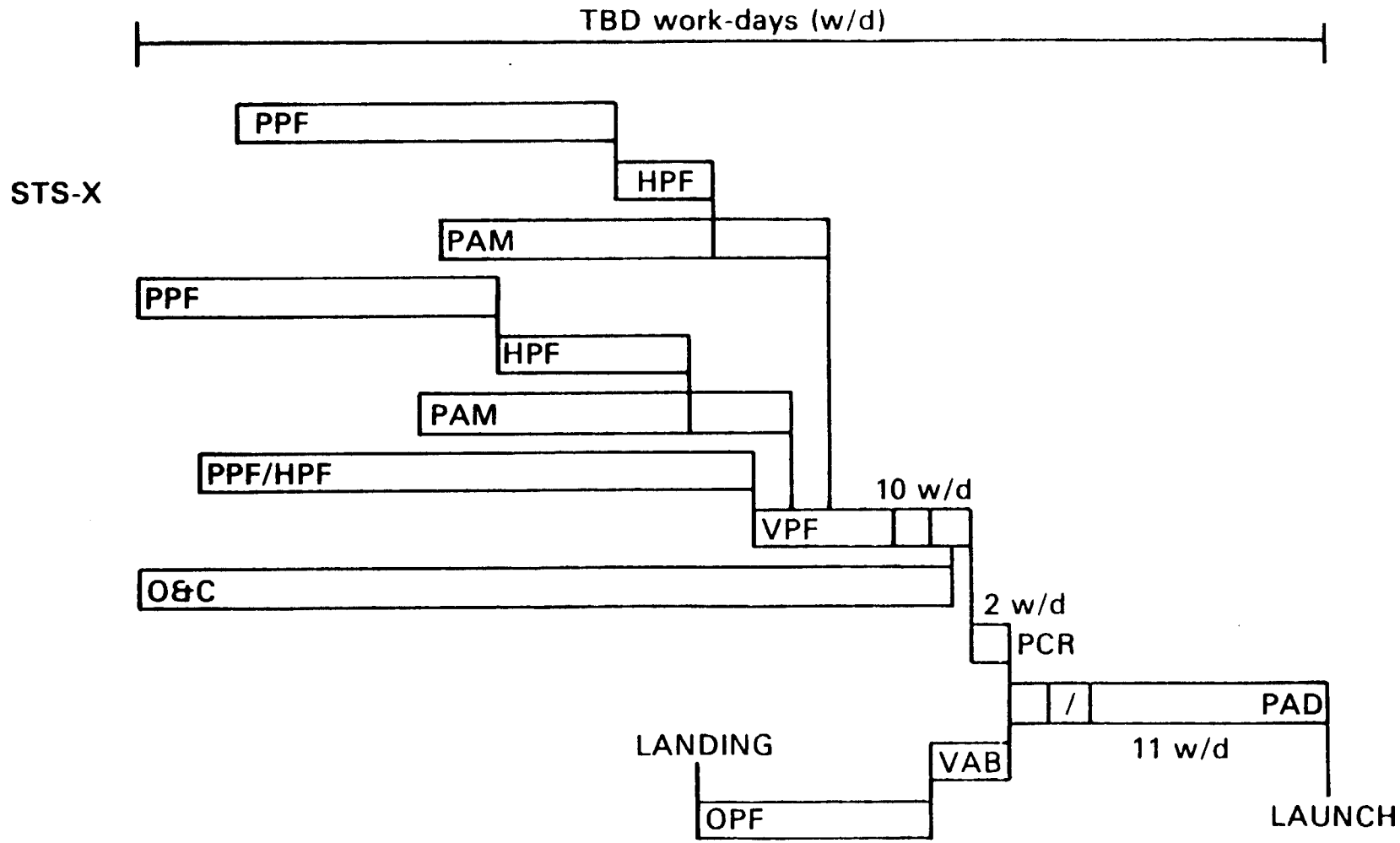
SCHEDULES

KSC FORM 4-588NS (6/84)

SPACE
SHUTTLE
PAYLOAD

DESIGN AND DEVELOPMENT

NASA



VERTICAL CARGO PROCESSING FLOW

86B

KSC FORM 4-588NS (6/84)

C-2.

CUSTOMER REQUIREMENTS

- FACILITIES, EQUIPMENT, AND SUPPORT SERVICES PROVIDED TO THE CUSTOMER ARE DIVIDED INTO THREE CATEGORIES:
  - STANDARD SERVICES REQUIRED AS A PART OF THE PAYLOAD-TO-ORBITER INTEGRATION AND LAUNCH PROCESS
  - UNIQUE SERVICES REQUIRED DURING, BUT NOT PART OF, THE INTEGRATION AND LAUNCH PROCESS AND PERFORMED BY THE TEST TEAM
  - OPTIONAL SERVICES REQUIRED DURING PPF, HPF, OR STAND ALONE ACTIVITIES DURING THE INTEGRATION AND LAUNCH PROCESS

KSC FORM 4-588NS (6 '84)

PAYLOAD OPTIONAL SERVICES

ARRIVAL/DEPARTURE SUPPORT
COMMUNICATIONS
PROPELLANTS AND HANDLING
TECHNICAL SHOPS
SCAPE AND SPLASH SUITS
SPIN BALANCE OPERATIONS
TEST EQUIPMENT LOAN
DOCUMENTATION
SAFETY REVIEW AND MONITOR
G.S.A. SERVICES
EQUIPMENT CALIBRATION
PAYLOAD PROCESSING FACILITY

LAUNCH SITE MANAGEMENT
WEATHER FORECAST
SECURITY
PROPELLANTS, GAS, AND SUPPLIES
TRANSPORT AND HANDLING EQUIPMENT
TRANSPORT AND HANDLING SERVICES
PHOTO SERVICES
ORDNANCE HANDLING AND STORAGE
NON-DESTRUCT TESTING (X-RAY)
COLD SOAK
SAMPLING AND ANALYSIS
HAZARDOUS PROCESSING FACILITY

KSC FORM 4-588NS (6/84)

UNIQUE SERVICES

- END-TO-END TESTING
- ON-PAD FUELING
- PATHFINDER OPERATIONS
- MISSION SEQUENCE TEST

PROGRAM REQUIREMENTS DOCUMENTATION

- SPECIFICALLY IDENTIFIES KSC RESOURCES REQUIRED
- IDENTIFIES THE AVAILABILTY OF KSC RESOURCES RELATIVE TO EACH CUSTOMER

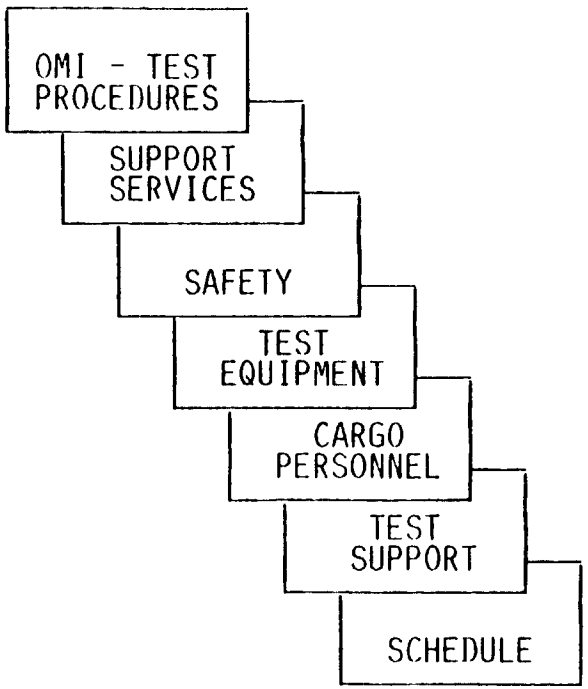
OPERATIONS REQUIREMENTS DOCUMENTATION

- SCHEDULES KSC RESOURCES IN REGARD TO CUSTOMER TESTING

KSC FORM 4-588NS (6/84)

DESIGN AND DEVELOPMENT

- **KSC AND CUSTOMER STS ON-LINE REQUIREMENTS**
  - DERIVED FROM OMRS, PIP ANNEX 9, AND WORKING GROUP MEETINGS WITH THE TEST TEAM



KSC FORM 4-588NS (6/84)

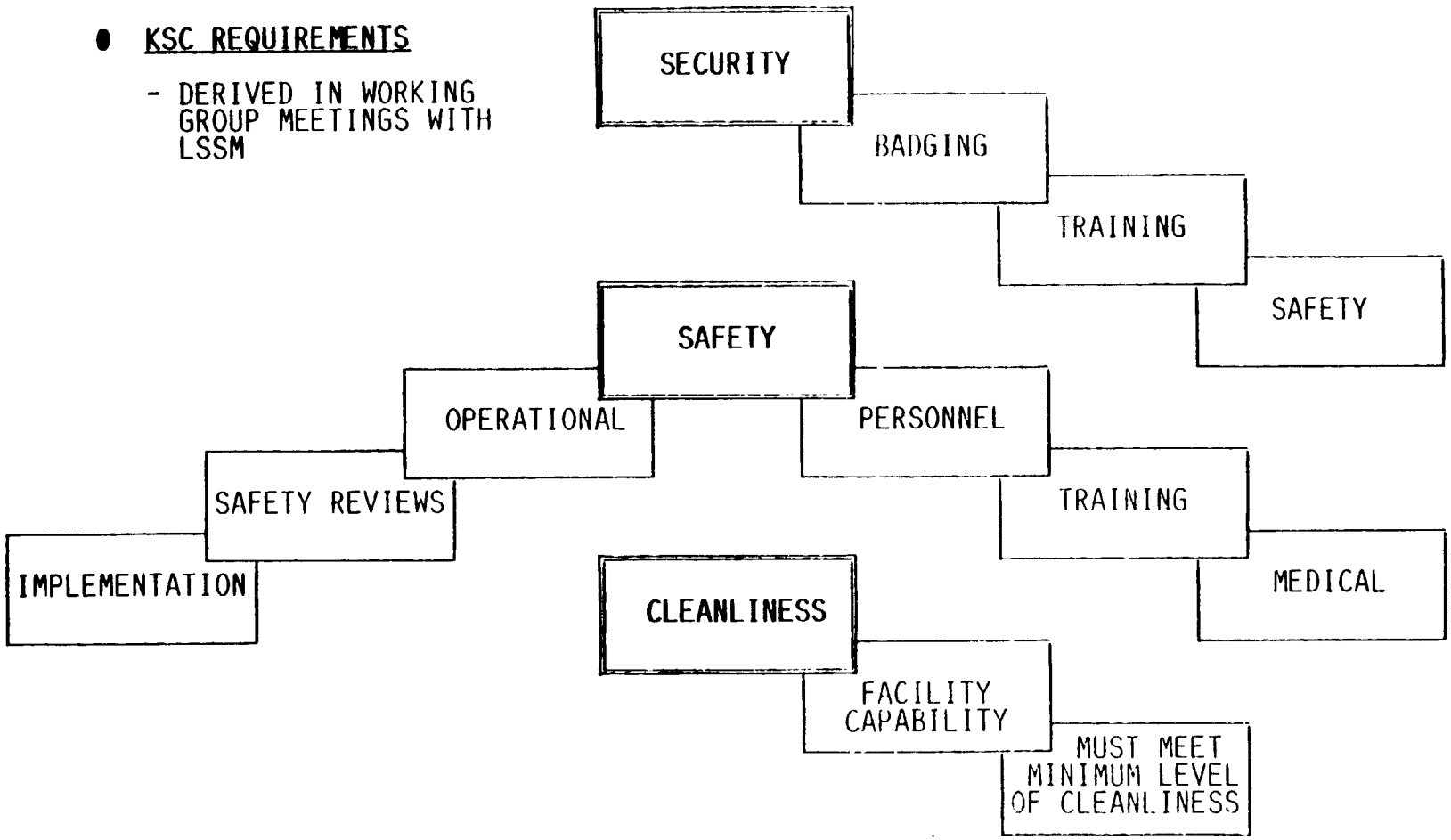
OMI TEST PROCEDURES

- IDENTIFY:
  - SAFETY CONSTRAINTS FOR HAZARDOUS OPERATIONS
  - NECESSARY TEST EQUIPMENT
  - PARTICIPATING PERSONNEL AND LOCATION
  - SCHEDULE FOR TEST EQUIPMENT
  - TEST TIMELINE AND DURATION

KSC FORM 4-588NS (6/84)

DESIGN AND DEVELOPMENT

- **KSC REQUIREMENTS**
  - DERIVED IN WORKING GROUP MEETINGS WITH LSSM



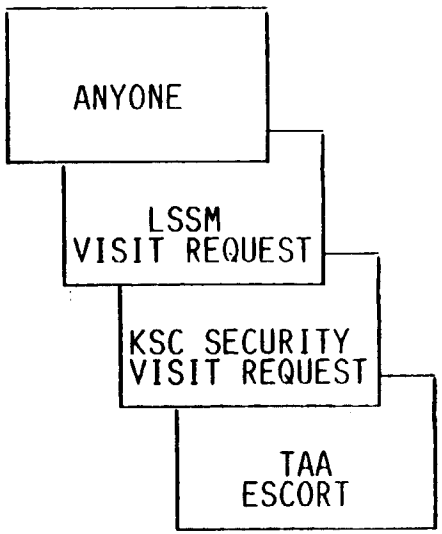
KSC FORM 4-588NS (6/84)

SECURITY

- KSC SECURITY OFFICE WILL ASSURE PROTECTION OF:
  - NATIONAL SECURITY INFORMATION
  - NATIONAL RESOURCES ASSETS
  - PAYLOADS FROM DANGER
- ADDITIONAL PROTECTIVE SERVICES REQUIRED BY PAYLOAD CARGO CUSTOMERS WILL INCUR COSTS
- KSC SECURITY PLAN IS AVAILABLE UPON REQUEST FROM LSSM

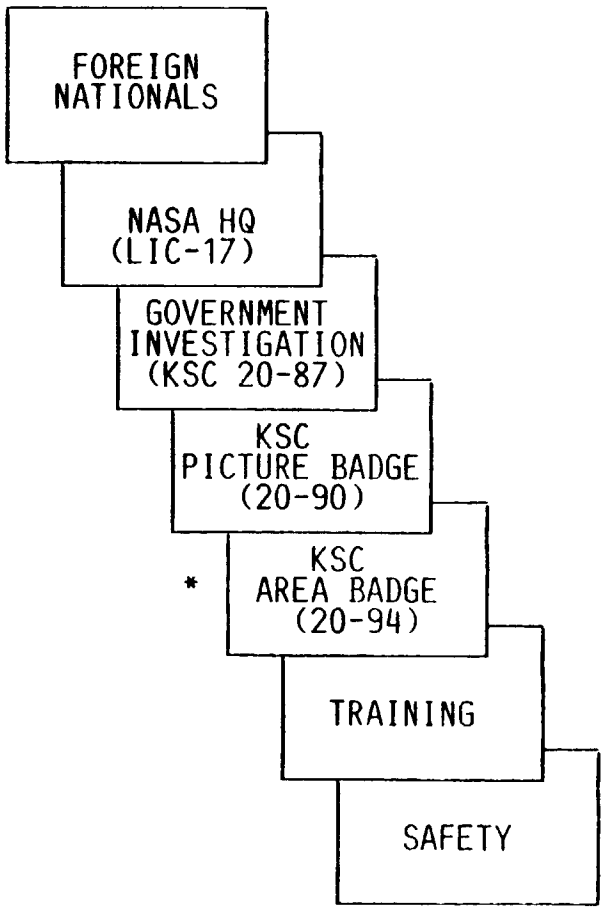
KSC FORM 4-588NS (6/84)

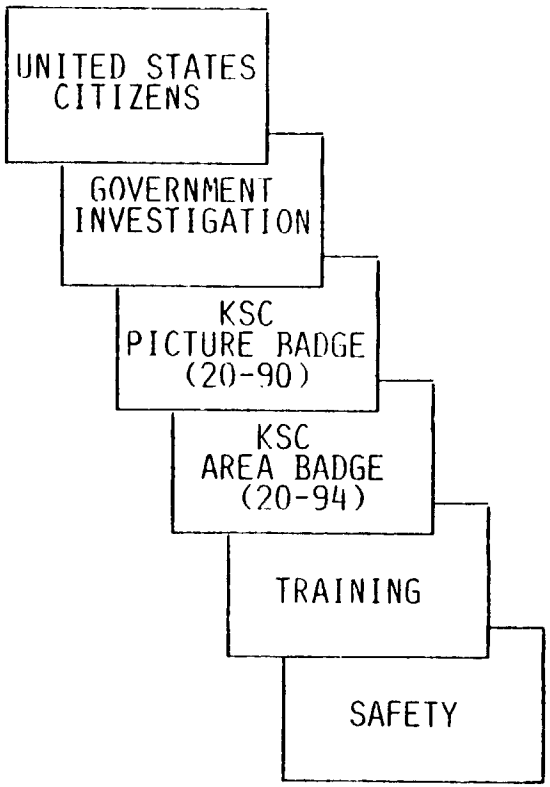
SECURITY/BADGING/ACCESS



KSC FORM 4-588NS (6/84)

BADGING

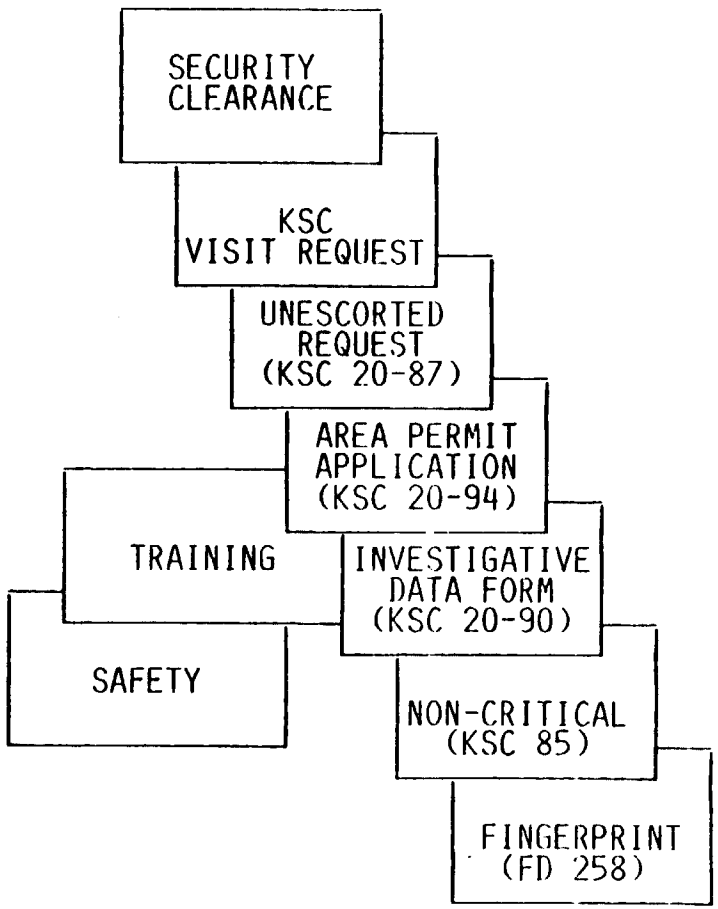




* LIMITING FACTOR: FOREIGN NATIONALS MUST BE ESCORTED IN ORBITER PROCESSING AREAS.

KSC FORM 4-586NS (6/84)

UNESCORTED ACCESS



KSC FORM 4-588NS (6/84)

GROUND SAFETY REQUIREMENTS

- SATISFY SOURCE DOCUMENTS (POLICY DOCUMENTS)
  - NASA HEADQUARTERS - NHB 1700.7A
  - NASA JOHNSON SPACE CENTER (JSC) - JSC 13830A
  - NASA KENNEDY SPACE CENTER (KSC) - SAMTO HB S-100/KHB 1700.7
- IMPLEMENTED VIA JSC 13830A, "IMPLEMENTATION PROCEDURE FOR STS PAYLOADS SYSTEMS SAFETY REQUIREMENTS"
- PAYLOADS RESPONSIBLE FOR:
  - SAFETY DATA
  - SAFETY ANALYSIS
  - SAFETY COMPLIANCE OR WAIVER

KSC FORM 4-588NS (6/84)

SAFETY REVIEWS

- CONDUCTED BY REVIEW PANELS
  - TO ASSESS COMPLIANCE
- FOUR PHASE REVIEWS
  - TO ASSESS PAYLOAD PRESENTATIONS AND DATA
    - PHASE 0 - CONCEPT
    - PHASE I - PRELIMINARY DESIGN
    - PHASE II - FINAL DESIGN
    - PHASE III - FABRICATION AND TEST COMPLETE
- OBJECTIVES
  - IDENTIFY HAZARDS VIA SAFETY ANALYSIS

KSC FORM 4-588NS (6/84)

SAFETY REVIEW DATA

PHASE 0 (INFORMAL)	PHASE I	PHASE II
1. PAYLOAD/GSE OPERATIONS	1. UPDATE	1. UPDATE
2. SAFETY - CRITICAL SUBSYSTEMS	2. BLOCK DIAGRAMS/ SCHEMATICS	2. UPDATE ENGR. DRAWINGS
3. GROUND OPERATIONS FLOW	3. UPDATE	3. GROUND OPERATIONS PLAN
4. HAZARD REPORTS	4. SUPPORT DATA	4. UPDATE
5. TRAINING/CERTI-FICATION RQMTS.	5. N/A	5. LIST OF EQUIPMENT
	6. IONIZING RADIA-TION SOURCE DATA SHEET	6. N/A
		7. LIST SAFETY-RELATED FAILURES/ ACCIDENTS
		8. LIST OF HAZARDOUS TECHNICAL OPER-ATING PROCEDURES

KSC FORM 4-588NS (6/84)

PHASE III SAFETY REVIEW DATA

- SUBMITTAL OF SAFETY COMPLIANCE DATA PACKAGE (JSC 13830A)
  - CERTIFICATE OF PAYLOAD/GSE SAFETY COMPLIANCE
  - SAFETY ASSESSMENT REPORTS
  - SUMMARY OF PREVIOUS DATA AND OPEN ACTION ITEMS
  - APPROVED WAIVERS AND DEVIATIONS
  - PRESSURE VESSEL/SYSTEM LOG BOOK
  - FAILURES AND ACCIDENTS SUMMARIZED

KSC FORM 4-588NS (6/84)

OPERATIONAL SAFETY

- IMPLEMENTATION
  - IDENTIFY HAZARDOUS OPERATIONS IN PROCEDURES
  - PERFORM SAFETY INSPECTIONS
  - UTILIZE PROTECTIVE SAFETY EQUIPMENT
  - LOG AND RESTRAIN TOOLS
  - SENSITIVE TO PHOTOGRAPHIC CONSTRAINTS

KSC FORM 4-588NS (6/84)

PERSONNEL TRAINING REQUIREMENTS

- SAFETY TRAINING
  - IS THE RESPONSIBILITY OF THE PAYLOAD ORGANIZATION
  - SHALL MEET THE APPLICABLE FACILITY AND OPERATING SITE REQUIREMENTS
  - WILL INCLUDE IN EACH LAUNCH SITE SAFETY PLAN SUCH SUBJECTS AS:
    - o HAZARD TYPES, RECOGNITION, CAUSES AND EFFECT
    - o PREVENTION AND CONTROL MEASURES
    - o SAFE OPERATING PROCEDURES
    - o CHECKLISTS
    - o SAFEGUARDS AND SAFETY DEVICES
    - o PERSONAL PROTECTIVE EQUIPMENT
    - o MONITORING AND WARNING DEVICES
    - o EMERGENCY AND CONTINGENCY PROCEDURES

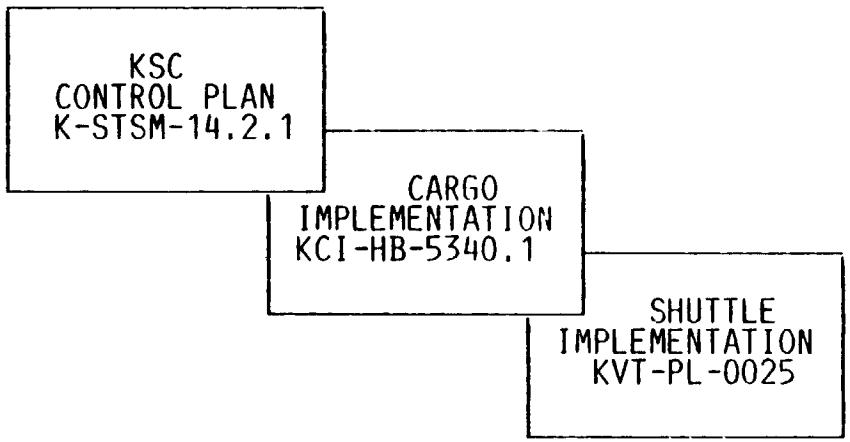
KSC FORM 4-588NS (6/84)

PERSONNEL MEDICAL REQUIREMENTS

- PHYSICAL EXAMINATION FOR:
  - CRANE OPERATORS
  - ORDNANCE WORKERS
  - PROPELLANT HANDLERS
  - SCAPE OPERATORS
  - PERSONNEL WORKING WITH CERTAIN TYPES OF RADIATION

KSC FORM 4-588NS (6/84)

CONTAMINATION REQUIREMENTS



KSC FORM 4-588NS (6/84)

CONTAMINATION CONTROL

- THE CARGO FACILITY CONTAMINATION CONTROL PLAN IDENTIFIES:
  - CONTAMINATION MONITORED BY KSC
    - AIRBORNE PARTICULATE
    - SURFACE FALLOUT
    - NON-VOLATILE RESIDUE
    - VOLATILE HYDROCARBONS
  - CLEAN WORK AREAS AVAILABLE
    - FACILITY CAPABILITIES
    - FACILITY LIMITATIONS
  - MONITORING PLAN
    - IDENTIFIES PARAMETERS
    - ESTABLISHES FREQUENCY
    - REPORTS DATA TO CUSTOMER

KSC FORM 4-588NS (6/84)

		LEVEL #1	LEVEL #2	LEVEL #3	LEVEL #4	LEVEL #5
AIR FLOW TYPE		LAMINAR	LAMINAR	NON-LAMINAR	NON-LAMINAR	NON-LAMINAR
MAXIMUM AIRBORNE PARTICULATE COUNTS (PER FT^3)	REQ. 0.5	5,000	10,000	50,000	100,000	300,000
	REQ. 5.0	30	65	300	700	1,000
	MONITORING	CONTINUOUS	CONTINUOUS	CONTINUOUS	CONTINUOUS	MONTHLY
TEMPERATURE (°F)	REQUIREMENT	71 ± 6	71 ± 6	71 ± 6	71 ± 6	71 ± 6
	MONITORING	CONTINUOUS	CONTINUOUS	CONTINUOUS	CONTINUOUS	MONTHLY
RELATIVE HUMIDITY (%)	REQUIREMENT	50 MAX	50 MAX	50 MAX	50 MAX	50 MAX
	MONITORING	CONTINUOUS	CONTINUOUS	CONTINUOUS	CONTINUOUS	MONTHLY
MAXIMUM PARTICLE FALLOUT	GOAL	LEVEL 200	LEVEL 200	LEVEL 500	LEVEL 750	LEVEL 1000
	MONITORING	CONTINUOUS	CONTINUOUS	CONTINUOUS	CONTINUOUS	EVERY 6 MOS.
MAXIMUM NVR ($mg/0.1m^2/month$)	REQUIREMENT	1.0	1.0	1.0	1.0	2.0
	MONITORING	CONTINUOUS	CONTINUOUS	CONTINUOUS	CONTINUOUS	ANNUALLY
MAXIMUM VOLATILE HYDROCARBONS (PPM) (v/v)	REQUIREMENT	15	15	15	15	N/A
	MONITORING	EVERY 2 WEEKS	EVERY 2 WEEKS	EVERY 2 WEEKS	EVERY 2 WEEKS	N/A
MINIMUM POSITIVE PRESSURE	REQUIREMENT	0.05 IN. H_2O	0.05 IN. H_2O	0.05 IN. H_2O	0.02 IN. H_2O	N/A
	MONITORING	DAILY	DAILY	DAILY	DAILY	N/A
MINIMUM AIR CHANGES	REQUIREMENT	20/HOUR	20/HOUR	6/HOUR	4/HOUR	2/HOUR

CONTAMINATION MONITORING PARAMETERS

KSC FORM 4-588NS (6/84)

CLEANLINESS MAINTENANCE

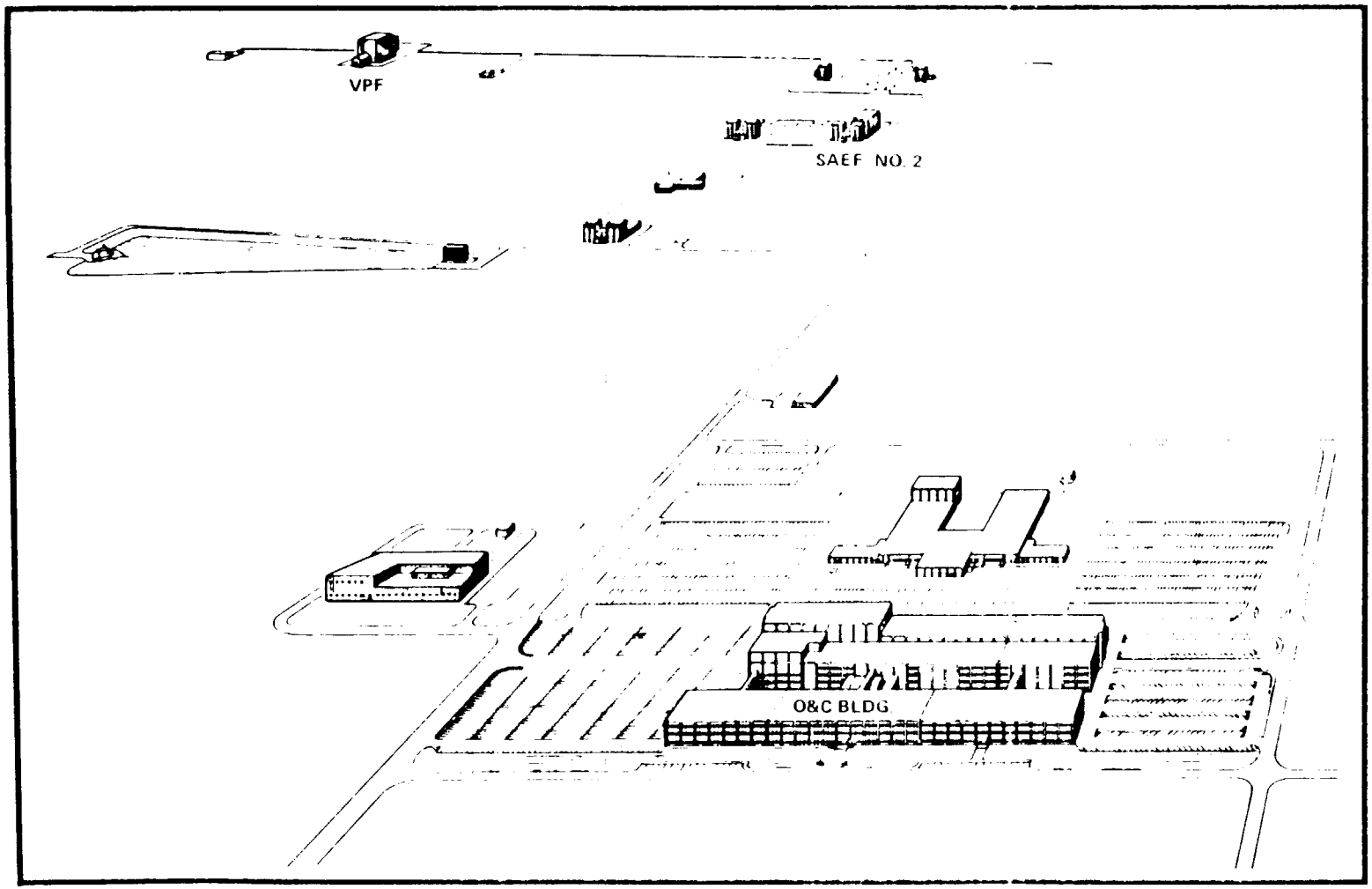
- OPERATIONAL AND MAINTENANCE RULES ARE ESTABLISHED FOR:
  - CLEAN WORK AREA OPERATIONS:
    - PERSONNEL ATTIRE
    - CLEAN WORK AREA ENTRY
    - CLEAN WORK AREA OPERATIONS
    - TOOLS AND FIXTURES
    - MATERIALS
  - CLEAN WORK AREA CLEANING:
    - CLEAN WORK AREA FLOORS, CEILINGS, WALLS AND LEDGES
    - TACKY MATS
  - GSE CLEANING:
    - PLATFORM STRUCTURES
    - ELECTRICAL PANELS AND CONSOLES
    - SERVICER UNITS
    - CRANES, HOISTS, ETC.

KSC FORM 4-588NS (6/84)

CLEANLINESS REQUIREMENTS

- PAYLOAD CLEANLINESS IS THE RESPONSIBILITY OF THE CUSTOMER OR AGENCY USING THE PAYLOAD FACILITIES AT KSC AND CCAFS.
- THE FREQUENCY OF PAYLOAD CLEANLINESS INSPECTIONS IS DETERMINED BY THE CLEANLINESS LEVEL REQUIREMENT:
  - STANDARD LEVEL SHOULD BE INSPECTED EVERY 3 WEEKS
  - SENSITIVE LEVEL SHOULD BE INSPECTED EVERY 2 WEEKS
  - HIGHLY SENSITIVE LEVEL SHOULD BE INSPECTED EVERY WEEK
- EACH CUSTOMER OR AGENCY SHALL DEVELOP CLEANING METHODS AND PROCEDURES APPLICABLE TO THEIR HARDWARE.
  - PAYLOAD CLEANING OPERATIONS SHOULD BE COORDINATED WITH THE NASA FACILITY OR SITE MANAGER FOR IMPLEMENTATION.
  - THE NASA FACILITY OR SITE MANAGER WILL PROVIDE NORMAL CLEANING SUPPLIES AS REQUESTED BY THE CUSTOMER.

KSC FORM 4-588NS (6/84)



KSC CARGO INDUSTRIAL AREA

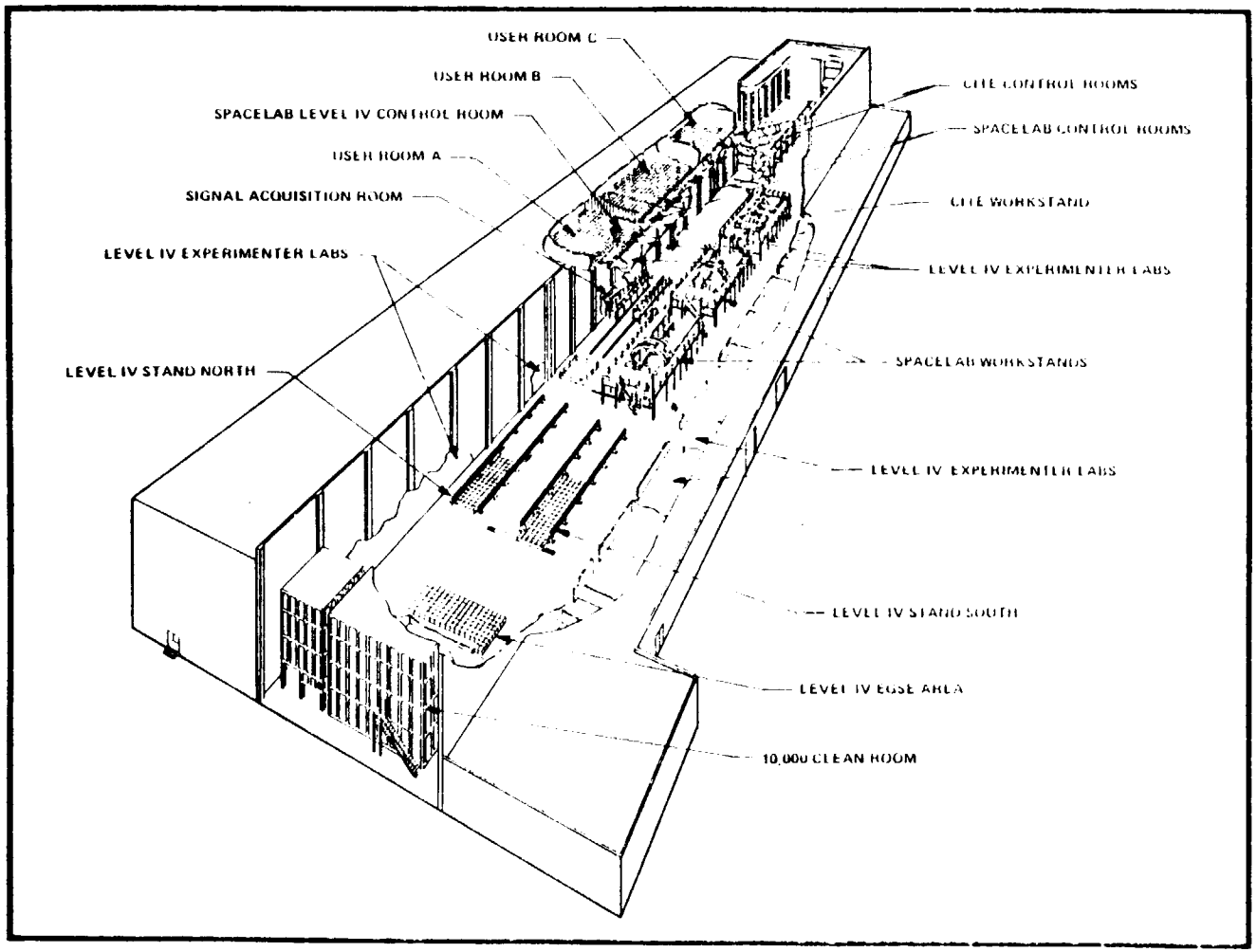
KSC FORM 4-588NS (6/84)

HORIZONTAL CARGO FACILITIES
KSC O&C BUILDING
ASSEMBLY AND TEST AREA

- EXPERIMENT INTEGRATION STANDS
  - PROVIDE FOR PALLET AND RACK TRAIN ASSEMBLY AND EXPERIMENT INTEGRATION
- SPACELAB INTEGRATION STANDS
  - PROVIDE FOR SPACELAB MODULE PREPARATION AND EXPERIMENT RACK TRAIN INTEGRATION INTO THE MODULE, PALLET-TO-MODULE MATING, AS WELL AS SYSTEMS CHECKOUT AND VERIFICATION
- CARGO INTEGRATION TEST EQUIPMENT (CITE) STAND
  - PROVIDES FOR HORIZONTAL CARGO TESTING AND CHECKOUT IN AN ELECTRONIC ENVIRONMENT USING ORBITER AVIONICS

KSC FORM 4-588NS (6/84)

DESIGN AND DEVELOPMENT

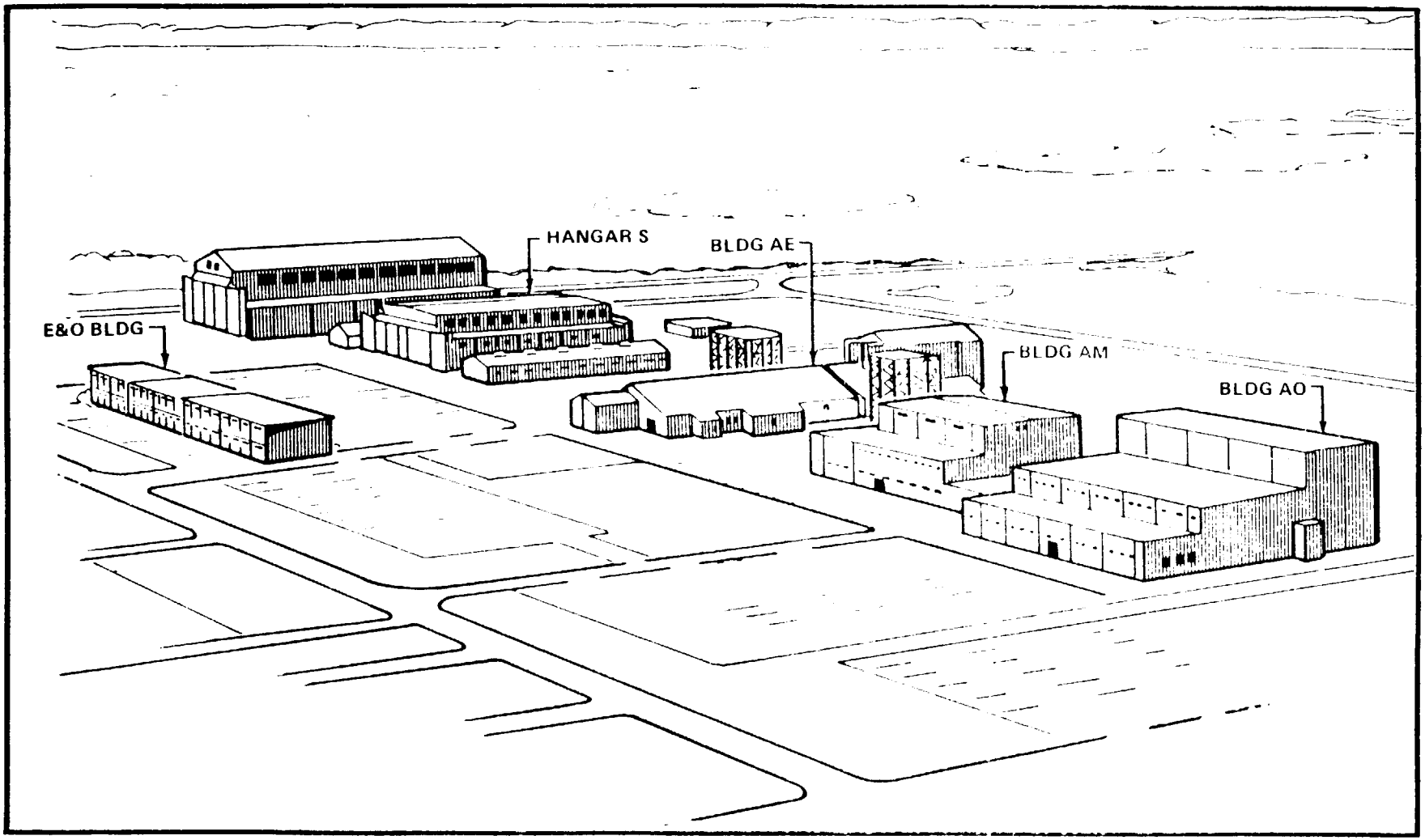


O&C BUILDING ASSEMBLY AND TEST AREA

HORIZONTAL CARGO FACILITIES
KSC O&C BUILDING
CONTROL ROOMS

- EXPERIMENT INTEGRATION CONTROL ROOM
- SPACELAB CONTROL ROOM
- CITE CONTROL ROOMS
  - ALL CONTROL ROOMS PROVIDE SPACE AND HARDWARE FOR CONTROL OF GROUND SUPPORT EQUIPMENT ASSOCIATED WITH THE ASSEMBLY AND TEST AREA WORKSTANDS

KSC FORM 4-588NS (6/84)



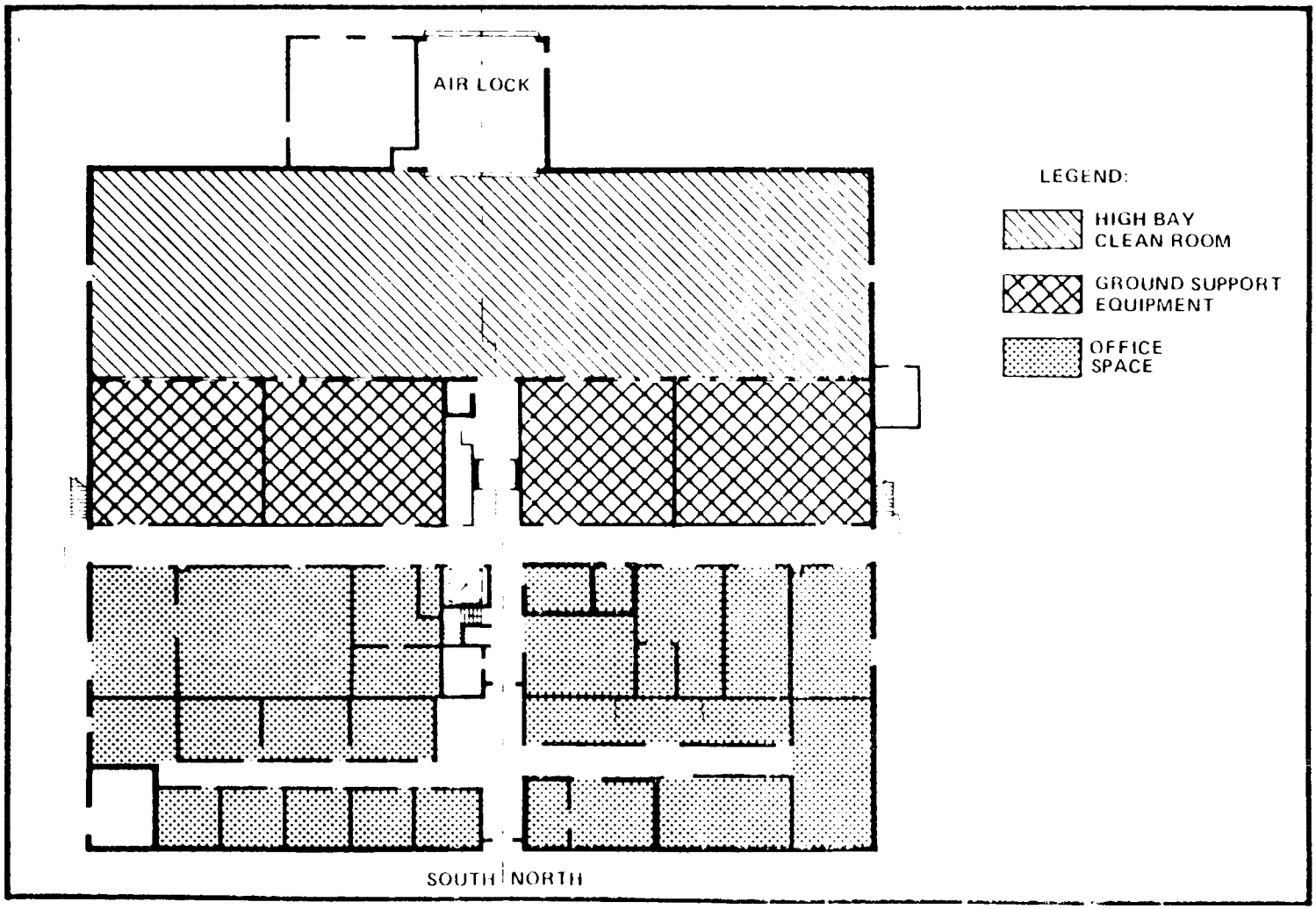
CCAFS CARGO INDUSTRIAL AREA

KSC FORM 4-588NS (6/84)

SUMMARY OF AVAILABLE PPF'S

- BUILDING AO
  - BUILDING ASSIGNED TO TWO USERS
  - HIGH BAY WORK AREA: 45 FT. BY 87 FT. 6 IN.
  - CRANE: 10 TON, 48 FT. LIFT
  - CLEANLINESS: CLASS 100,000, CWA LEVEL 4
  - ENTRY DOOR: 25 FT. WIDE BY 40 FT. HIGH
- BUILDING AM
  - BUILDING ASSIGNED TO TWO USERS
  - HIGH BAY WORK AREA: 63 FT. BY 70 FT.
  - CRANE: 5 TON, 36 FT. 1 IN. LIFT
  - CLEANLINESS: CLASS INDUSTRIAL CLEAN, CWA LEVEL 5
  - ENTRY DOOR: 15 FT. WIDE BY 34 FT. HIGH

KSC FORM 4-588NS (6/84)



BUILDING AO, CCAFS

KSC FORM 4-588NS (6/84)

SUMMARY OF AVAILABLE PPF'S

- BUILDING AE
  - HIGH BAY WORK AREA: 43 FT. 10 IN. BY 51 FT. 6 IN.
  - CRANE: 6 TON, 36 FT. 10 IN. LIFT
  - CLEANLINESS: CLASS 10,000, CWA LEVEL 2
  - ENTRY DOOR: 16 FT. WIDE BY 36 FT. 6 IN. HIGH
- HANGAR S
  - HIGH BAY WORK AREAS
    - NORTH: 30 FT. BY 43 FT.
    - SOUTH: 23 FT. BY 56 FT.
  - CRANES: 2 TON, 19 FT. 1 IN. LIFT
  - CLEANLINESS: CLASS 100,000, CWA LEVEL 4 (CAN MAINTAIN CLASS 10,000, CWA LEVEL 2)
  - ENTRY DOOR: 16 FT. WIDE BY 20 FT. HIGH

KSC FORM 4-588NS (6/84)

SUMMARY OF AVAILABLE HPF'S

- DELTA SPIN TEST FACILITY
  - HIGH BAY WORK AREA:
    - SPIN TEST HIGH BAY: 36 FT. 6 IN. BY 60 FT.
    - CONTROL BLDG. HIGH BAY: 44 FT. X 27 FT.
      (NON-HAZARDOUS WORK ONLY)
  - CRANES:
    - SPIN TEST HIGH BAY: 10-TON, 35 FT. 4 IN. LIFT
    - CONTROL BLDG. HIGH BAY: 3-TON, 35 FT. LIFT
  - CLEANLINESS: CLASS 100,000, CWA 4
  - ENTRY DOORS:
    - SPIN TEST HIGH BAY: 16 FT. 10 IN. WIDE BY 29 FT. HIGH
    - CONTROL BLDG. HIGH BAY: 11 FT. 10 IN. WIDE BY 29 FT. 10 IN. HIGH

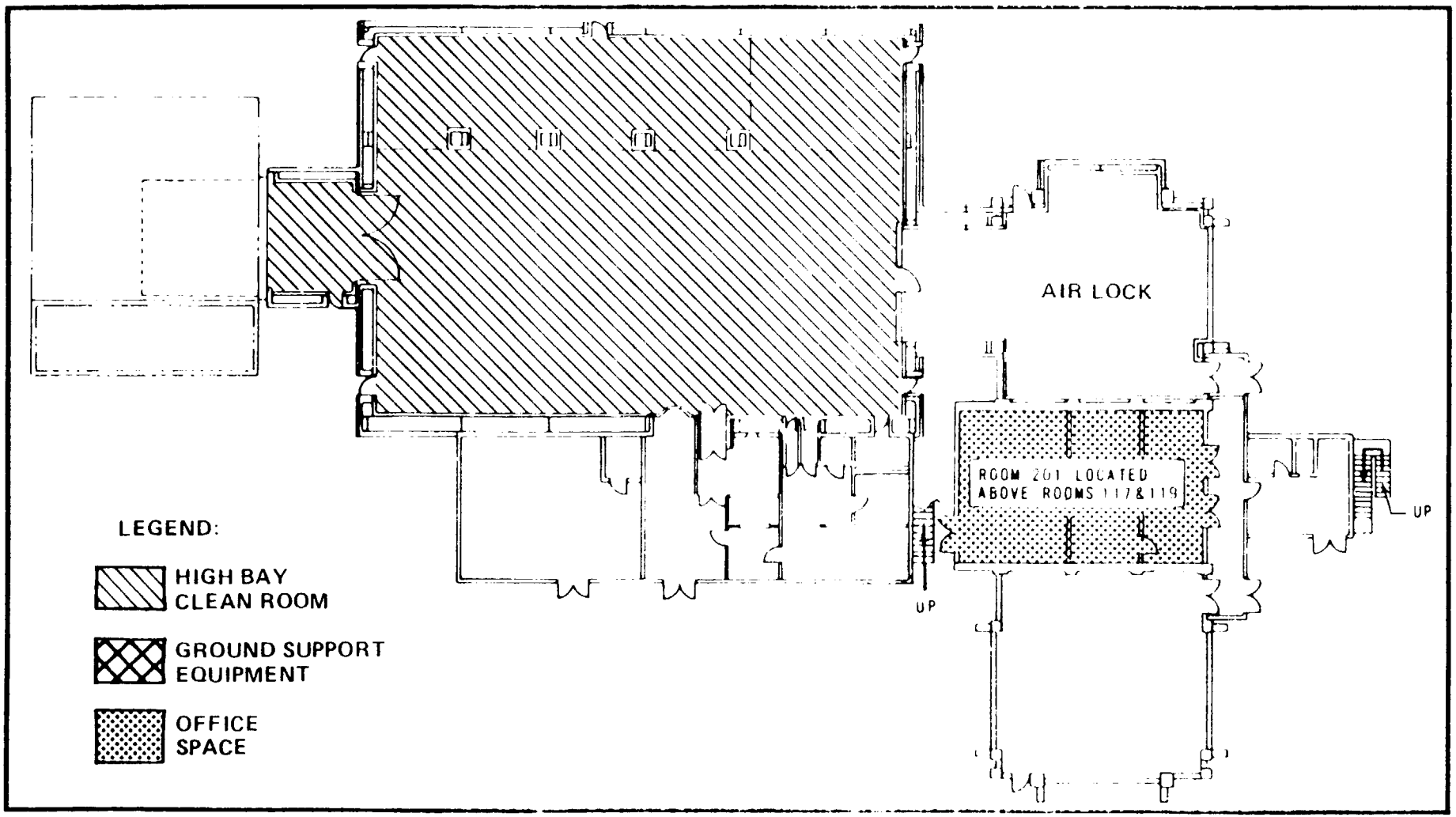
KSC FORM 4-588NS (6/84)

SUMMARY OF AVAILABLE HPF'S

- EXPLOSIVE SAFE AREA 60A
  - HIGH BAY WORK AREAS: 37 FT. 5 IN. BY 56 FT. (NORTH AND SOUTH THE SAME SIZE)
  - CRANE: 5-TON, 33 FT. 6 IN. LIFT
  - CLEANLINESS: CLASS 100,000, CWA LEVEL 4
  - ENTRY DOOR: 18 FT. WIDE BY 35 FT. HIGH
- SAEF 2
  - HIGH BAY WORK AREA: 49 FT. BY 99 FT.
  - CRANE: 10-TON, 65 FT. LIFT
  - CLEANLINESS: CLASS 100,000, CWA LEVEL 4 (CAN MAINTAIN CLASS 10,000, CWA LEVEL 3)
  - ENTRY DOOR: 21 FT. WIDE BY 39 FT. 6 IN. HIGH
- CHSF
  - HIGH BAY WORK AREA: 60 FT. BY 107 FT.
  - CRANE: 50-TON, 85 FT. LIFT
  - CLEANLINESS: CLASS 100,000, CWA LEVEL 4
  - ENTRY DOOR: 35 FT. WIDE BY 75 FT. HIGH

KSC FORM 4-588NS (6/84)

DESIGN AND DEVELOPMENT

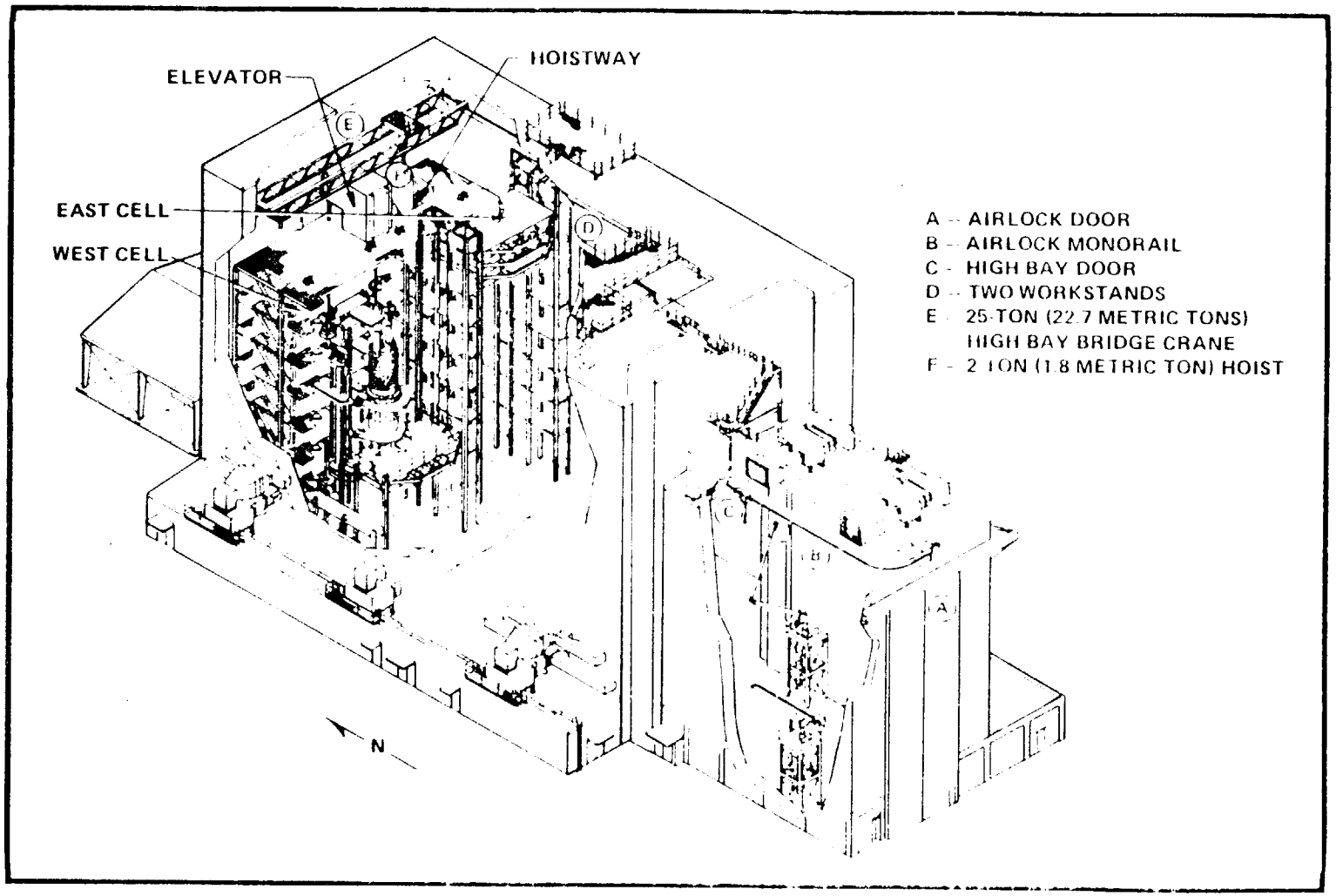


KSC FORM 4-588NS (6/84)

VERTICAL PROCESSING FACILITY

- HIGH BAY
  - WORK AREA: 72 FT. BY 143 FT.
  - CRANES: 12-TON, 25-TON, 95 FT. LIFT
  - CLEANLINESS: CLASS 100,000, CWA LEVEL 4
  - ENTRY DOOR: 38 FT. WIDE BY 72 FT. HIGH
  - TWO CARGO INTEGRATION AND TEST CELLS
- AIRLOCK
  - WORK AREA: 42 FT. BY 74 FT.
  - CRANE: 10-TON, 69 FT. LIFT PLUS TWO ARTICULATING ARMS
  - CLEANLINESS: CLASS 100,000, CWA LEVEL 5
  - ENTRY DOORS: 26 FT. WIDE BY 72 FT. HIGH

KSC FORM 4-588NS (6/84)



VERTICAL PROCESSING FACILITY, CUTAWAY

THIS CONCLUDES A BRIEF PRESENTATION OF KSC'S BROAD ROLE IN STS PAYLOAD PROCESSING, INTEGRATION, AND LAUNCH AT THE EASTERN LAUNCH SITE. MORE DETAILED MATERIAL IS AVAILABLE FROM KSC'S CARGO MANAGEMENT AND OPERATIONS DIRECTORATE, ATTENTION: CM-CIO, KENNEDY SPACE CENTER, FLORIDA 32899, TELEPHONE: 305-867-7650.

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