

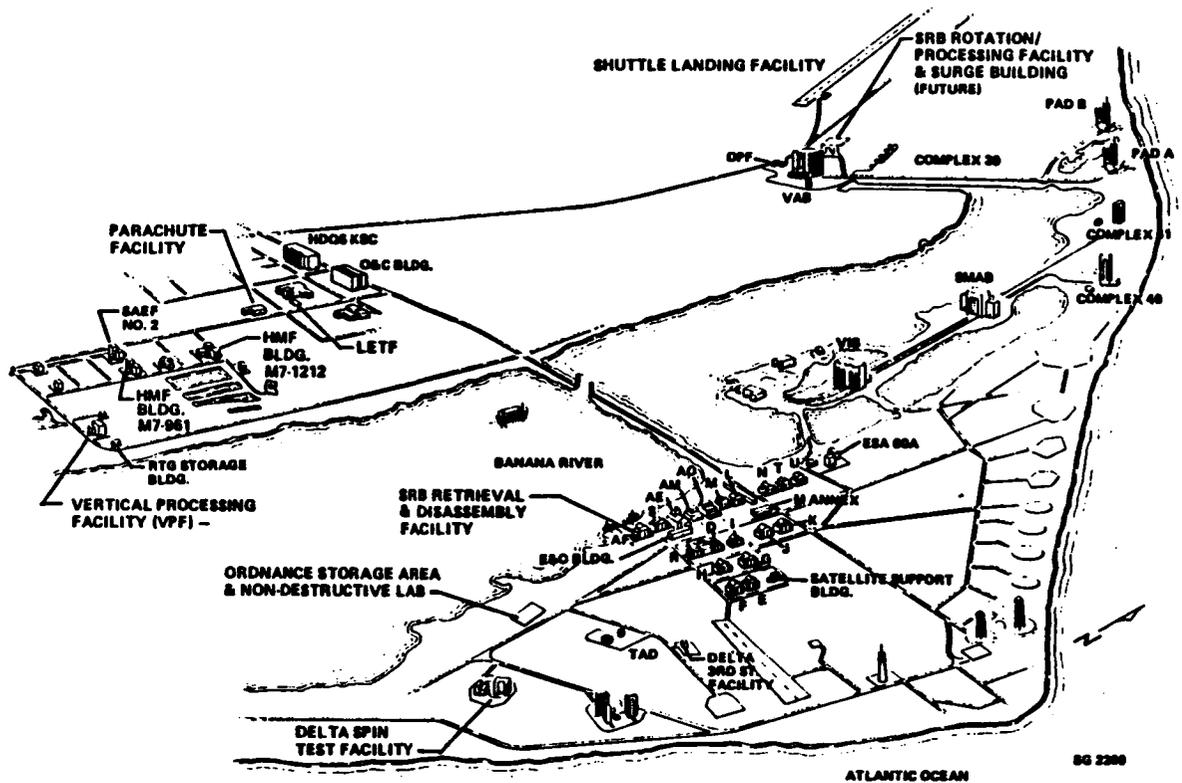
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PAYLOAD PROCESSING  
AND INTEGRATION AT KSC

JSC  
SATELLITE SERVICES WORKSHOP  
JUNE 22-24

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### SHUTTLE / AUTOMATED PAYLOAD PROCESSING FACILITIES



### FACILITIES LAYOUT AT KSC

- 0 PAYLOAD ARRIVAL, CHECKOUT, HAZARDOUS SERVICING
- 0 MATE TO UPPER STAGE
- 0 INTEGRATE WITH OTHER PAYLOADS
- 0 INTEGRATE INTO ORBITER
- 0 INTERFACE VERIFICATION CHECKS
- 0 LAUNCH

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PAYLOAD PROCESSING FACILITIES

- 0 PAYLOADS MAY ARRIVE BY LAND, SEA, AIR  
(USUALLY SPACECRAFT REQUIRING UPPER STAGES)
- 0 PAYLOAD PROCESSING FACILITY ASSIGNED FOR SPACECRAFT  
OPERATIONS
  - FINAL ASSEMBLY OR BUILDUP
  - INSPECTIONS, CLEANING
  - FUNCTIONAL TESTING
- 0 "CLEAN ROOM" CONDITIONS, CRANES, SERVICES, OFFICES,  
ETC. AVAILABLE

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DELTA SPIN TEST FACILITY

- 0 ESA-60 AND DELTA SPIN TEST FACILITY (DSTF) BOTH USED FOR HAZARDOUS SPACECRAFT OPERATIONS (LOADING HYDRAZINE, CRYOGENS, ORDNANCE, ETC.)
- 0 DSTF ALSO USED AS PAM-D BUILDUP AND TEST FACILITY
- 0 ALL PAM-D PAYLOADS MATED TO UPPER STAGE AT DSTF
- 0 ALL OTHER UPPER STAGES ARE MOUNTED TO SPACECRAFT IN VERTICAL PROCESSING FACILITY

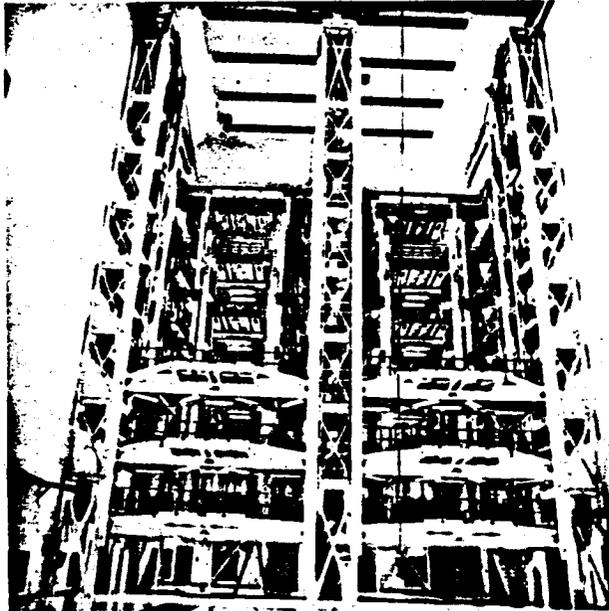
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KSC INDUSTRIAL AREA

- 0 "VERTICAL" PROCESSING FACILITY
- 0 "HORIZONTAL" PROCESSING FACILITY  
(O & C BUILDING)
- 0 SAEF-2

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INTERIOR OF VERTICAL PROCESSING FACILITY

- 0 TWO WORKSTANDS, EACH CAPABLE OF STACKING A FULL MANIFEST
- 0 PAM-D AND SPACECRAFT PREVIOUSLY MATED
- 0 PAM-A AND IUS TRANSPORTED TO VPF, THEN SPACECRAFT MATED
- 0 ELECTRICAL, MECHANICAL, AND CITE TESTING
- 0 INSTALL FULL MANIFEST INTO CANNISTER FOR TRIP TO LAUNCH PAD

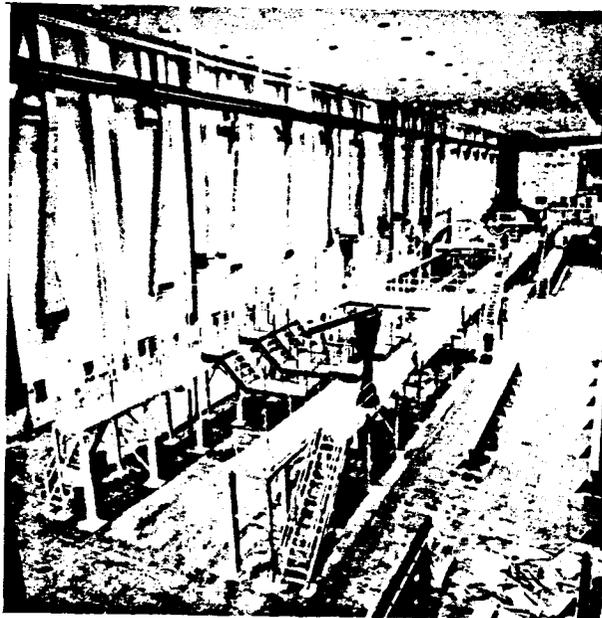
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PAYLOAD CANISTER

- 0 TRANSPORTED VERTICALLY FROM VPF
- 0 TRANSPORTED HORIZONTALLY FROM O & C
- 0 CARRIES FULL PAYLOAD MANIFEST
- 0 ENVIRONMENTALLY CONTROLLED, POWER, INSTRUMENTATION,  
PURGE, ETC.
- 0 MOVED BY 48 WHEEL OMNI-DIRECTIONAL TRANSPORTER

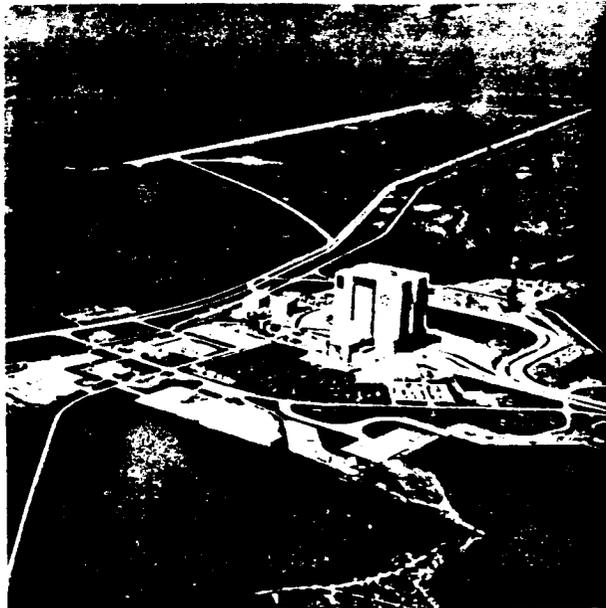
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INTERIOR OF O & C BUILDING

- 0 PAYLOAD MAY ARRIVE BY LAND, SEA, OR AIR AND IS TRANSPORTED TO O & C BUILDING
- 0 CONDUCT FINAL BUILDUP, TEST SYSTEMS, VERIFY INTERFACES, CITE TESTING
- 0 NO ORDNANCE OR PROPULSIVE STAGES
- 0 LOAD INTO CANISTER HORIZONTALLY

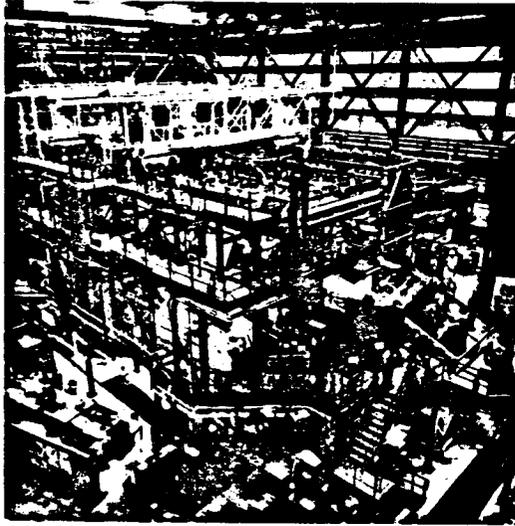
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LC-39 LANDING, PROCESSING & STACKING AREA

- 0 ORBITER LANDS ON RUNWAY, TOWED TO OPF
- 0 ORBITER PROCESSED IN OPF, SRB'S AND ET STACKED SIMULTANEOUSLY IN VAB
- 0 ORBITER TOWED TO VAB AND STACKED WITH SRB'S/ET
- 0 SHUTTLE INTERFACE TEST TO VERIFY ALL CONNECTIONS/ SYSTEMS
- 0 STACKED STS VEHICLE MOVED TO PAD ON MOBILE LAUNCHER

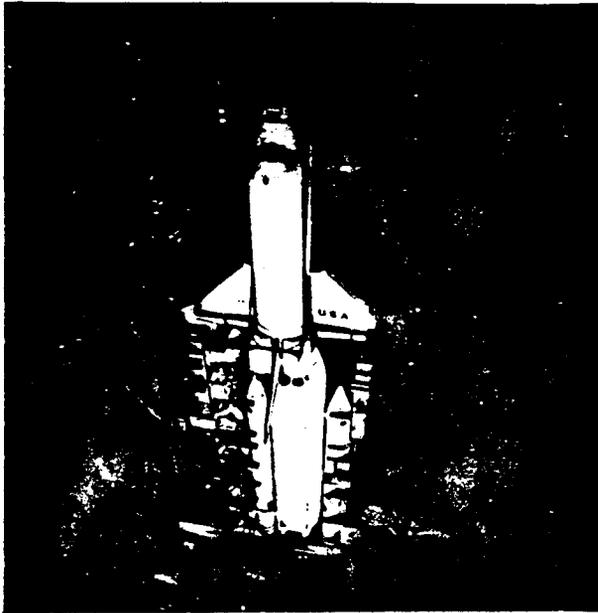
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"HORIZONTAL" PAYLOAD INTEGRATION TO ORBITER

- 0 TRANSPORTED FROM O & C TO OPF VIA CANISTER/TRANSPORTER
- 0 REMOVAL/INSTALLATION OF FLIGHT KITS AND/OR SATELLITE  
SERVICING EQUIPMENT
- 0 PAYLOAD HOISTED FROM CANISTER, LOWERED INTO ORBITER  
BAY AND SECURED
- 0 SHUTTLE/PAYLOAD INTERFACES CONNECTED
- 0 ORBITER INTEGRATED TEST CONDUCTED TO VERIFY INTERFACES
- 0 PAYLOAD BAY CLOSED OUT AND DOORS CLOSED

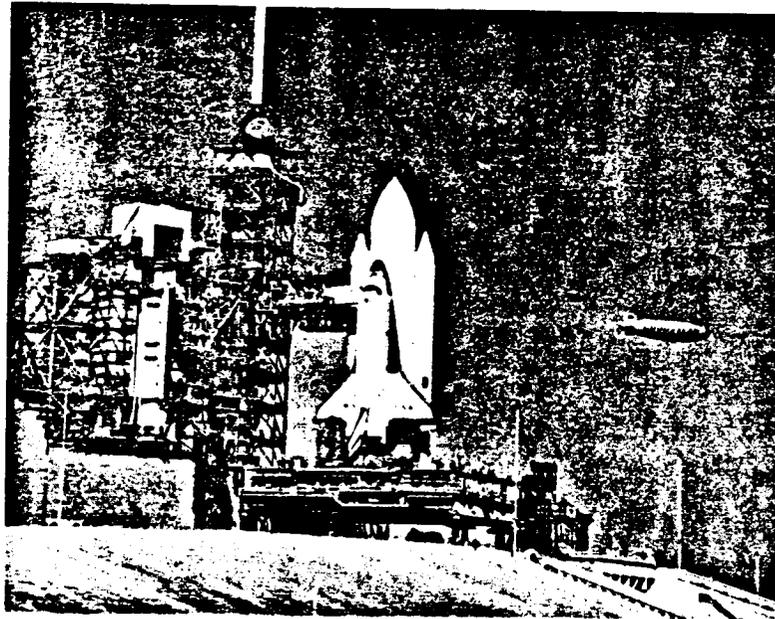
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VEHICLE ASSEMBLY BUILDING OPERATIONS

- 0 "HORIZONTAL" PAYLOADS:
- ORBITER MATED TO ET/SRB'S
  - DOORS REMAIN CLOSED
  - NO PAYLOAD ENVIRONMENTAL CONTROL UNTIL MATED WITH ET
  - ENVIRONMENTAL CONTROL ON WAY TO LAUNCH PAD
- 0 "VERTICAL" PAYLOADS:
- ORBITER MATED TO ET/SRB'S
  - DOORS REMAIN CLOSED
  - PAYLOAD BAY EMPTY, PAYLOADS AND CRADLES TO BE LOADED AT PAD

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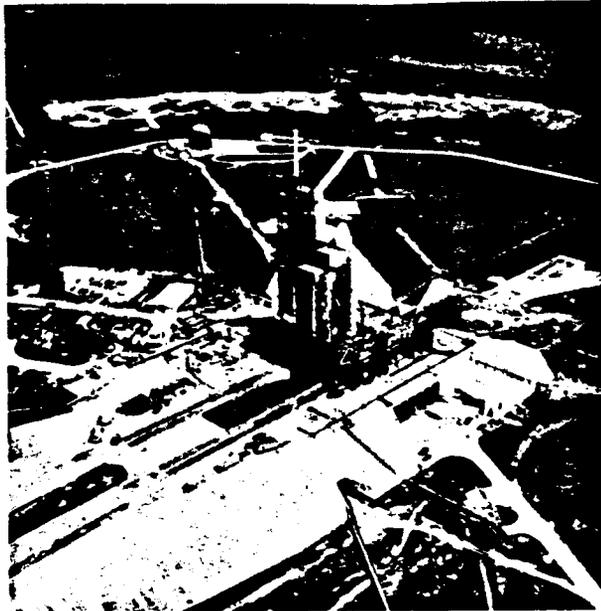


PAD OPERATIONS

(RSS ROLLED BACK)

- 0 MLP HARD DOWN, CONNECT SERVICES
- 0 "HORIZONTAL" PAYLOADS ARE IN THE ORBITER BAY.  
NORMALLY NO ACCESS, BUT DOORS CAN BE OPENED IF  
NECESSARY
- 0 "VERTICAL" PAYLOADS ARE TRANSPORTED TO PAD IN  
CANISTER AND OFFLOADED INTO ROTATING SERVICE  
STRUCTURE (RSS). SOME PAYLOAD TASKS/TESTS  
PERFORMED

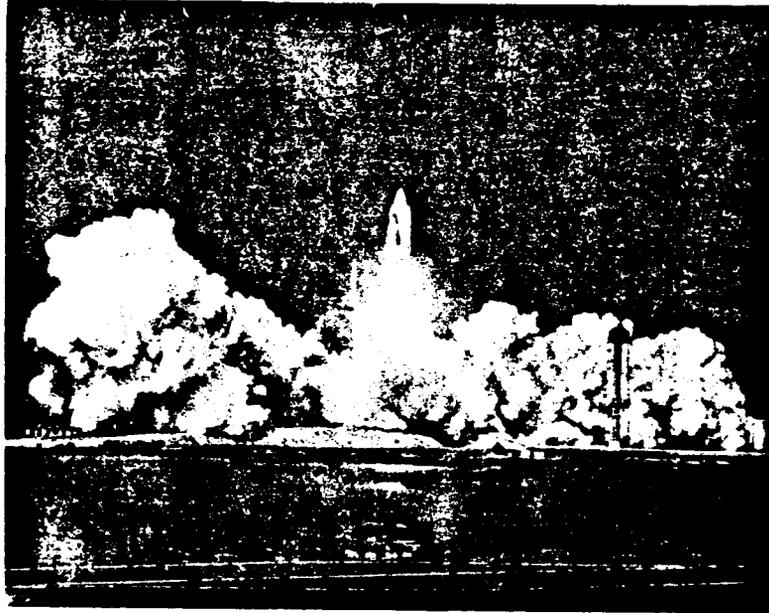
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PAD OPERATIONS  
(RSS IN POSITION)

- 0 RSS PROVIDES ACCESS, PROTECTION
- 0 "VERTICAL" PAYLOADS INSERTED INTO ORBITER, INTERFACES  
CONNECTED AND TESTED
- 0 SERVICING OPERATIONS (FUEL CELLS, RCS, OMS, ETC.)
- 0 FINAL COUNTDOWN

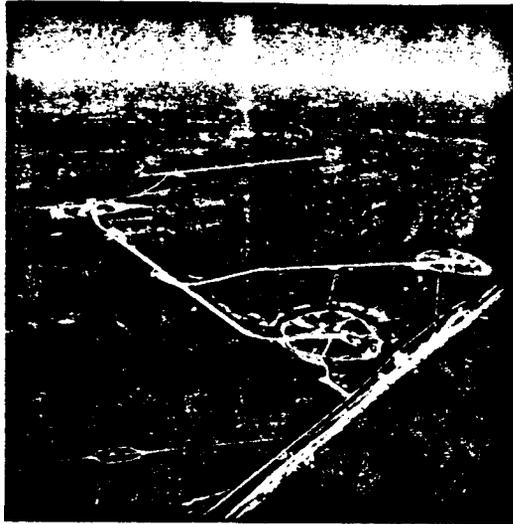
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LAUNCH

0 NO PAYLOAD ACCESS DURING FINAL 20 HOURS

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SHUTTLE LANDING FACILITY

- 0 RUNWAY 15000 FT X 300 FT
- 0 AFTER LANDING, TOW ORBITER TO OPF FOR PAYLOAD  
(OR CRADLE) REMOVAL, ORBITER SERVICING
- 0 CRADLES RETURNED TO OWNERS AT OPF. SPACELAB  
TAKEN TO O & C. ABORTED PROPULSIVE STAGES  
RETURNED TO VPF

ADVANCED EXTRAVEHICULAR MOBILITY UNIT STUDY

- REQUIREMENTS
- DESIGN CONSIDERATIONS
  - RADIATION PROTECTION
  - EVA OPERATIONAL PRESSURE
  - MOBILITY EFFECTS
  - TOOL/GLOVE/EFFECTOR
  - ANTHROPOMETRIC DEFINITION
  - EVA LIGHTING
  - EQUIPMENT TURNAROUND

**NASA**  **Lockheed**



**Boeing** Life Support Systems Inc.