

Ground Processing and Launch Facilities

- Historical examples
 - Early Launch Facilities
 - Saturn I
 - Saturn V
 - Russian
- Modern examples
 - Shuttle
 - Delta IV Heavy
 - DC-XA



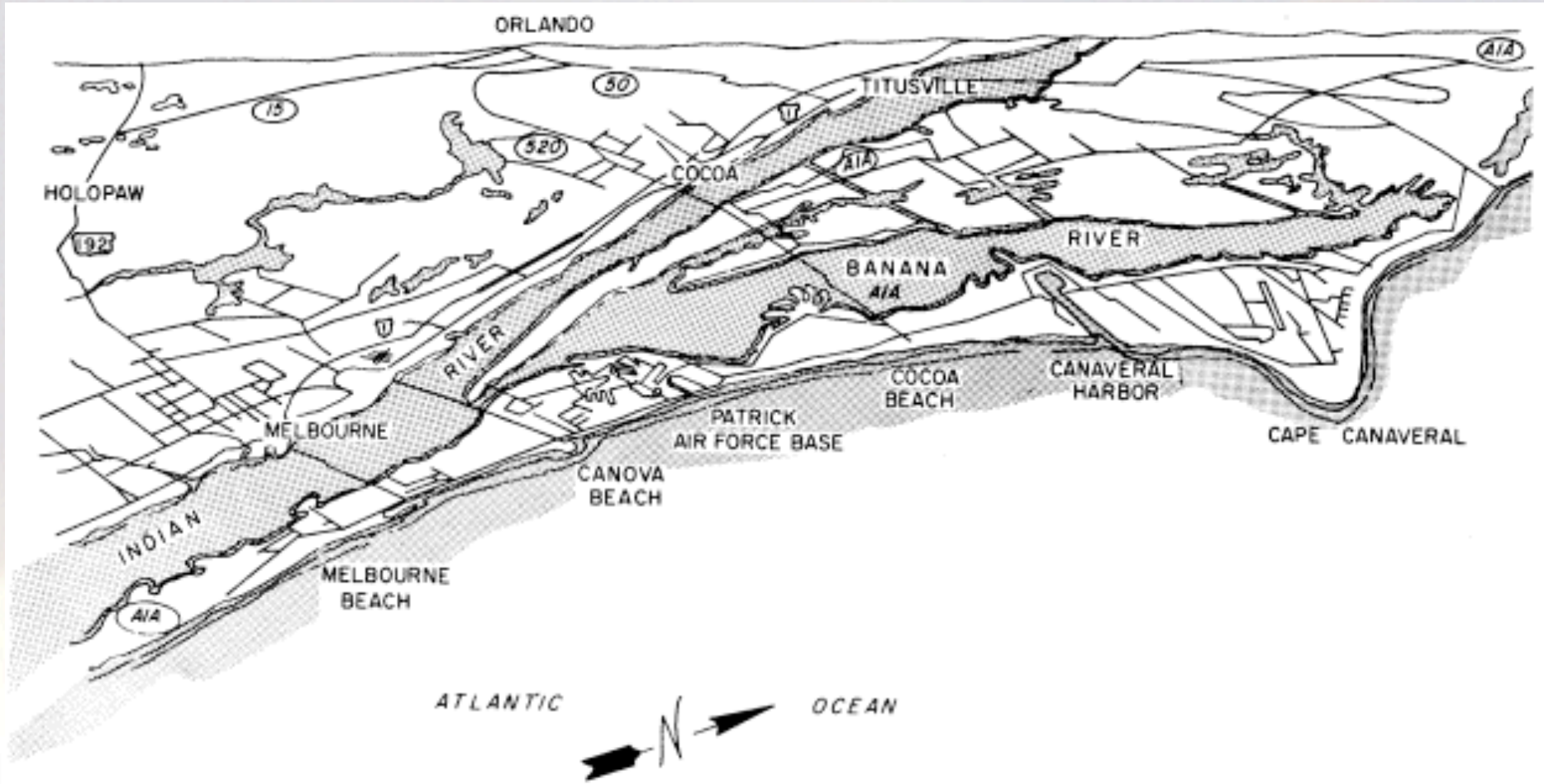
Cape Canaveral circa 1950



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Ground Processing and Launch Facilities
ENAE 791 - Launch and Entry Vehicle Design

Map of Cape Canaveral



“ICBM Row”



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LC-5 – Mercury-Redstone



LC-5 Emergency Crew Escape System



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Atlas Support Gantry



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LC-14 – Mercury-Atlas



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Titan II Access Tower Operation



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9

Ground Processing and Launch Facilities
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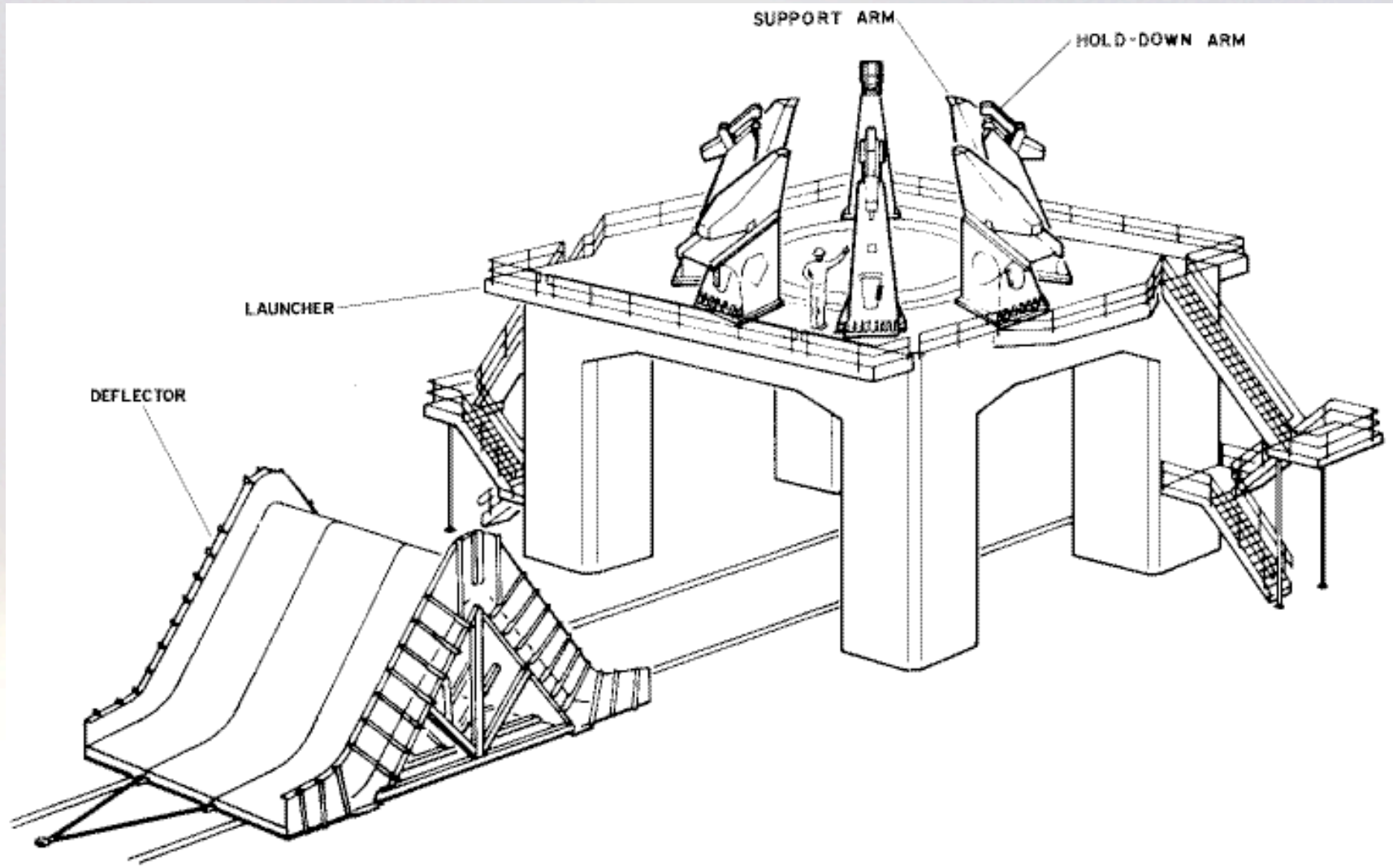
LC-34 Schematic



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Ground Processing and Launch Facilities
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Saturn I Launch Pedestal



LC-34 Launch Pedestal Under Construction



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LC-34 Flame Deflector



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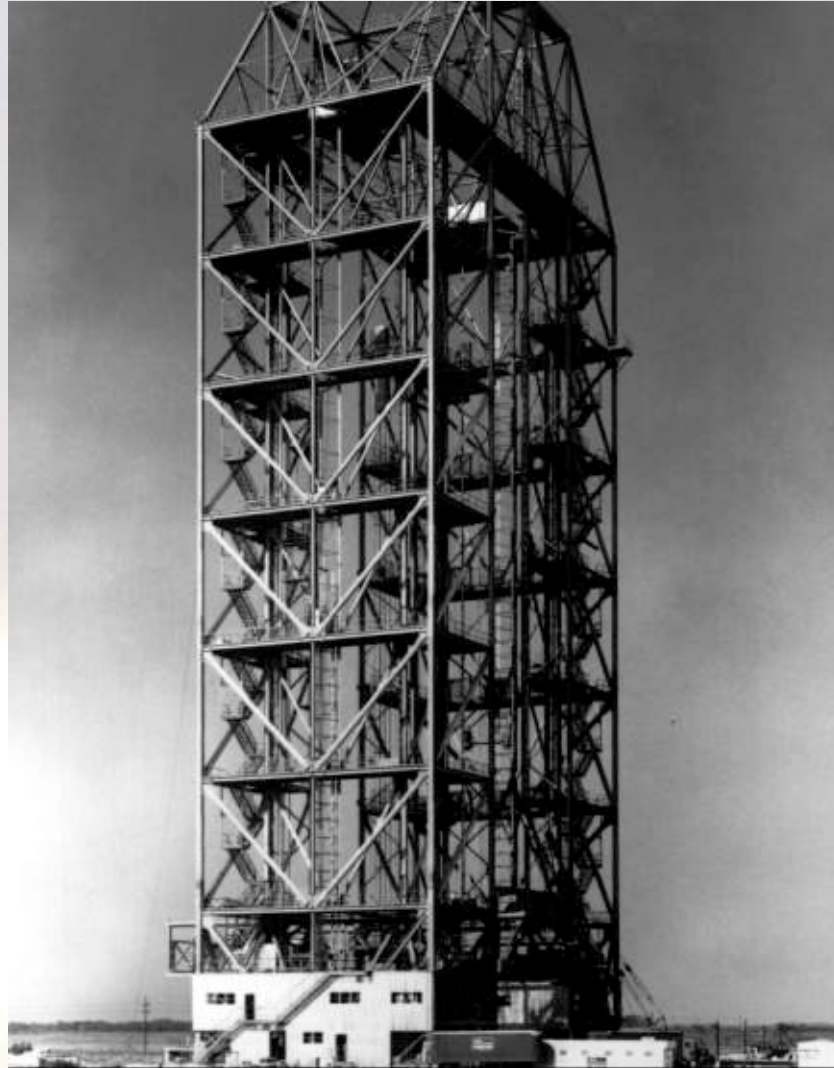
LC-34 Blockhouse



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Ground Processing and Launch Facilities
ENAE 791 - Launch and Entry Vehicle Design

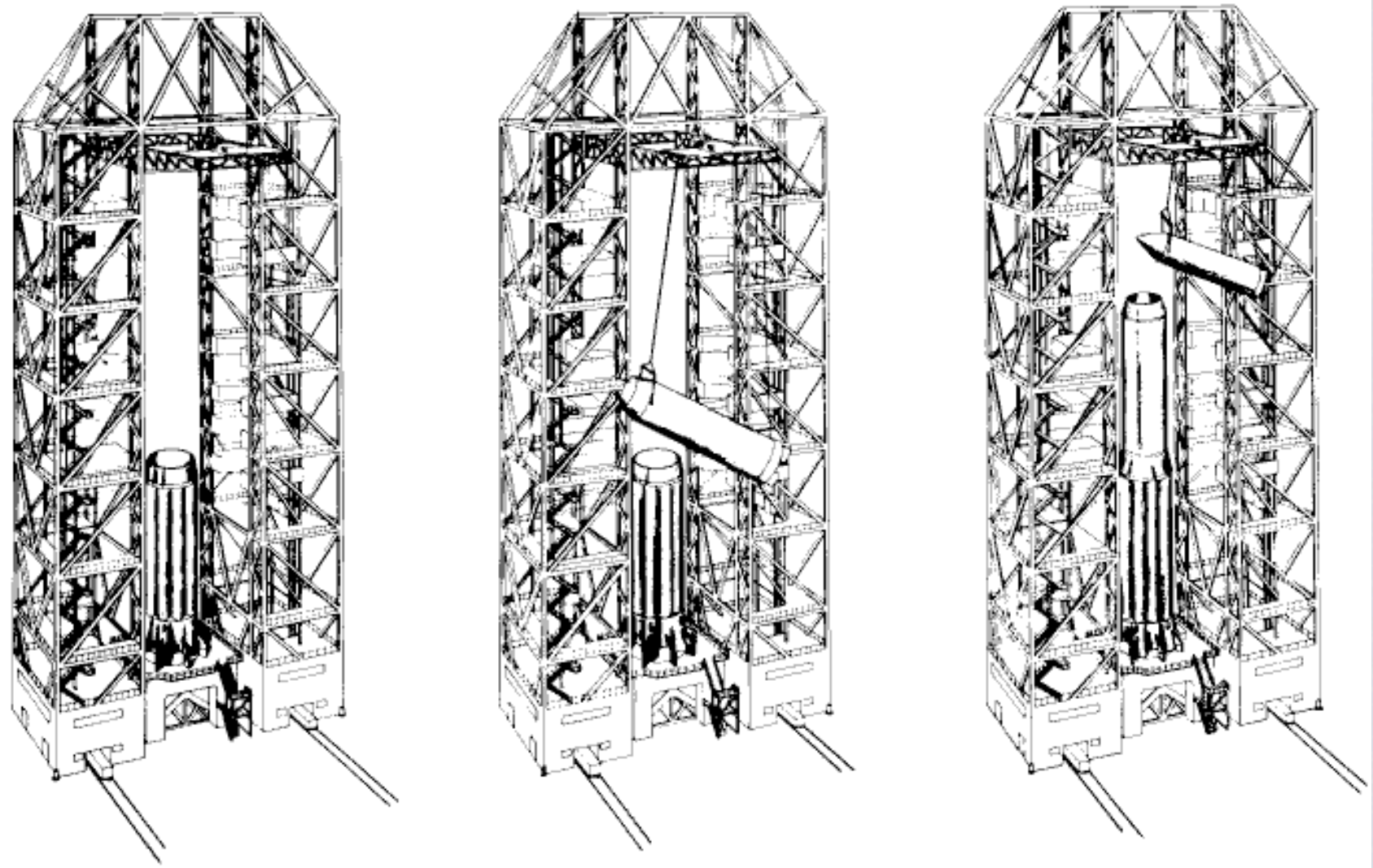
LC-34 Service Structure



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Saturn I Erection Process



Aerial View of LC-34



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Aerial View of LC-34



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Aerial View of LC-34



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Ground Processing and Launch Facilities
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S-I Stage Rotation



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Ground Processing and Launch Facilities
ENAE 791 - Launch and Entry Vehicle Design

S-I Stage Rotation



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Ground Processing and Launch Facilities
ENAE 791 - Launch and Entry Vehicle Design

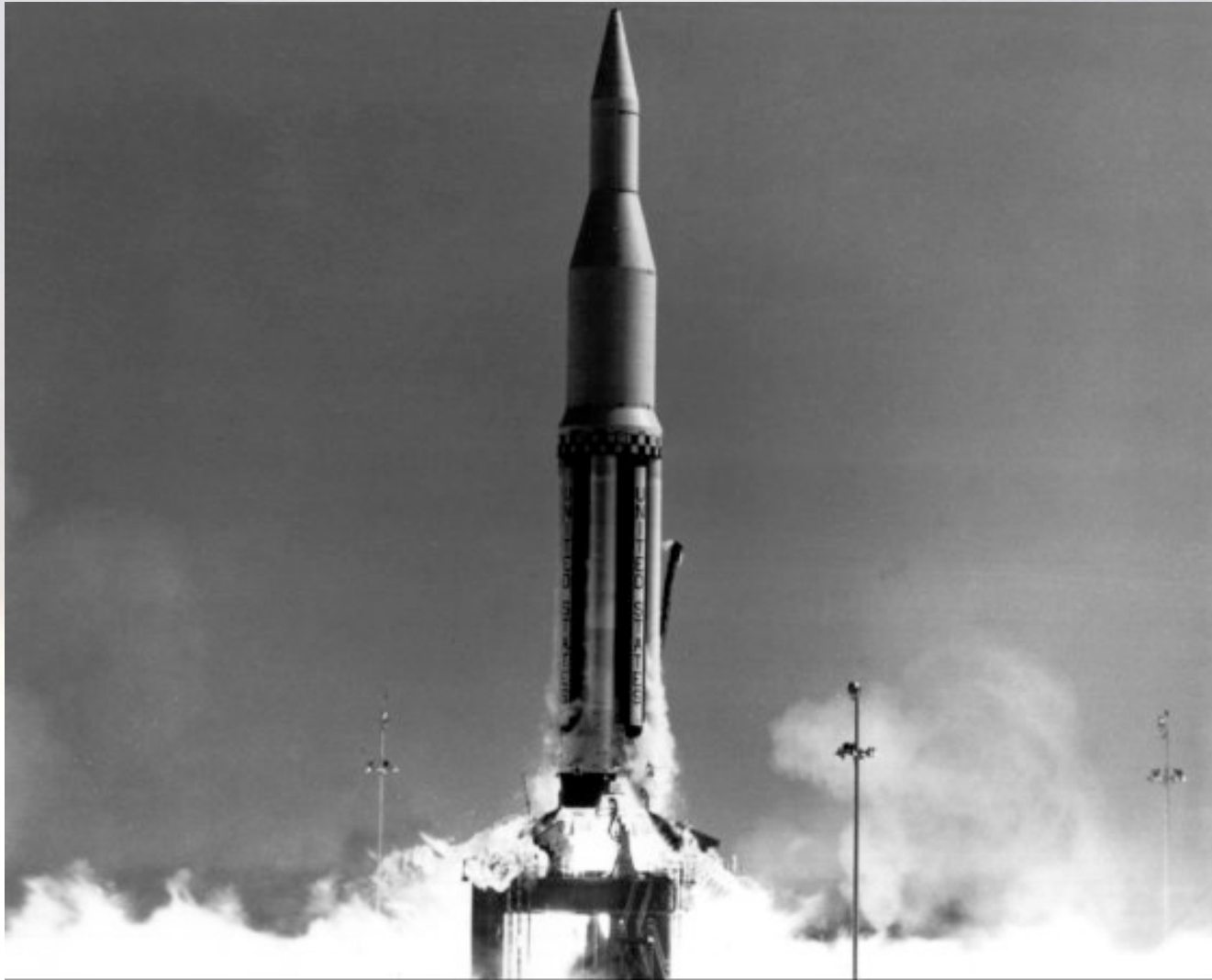
Assembly of Saturn I



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ENAE 791 - Launch and Entry Vehicle Design

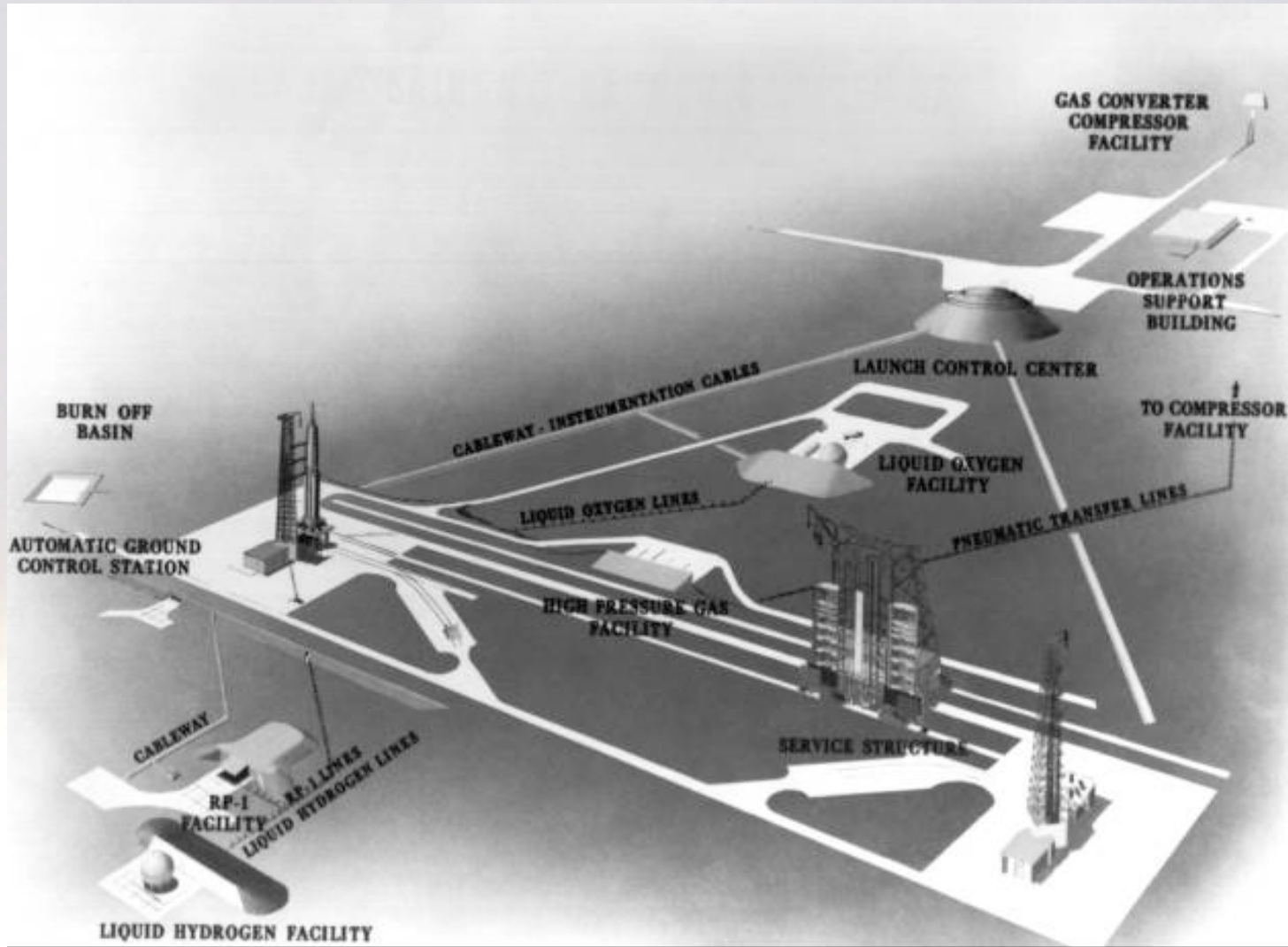
SA-201 Launch



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LC-37 Concept



LC-37 Under Construction (1963)



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Ground Processing and Launch Facilities
ENAE 791 - Launch and Entry Vehicle Design

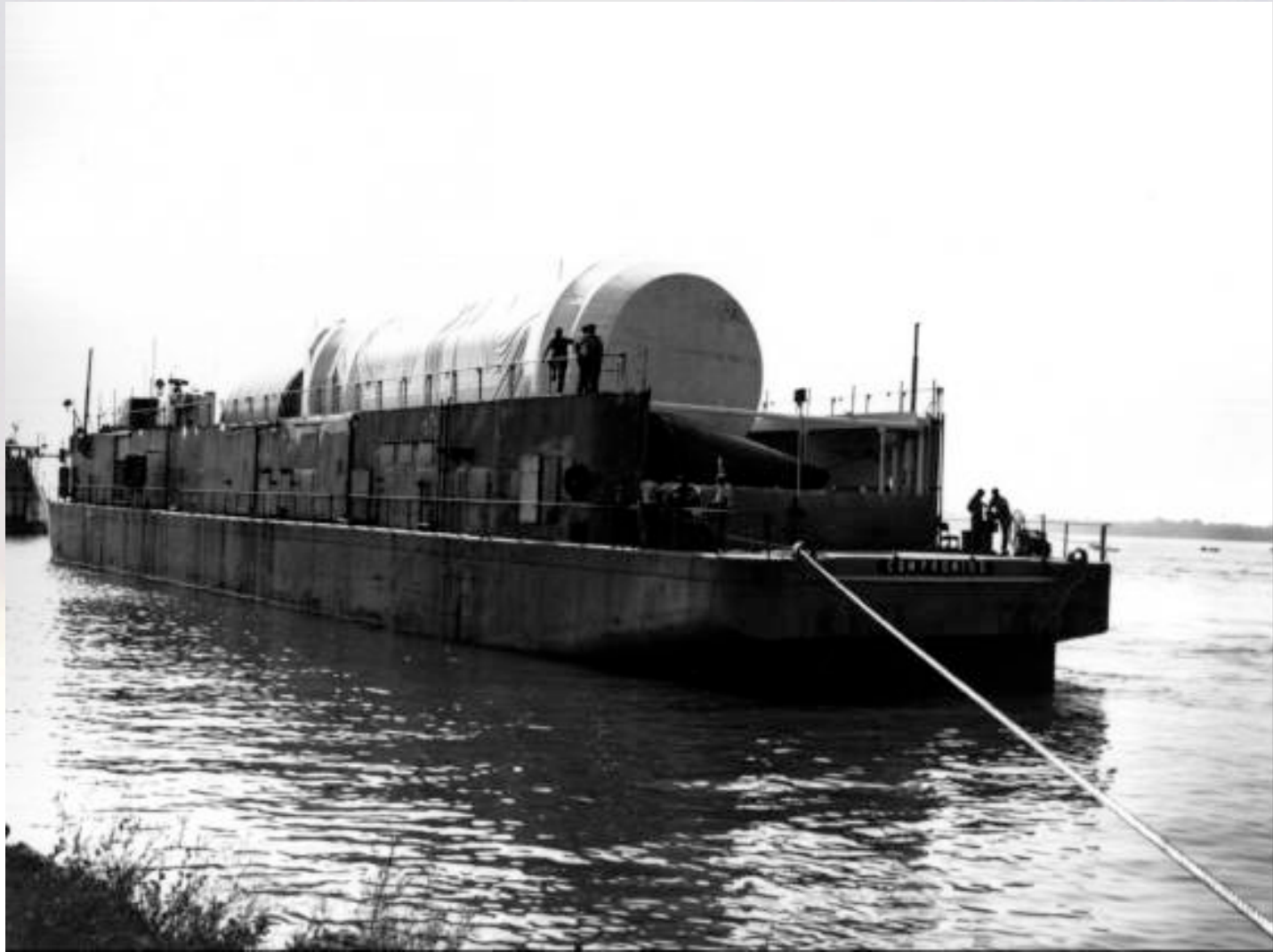
LC-37 Construction Photo



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Ground Processing and Launch Facilities
ENAE 791 - Launch and Entry Vehicle Design

Barge Transport of Launch Vehicle Stages



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Ground Processing and Launch Facilities
ENAE 791 - Launch and Entry Vehicle Design

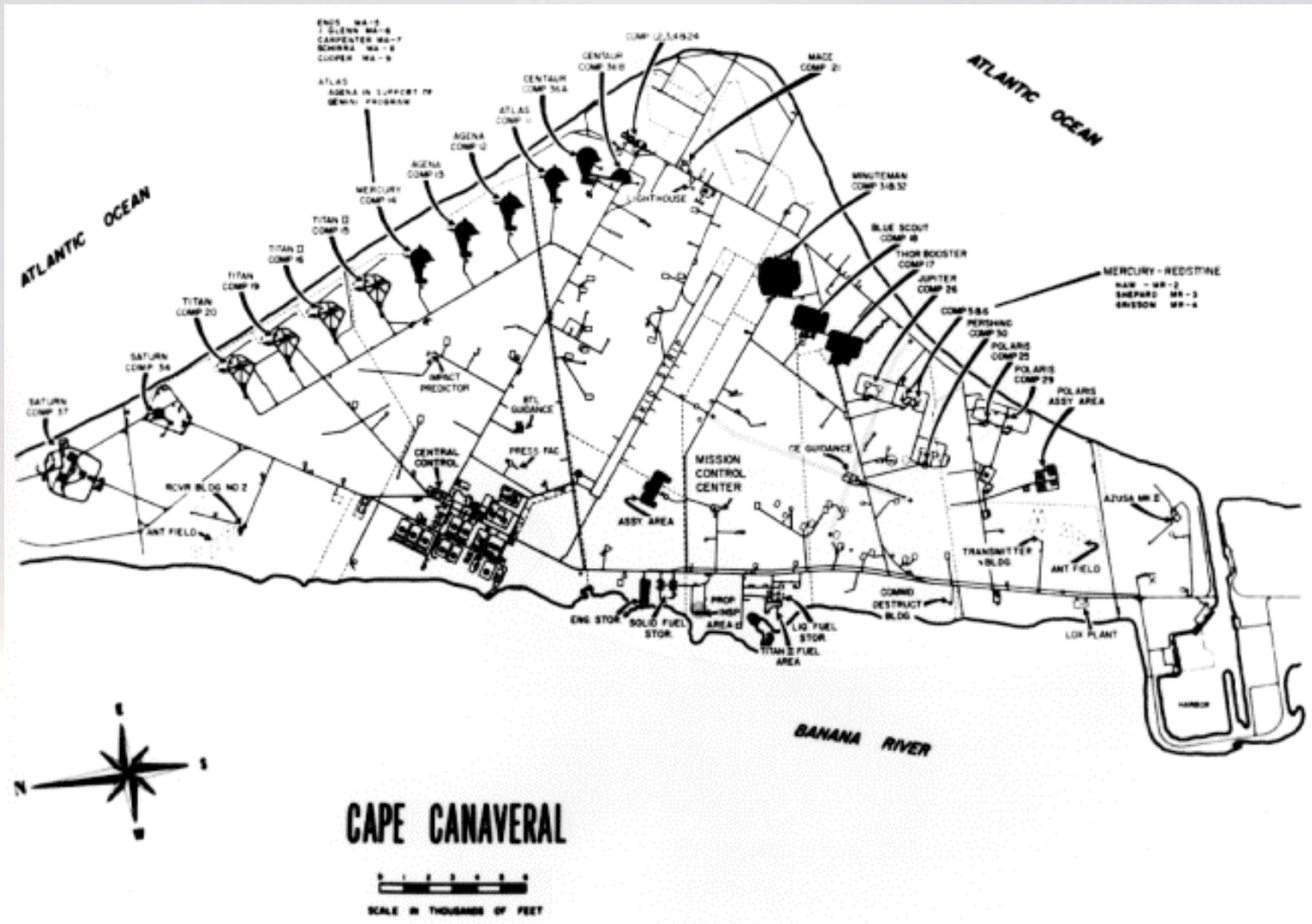
Aerial Transport of Stages



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ENAE 791 - Launch and Entry Vehicle Design

Cape Canaveral Siting Map

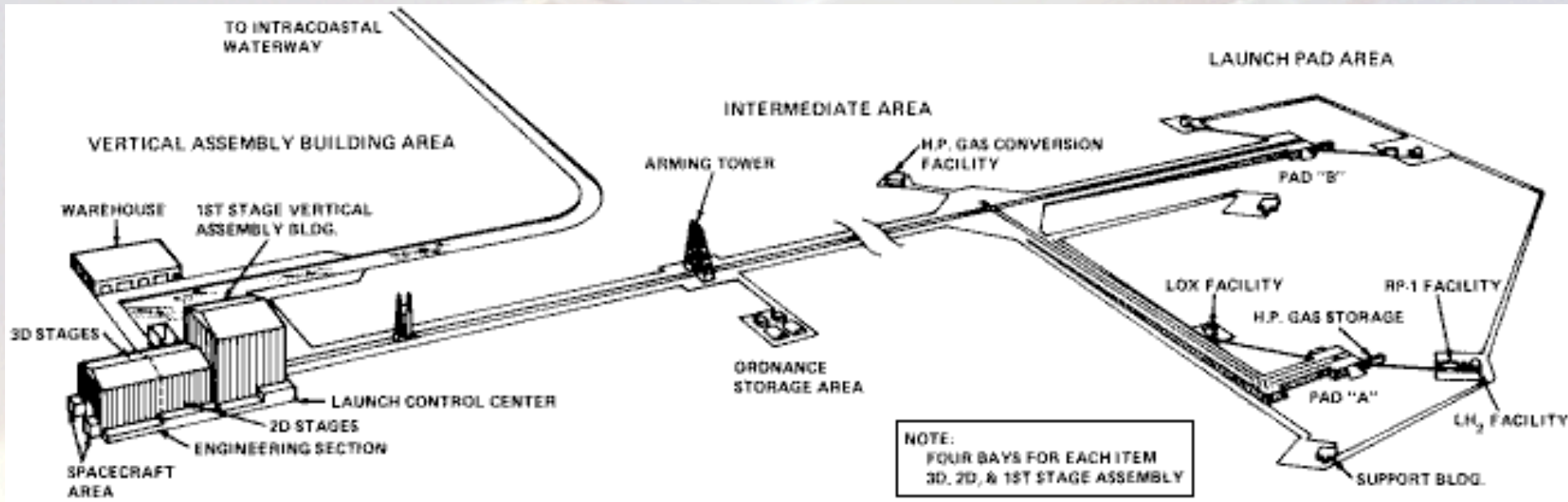


Launch Sites Considered for Apollo

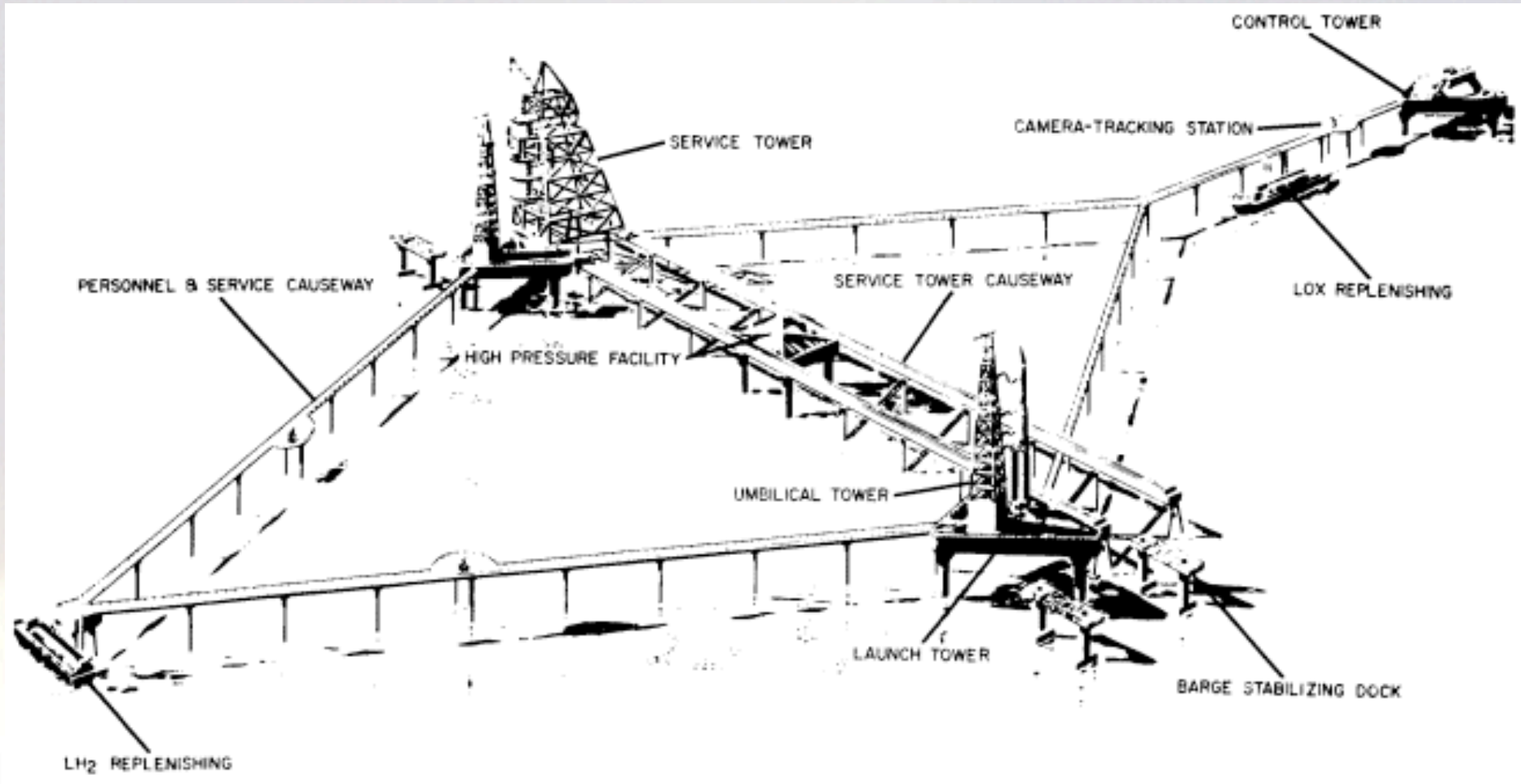
- Cape Canaveral
- Offshore from Cape Canaveral
- Mayaguana Island in the Bahamas
- Cumberland Island, Georgia
- A mainland site near Brownsville, Texas
- White Sands Missile Range in New Mexico
- Christmas Island in the mid-Pacific south of Hawaii
- South Point on the island of Hawaii



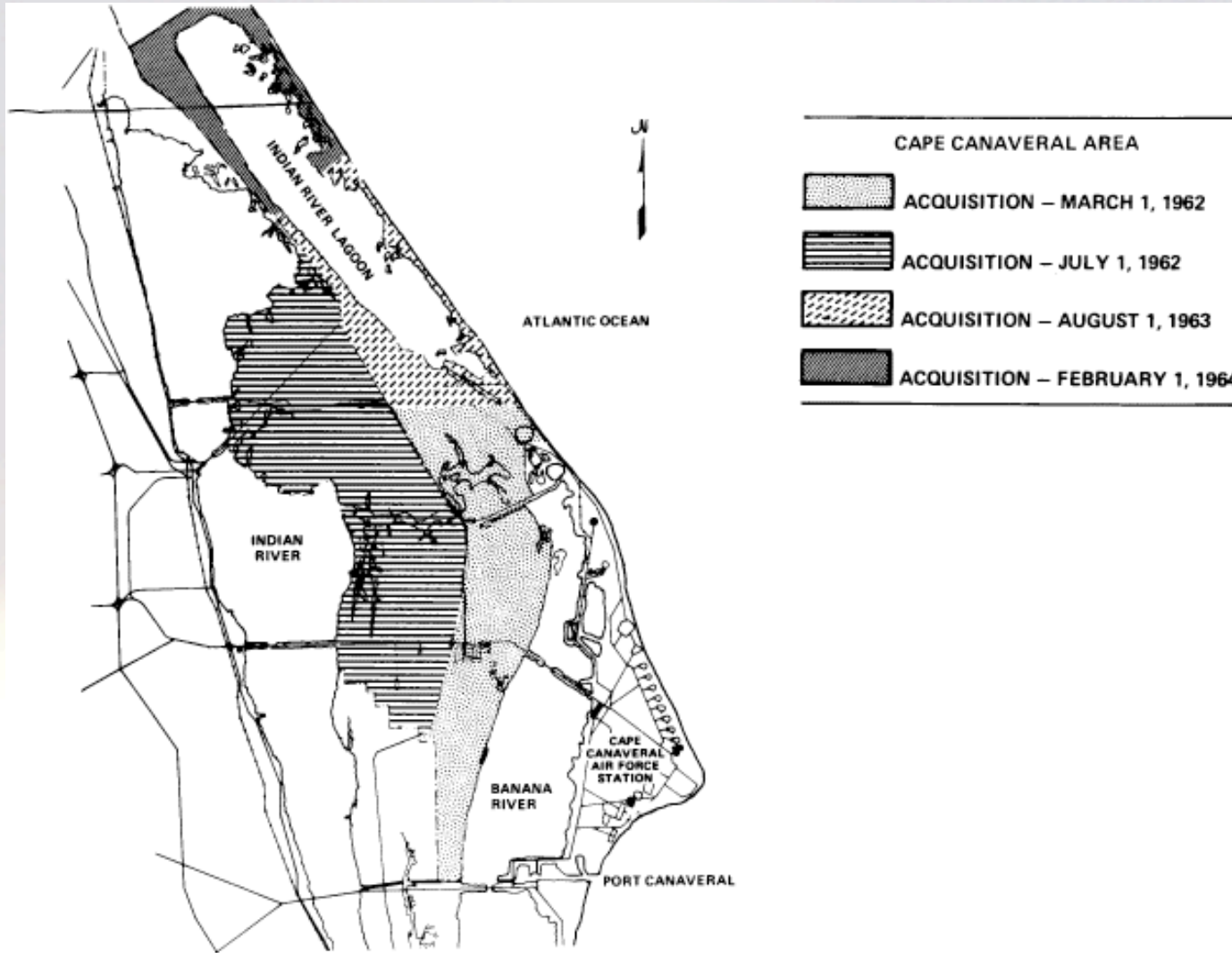
Early Mobile Launch Complex Concept



Concept of an Off-Shore Launch Facility



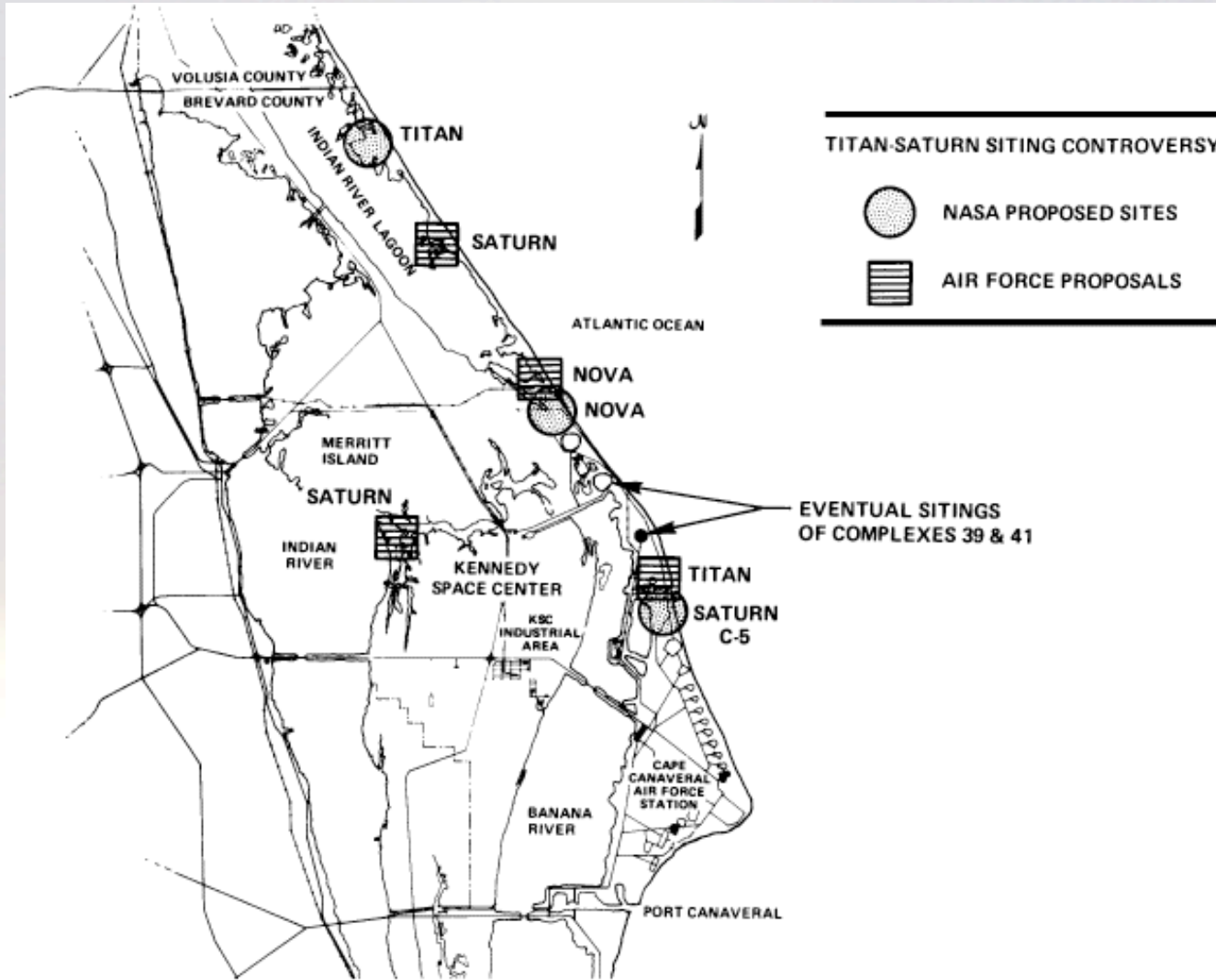
Merritt Island Launch Area (MILA)



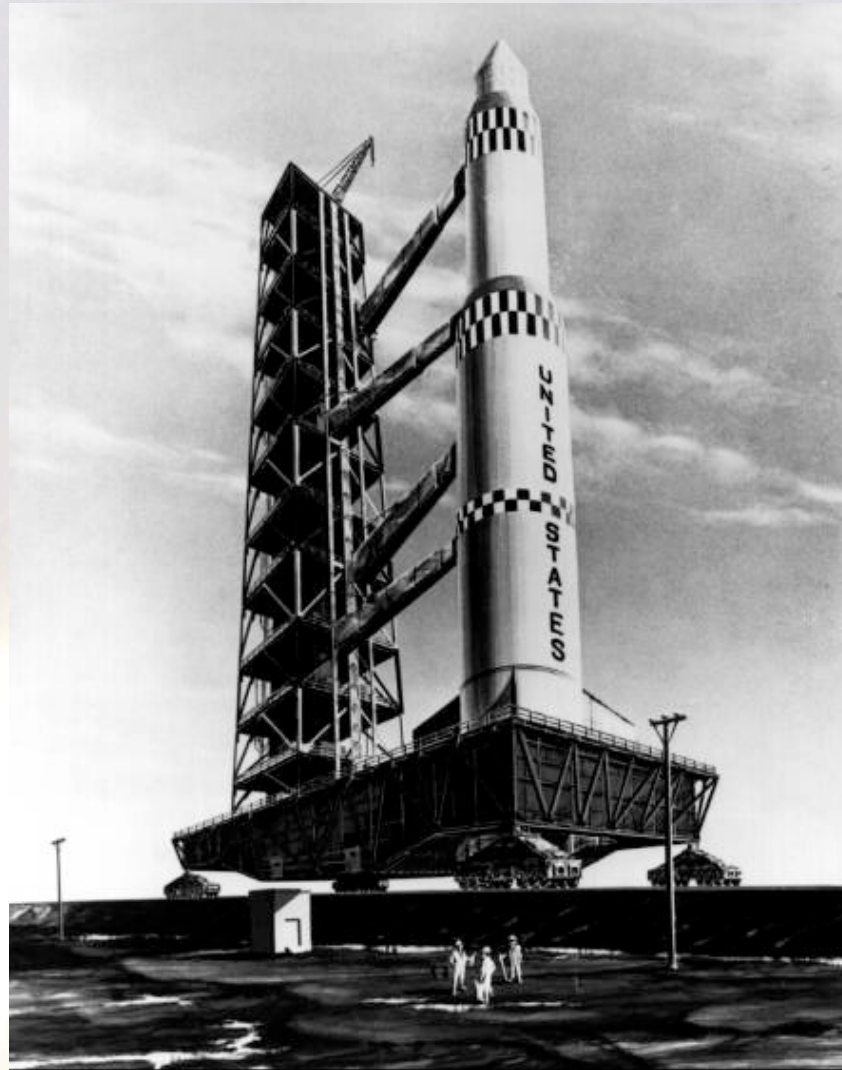
Map of KSC and CCAFS



Competition for MILA Launch Sites



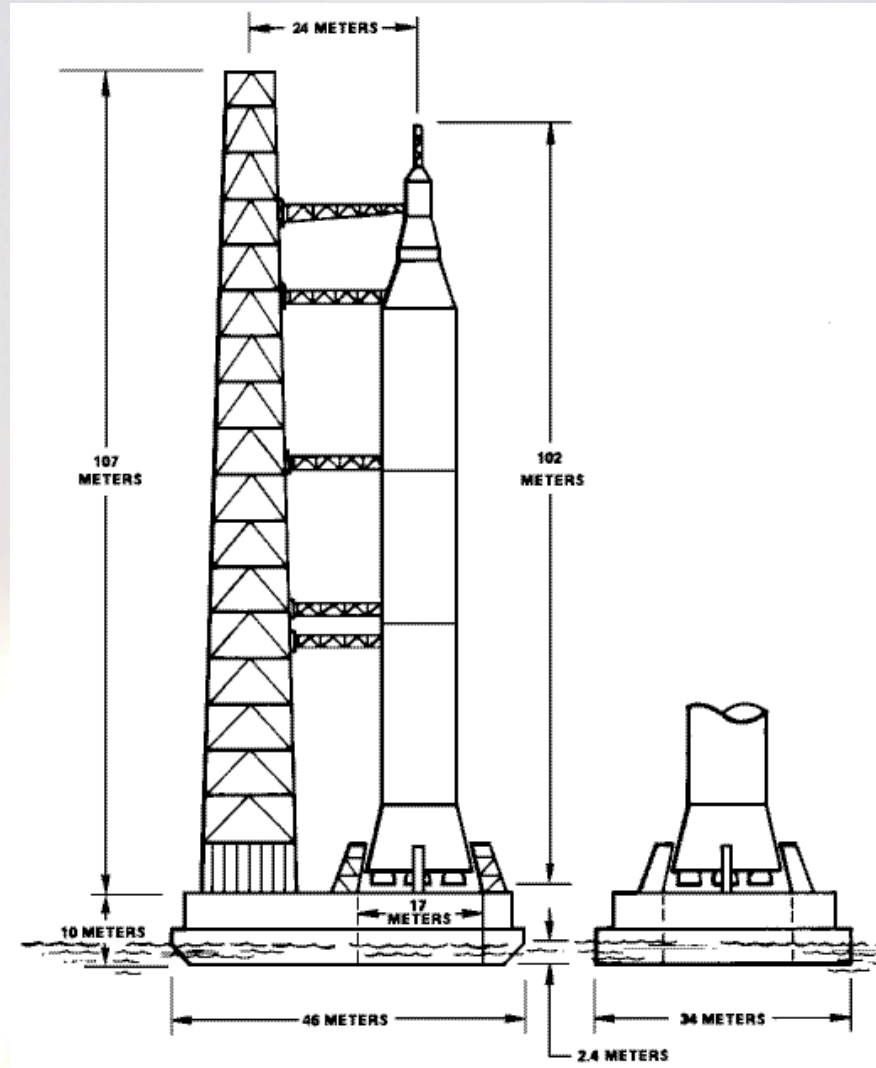
Rail-Based Nova Launch Concept



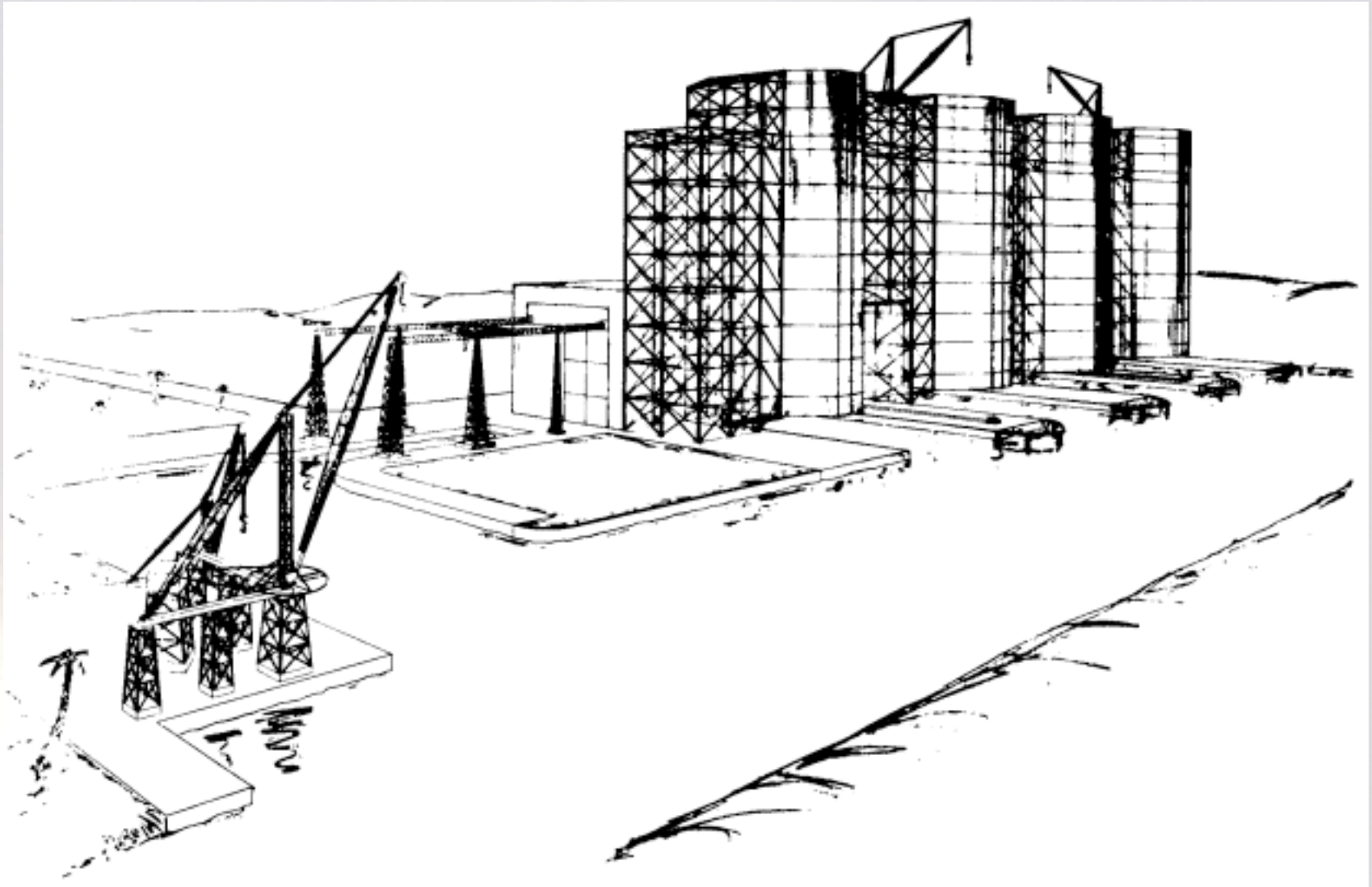
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ENAE 791 - Launch and Entry Vehicle Design

Barge-Based Saturn V Launch Concept



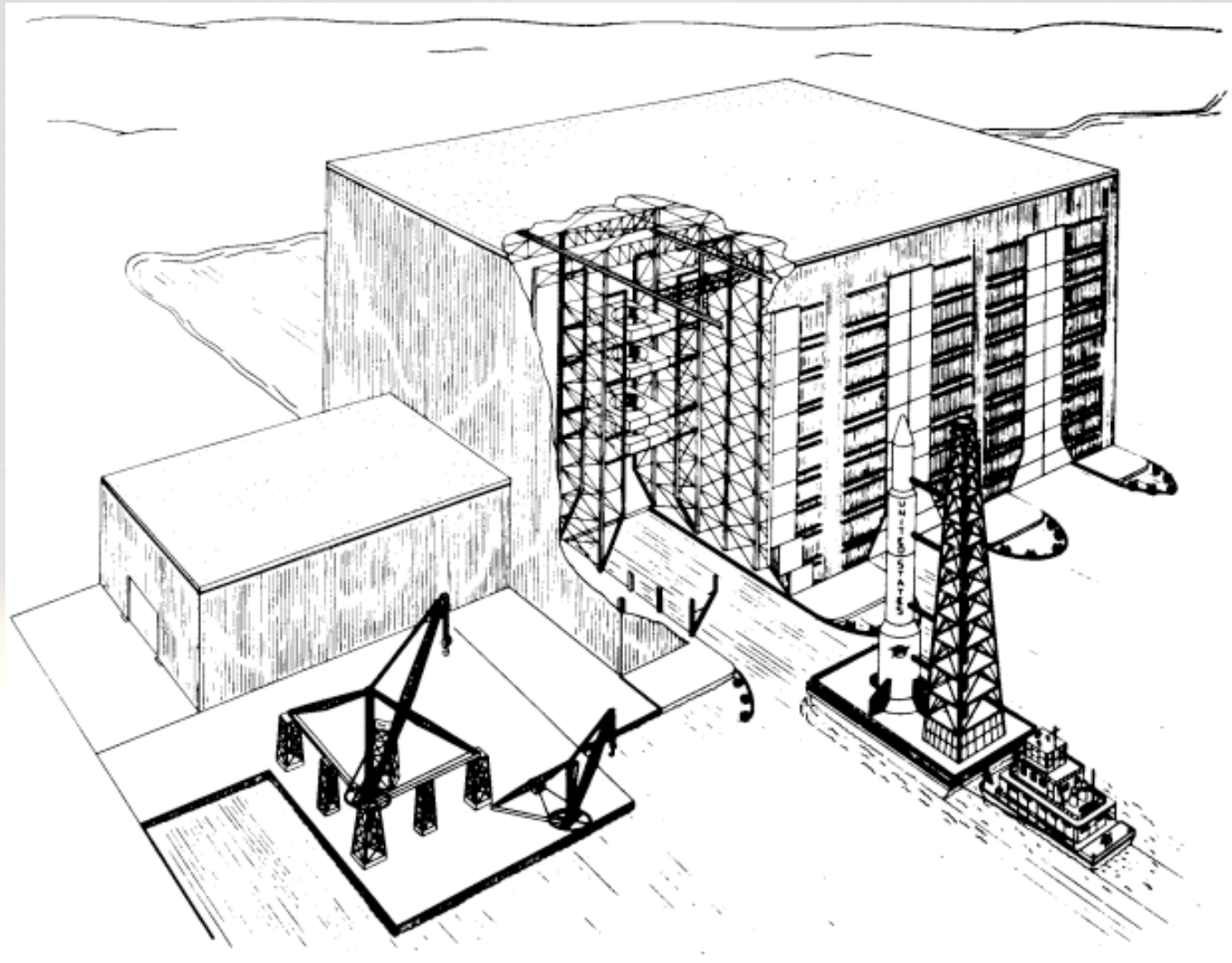
Barge-Based Vertical Assembly Building



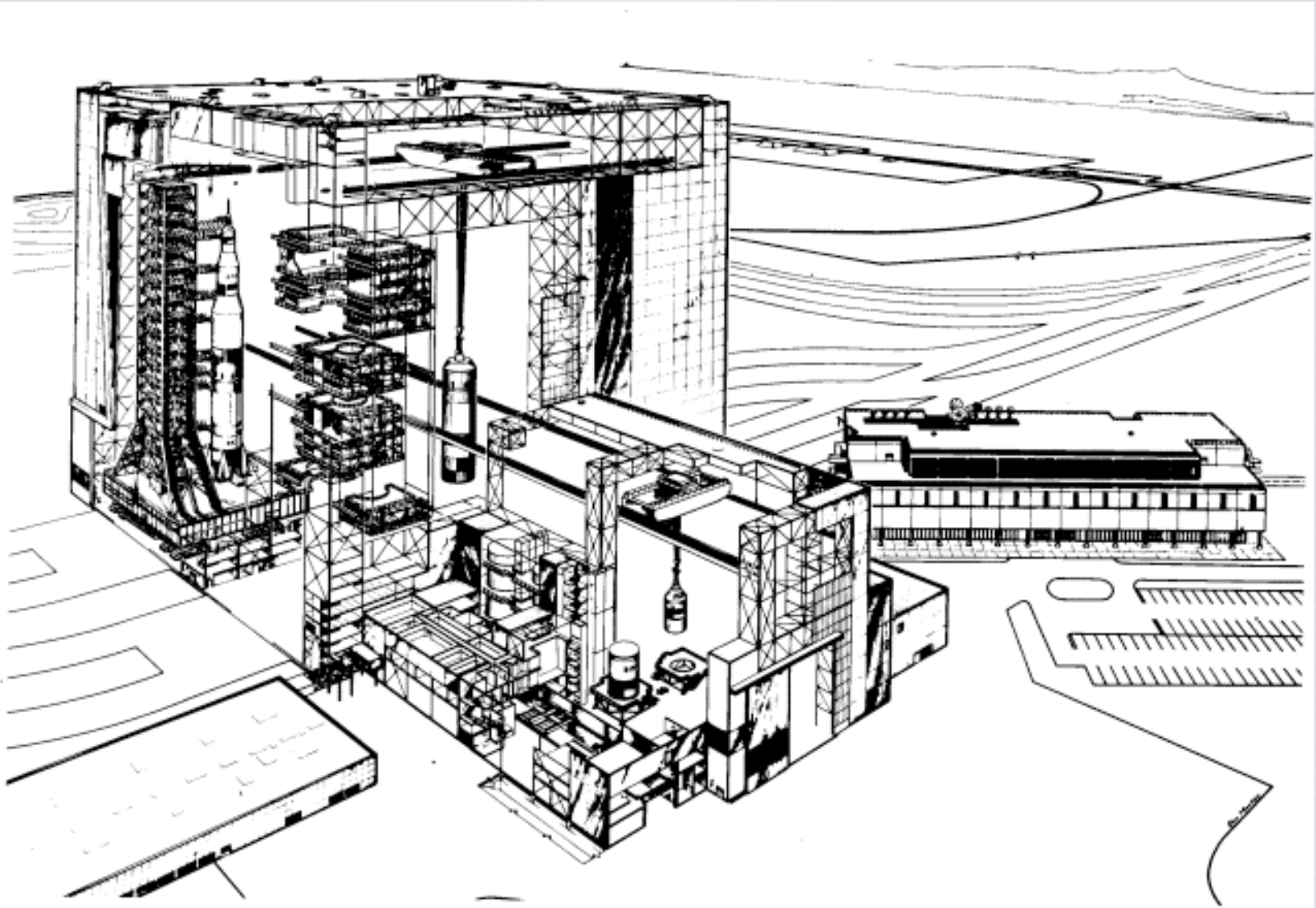
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Barge-Based VAB (Enclosed)



Interior Concept of VAB



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Early Construction of VAB



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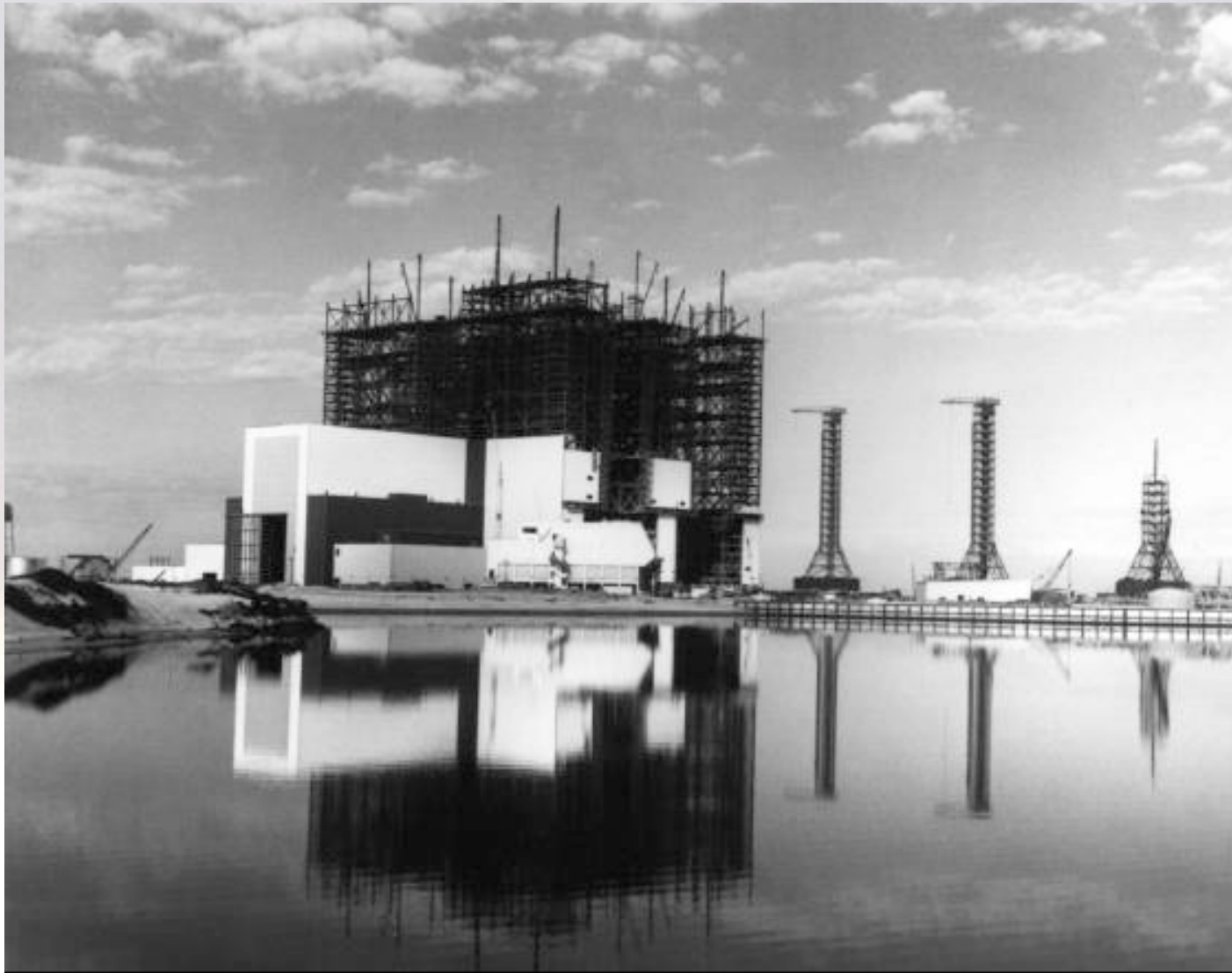
VAB and LCC Under Construction



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Ground Processing and Launch Facilities
ENAE 791 - Launch and Entry Vehicle Design

VAB from Turning Basin



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Ground Processing and Launch Facilities
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Interior of Launch Control Center



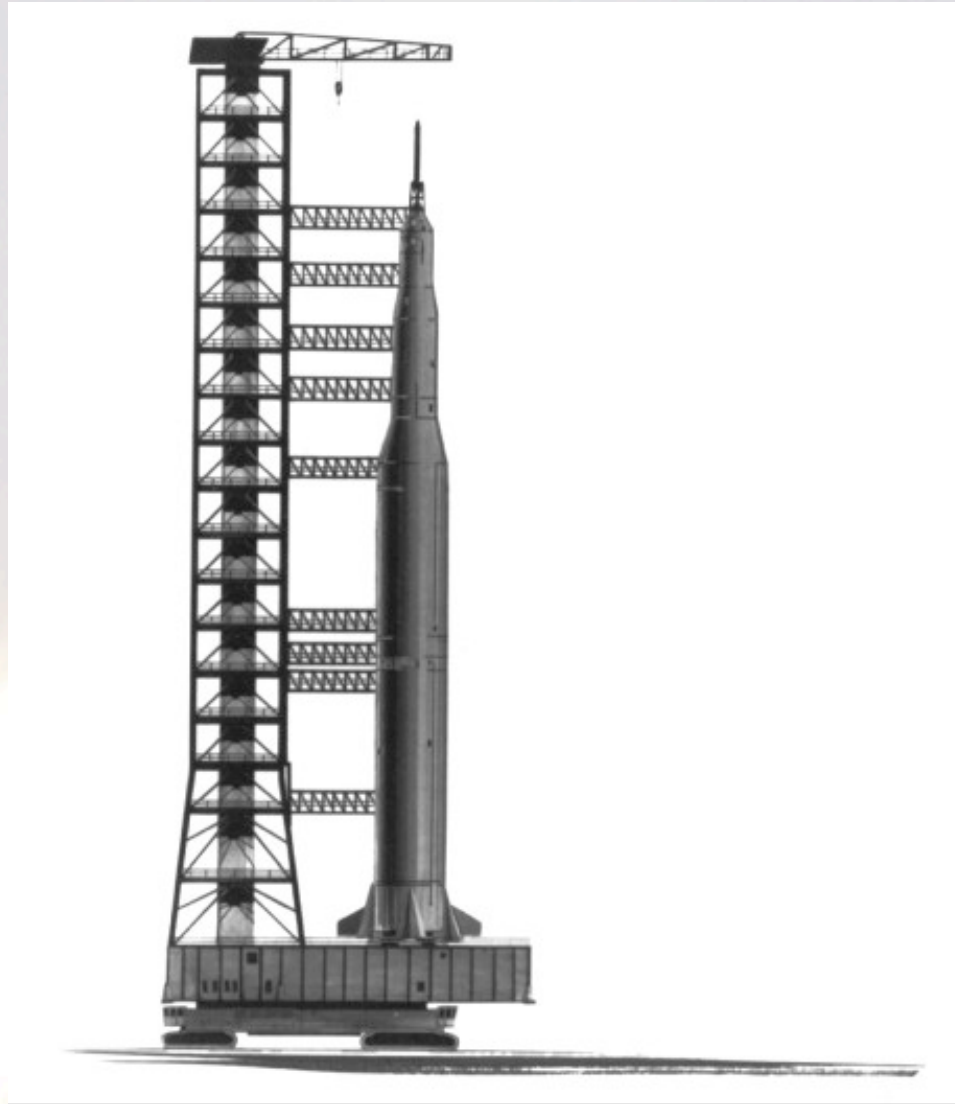
Interior of Launch Control Center



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Ground Processing and Launch Facilities
ENAE 791 - Launch and Entry Vehicle Design

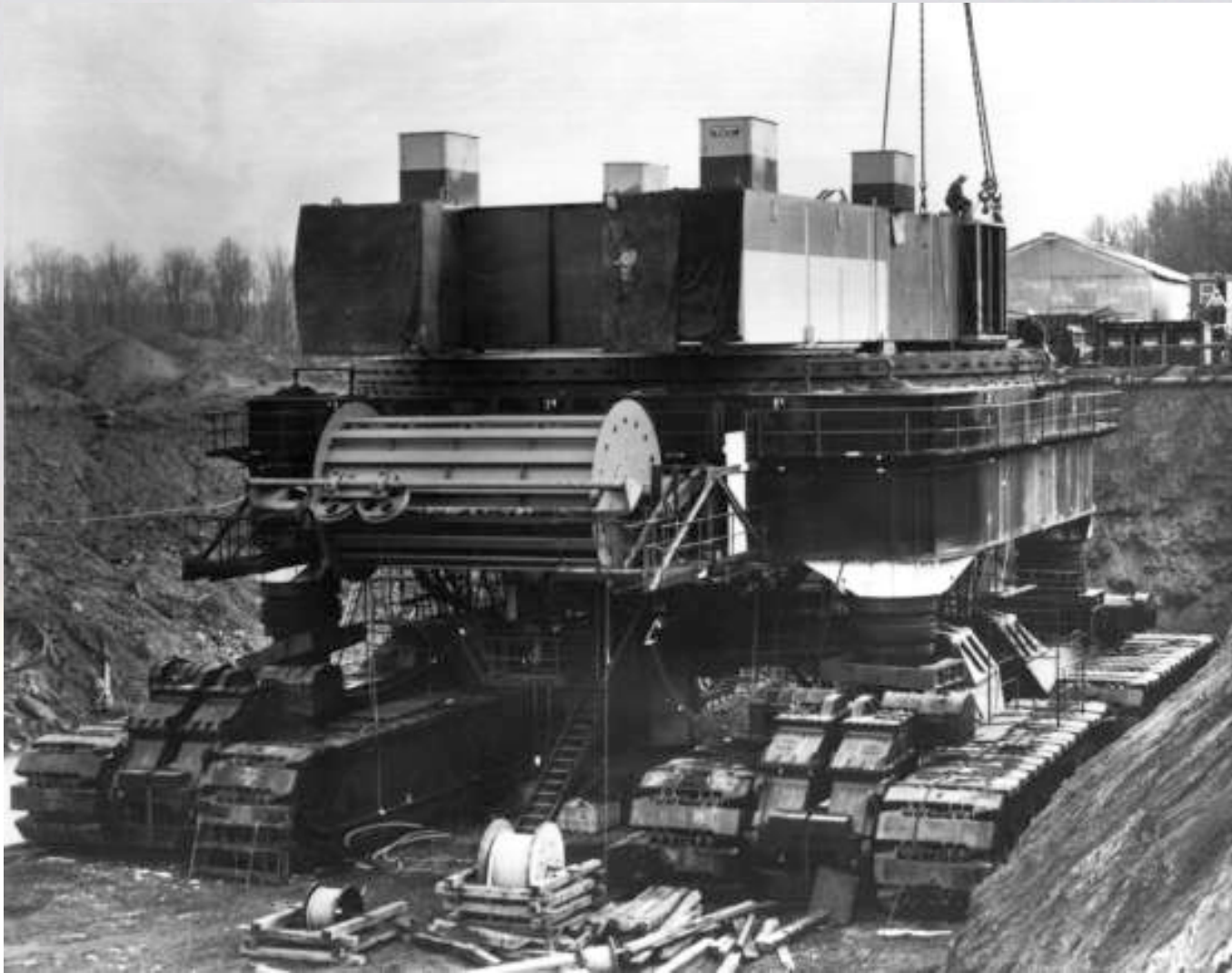
Early Concept of Mobile Launch Platform



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Ground Processing and Launch Facilities
ENAE 791 - Launch and Entry Vehicle Design

West Virginia Strip-Mine Coal Shovel



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Ground Processing and Launch Facilities
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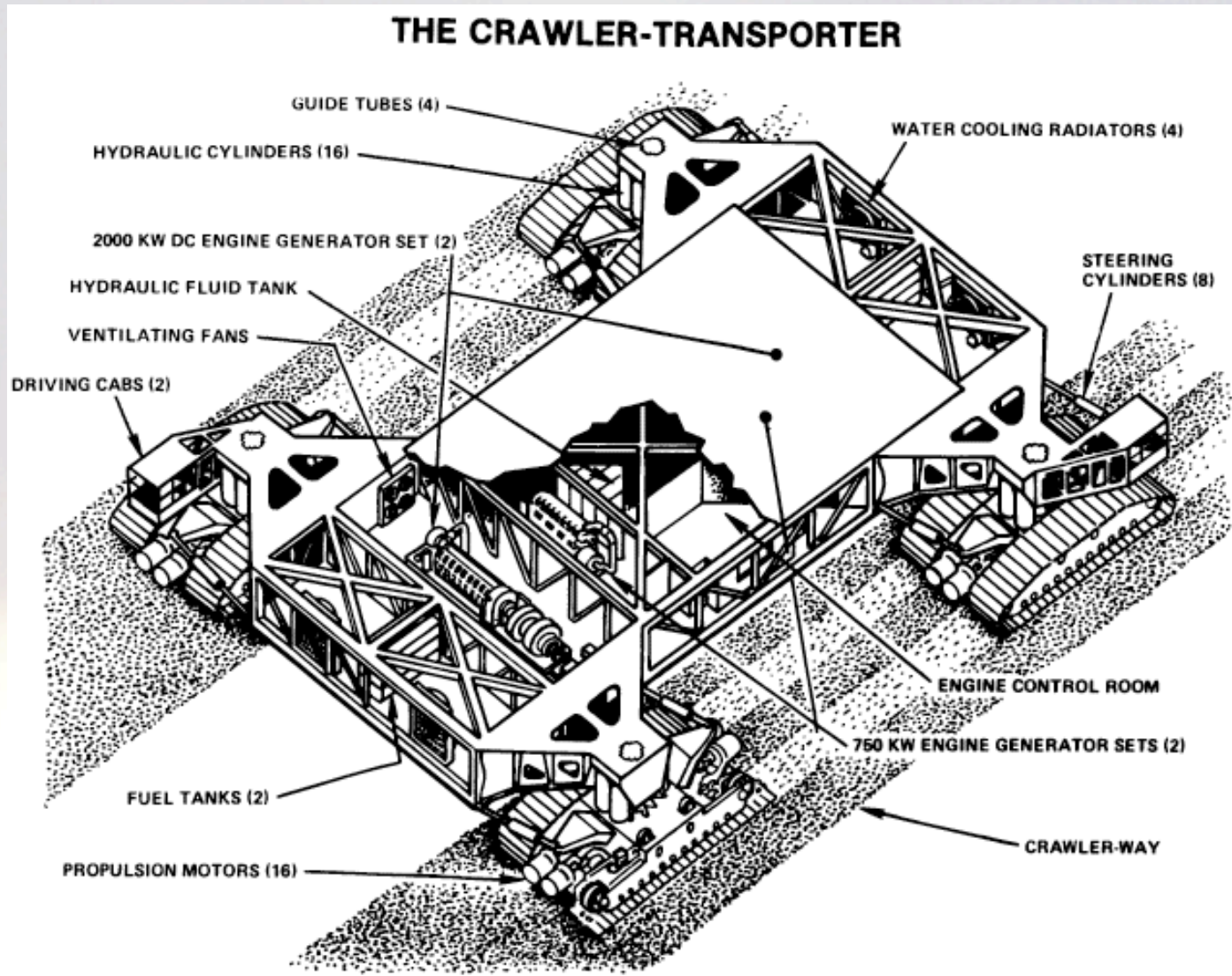
Crawler-Transporter



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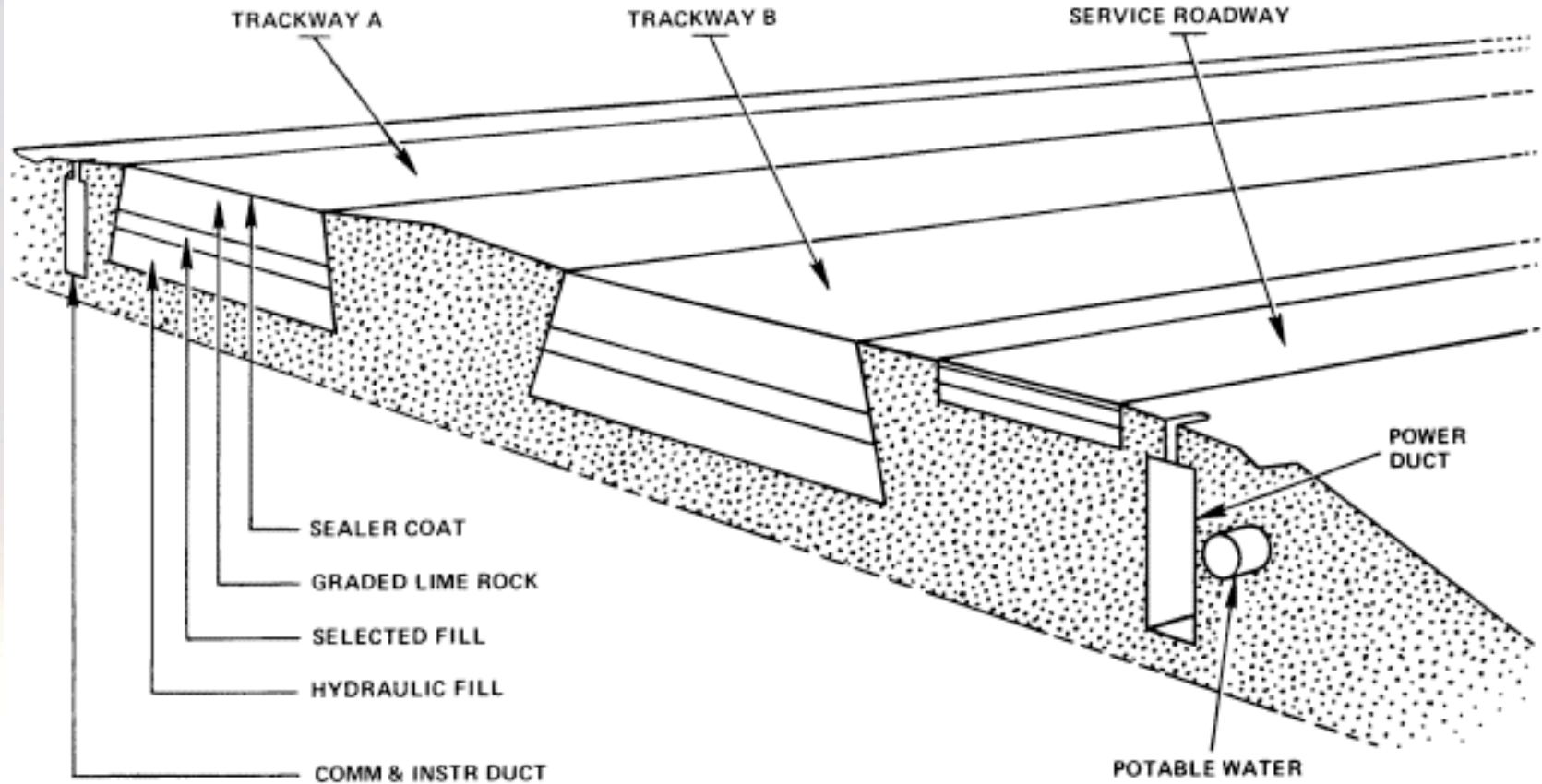
Ground Processing and Launch Facilities
ENAE 791 - Launch and Entry Vehicle Design

Cutaway of Crawler-Transporter



Complex 39 Crawlerway

PROFILE OF TYPICAL CRAWLERWAY SECTION



(NOT TO SCALE)



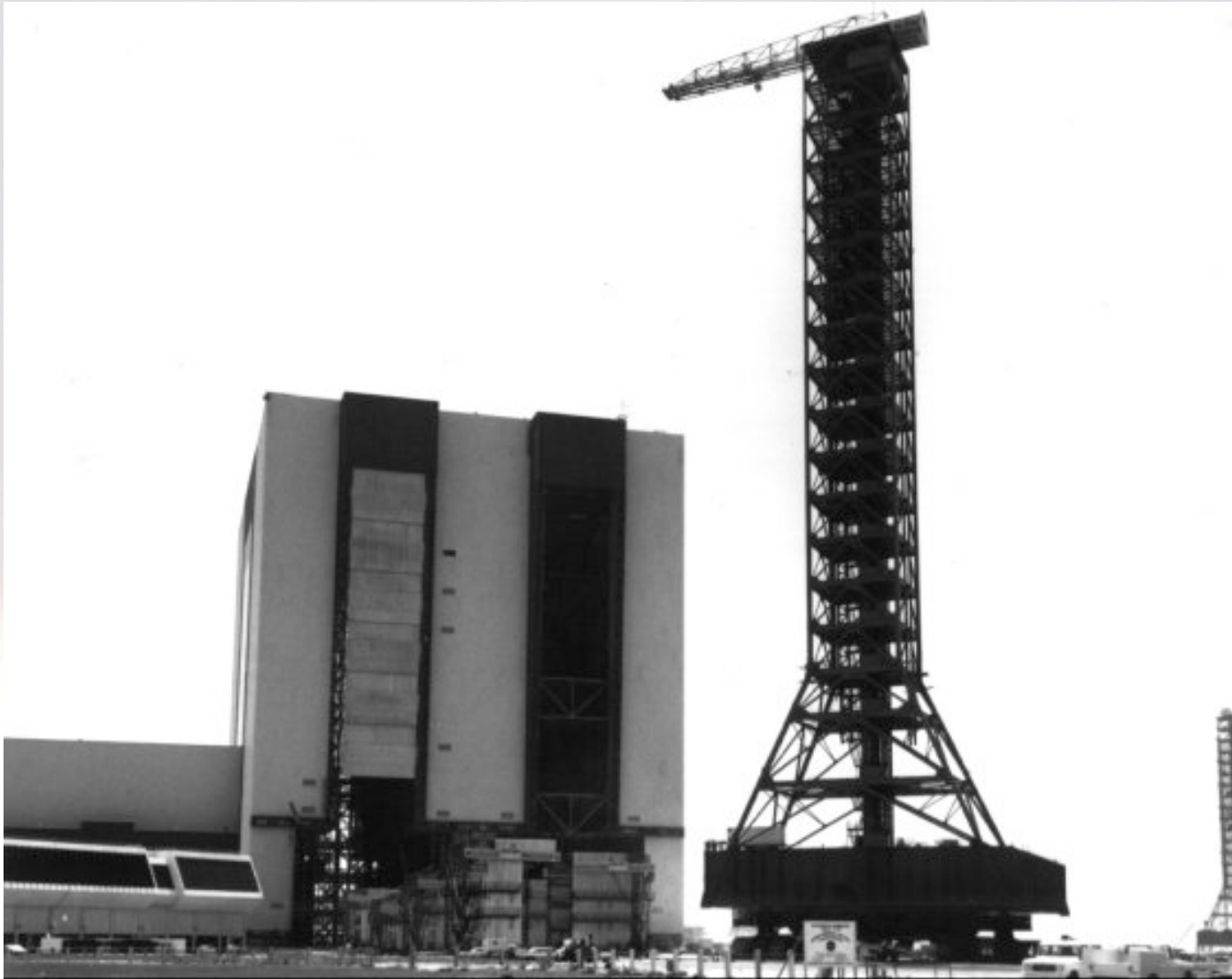
Saturn V Mobile Launch Platforms



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Ground Processing and Launch Facilities
ENAE 791 - Launch and Entry Vehicle Design

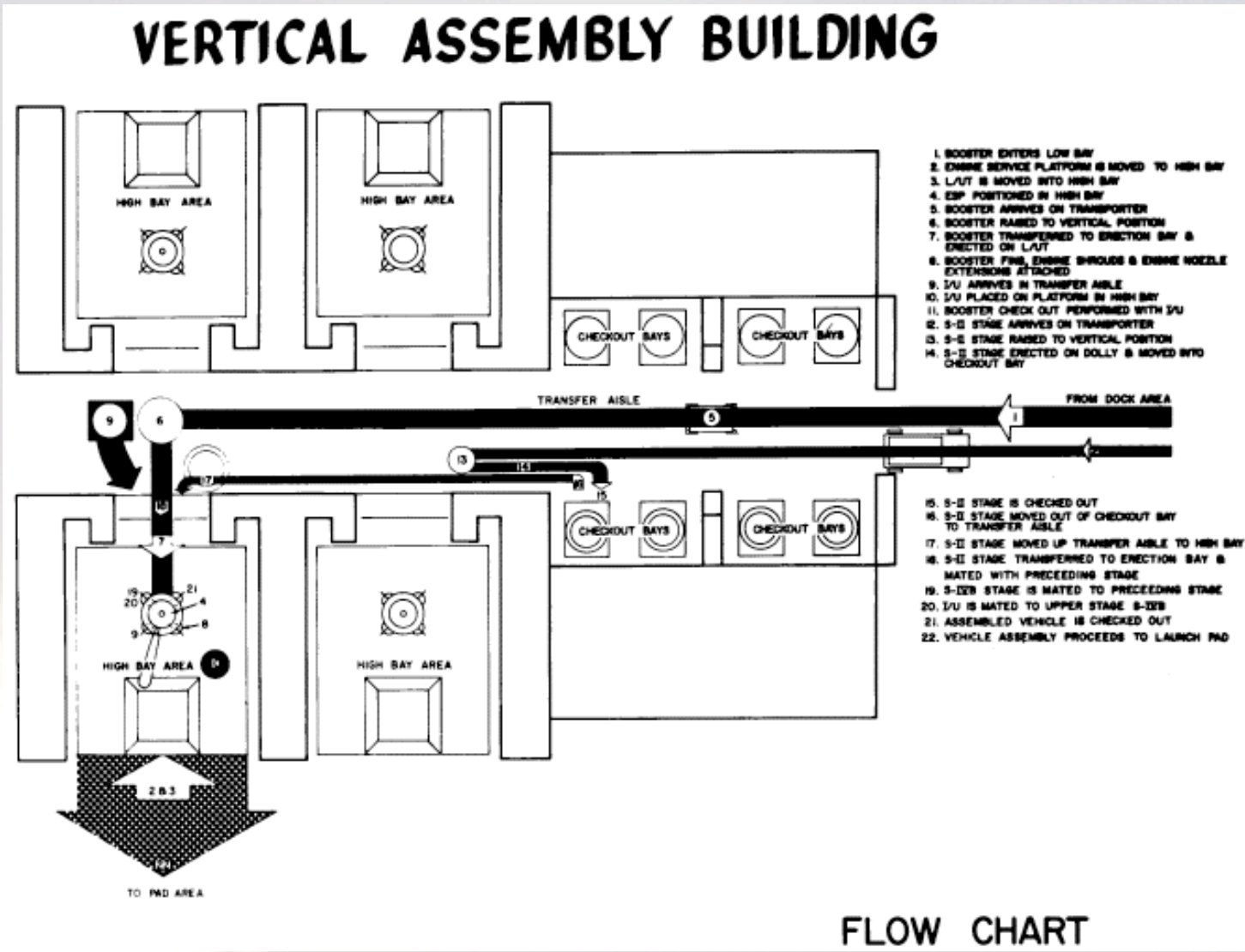
MLP Transport Tests



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Ground Processing and Launch Facilities
ENAE 791 - Launch and Entry Vehicle Design

Interior of VAB



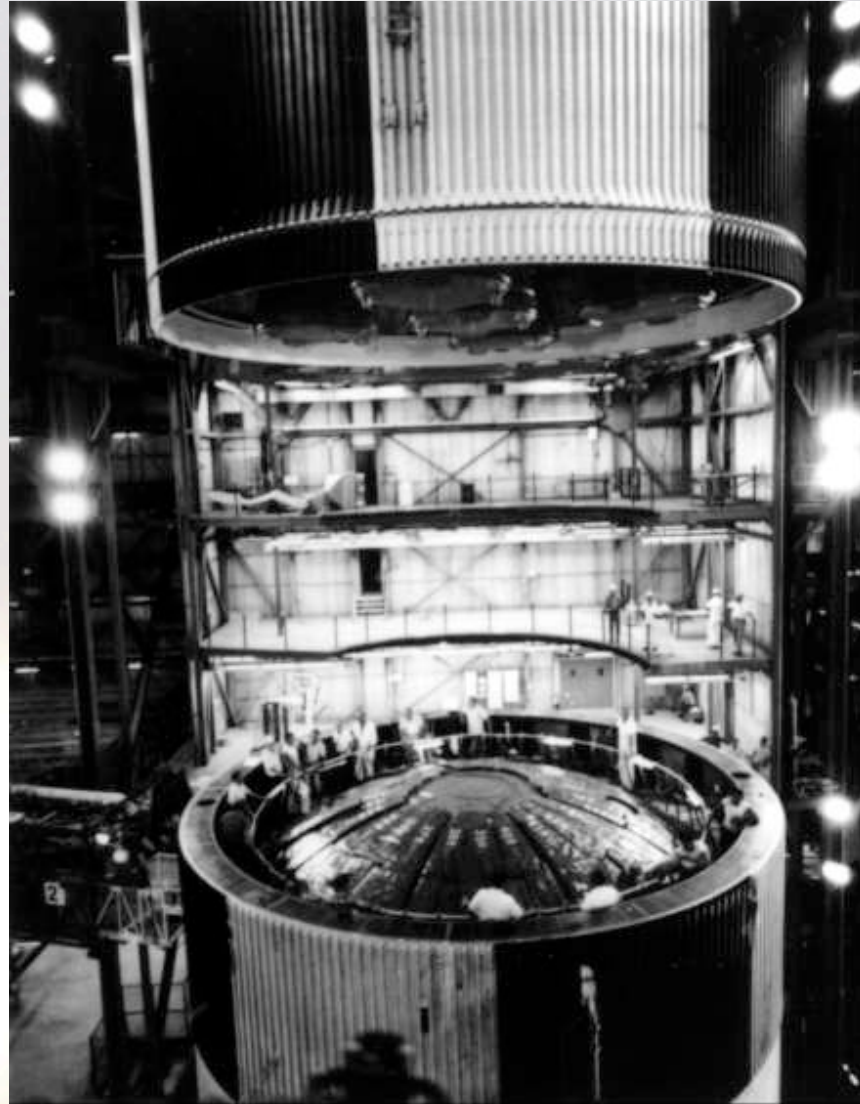
S-IC Stage in VAB Transfer Aisle



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Ground Processing and Launch Facilities
ENAE 791 - Launch and Entry Vehicle Design

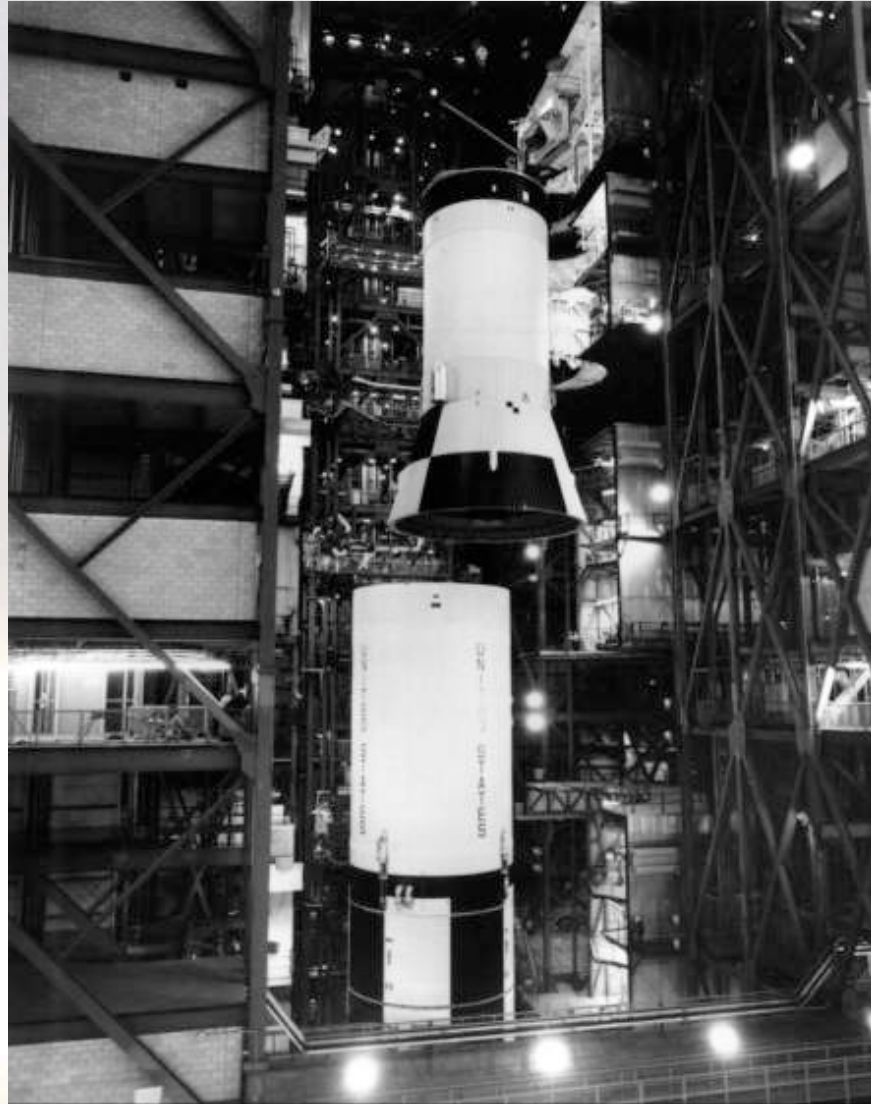
S-IC – S-II Stacking



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Ground Processing and Launch Facilities
ENAE 791 - Launch and Entry Vehicle Design

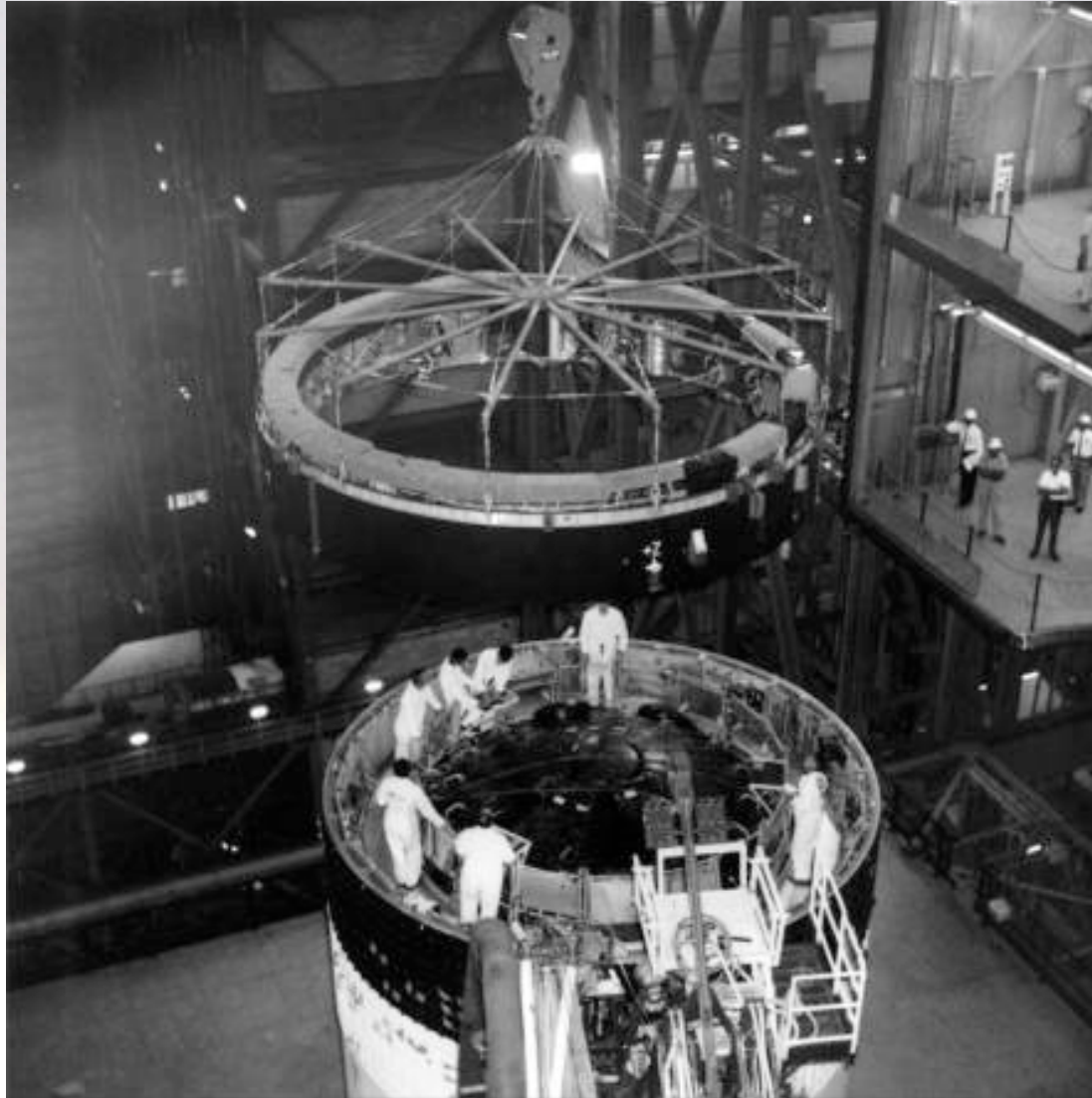
S-II – S-IVB Stacking



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ENAE 791 - Launch and Entry Vehicle Design

S-IVB – Instrument Unit Stacking



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IU – Apollo Spacecraft Stacking



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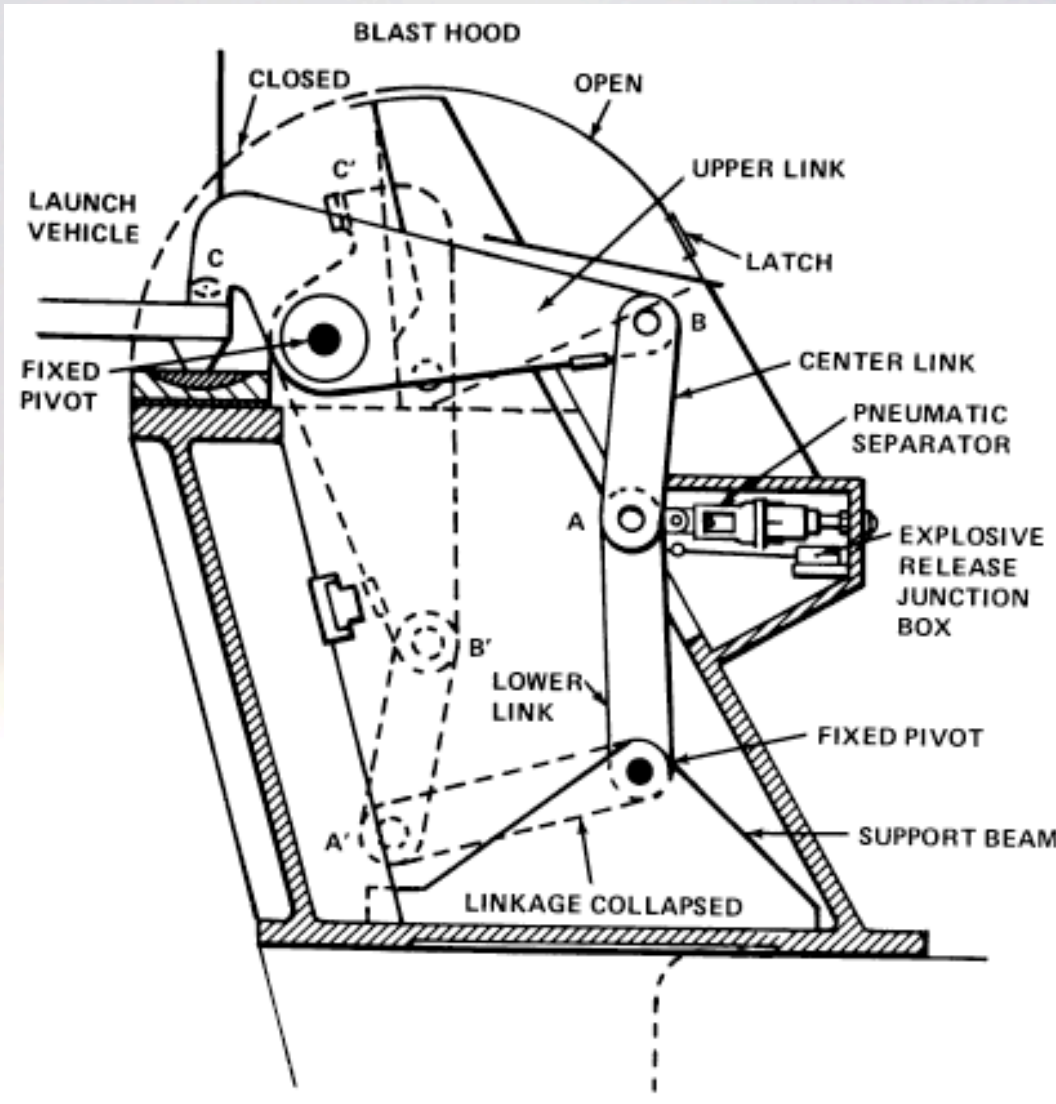
Apollo–Saturn V Completed Stack in VAB



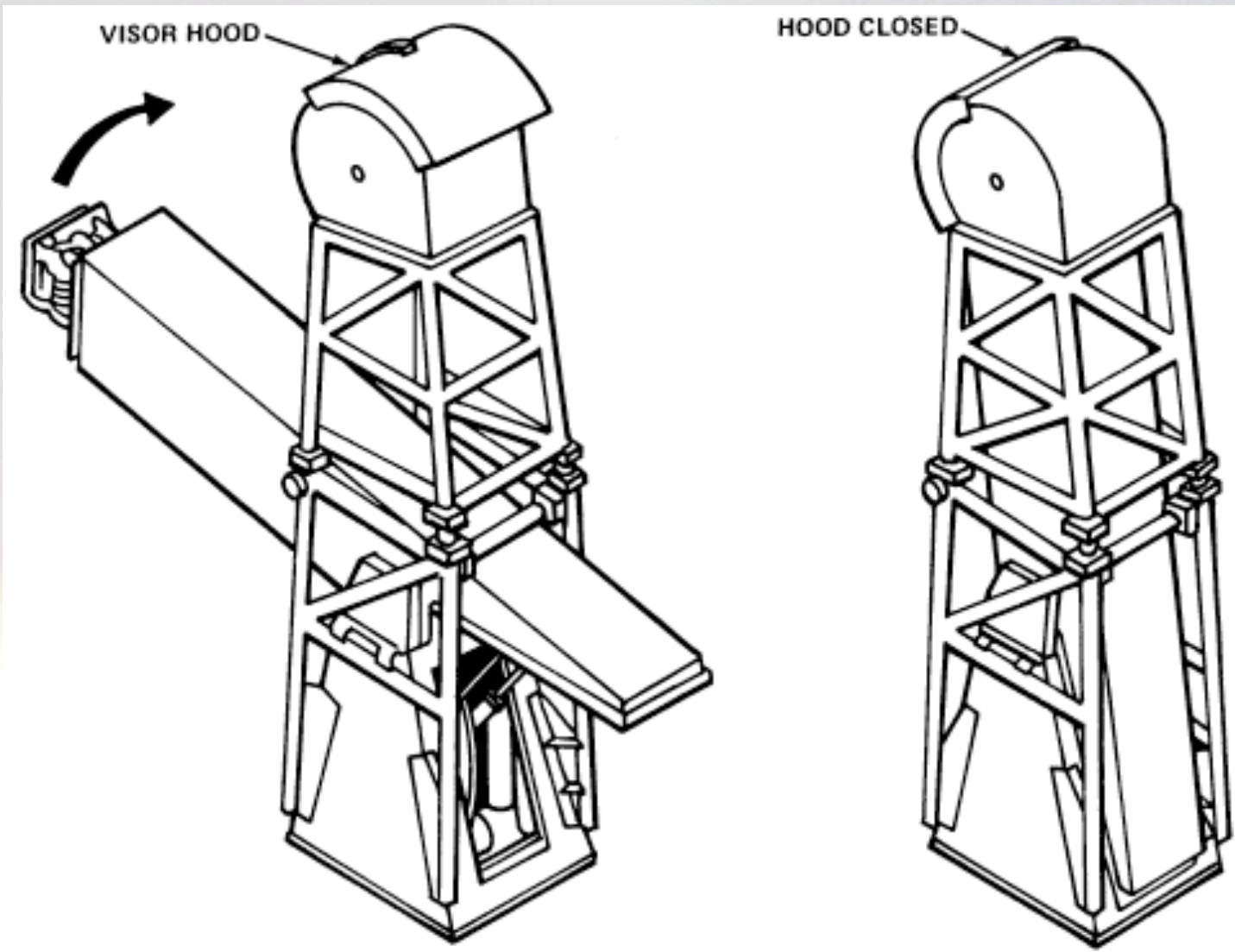
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ENAE 791 - Launch and Entry Vehicle Design

Saturn V Hold-Down Restraints



S-1C T-0 Disconnects



Building the LC-39 Launch Pads



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Ground Processing and Launch Facilities
ENAE 791 - Launch and Entry Vehicle Design

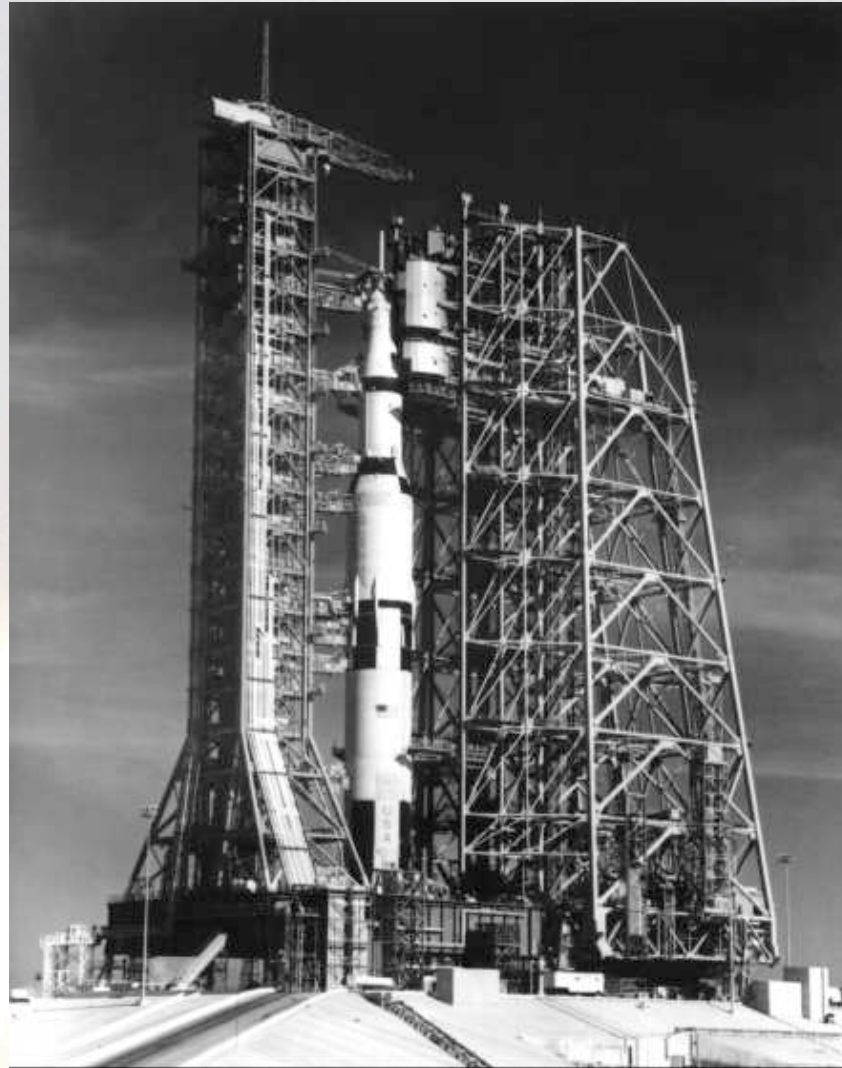
LC-39 Crawlerway and Stacks



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Ground Processing and Launch Facilities
ENAE 791 - Launch and Entry Vehicle Design

SA-501 at LC-39A



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Ground Processing and Launch Facilities
ENAE 791 - Launch and Entry Vehicle Design

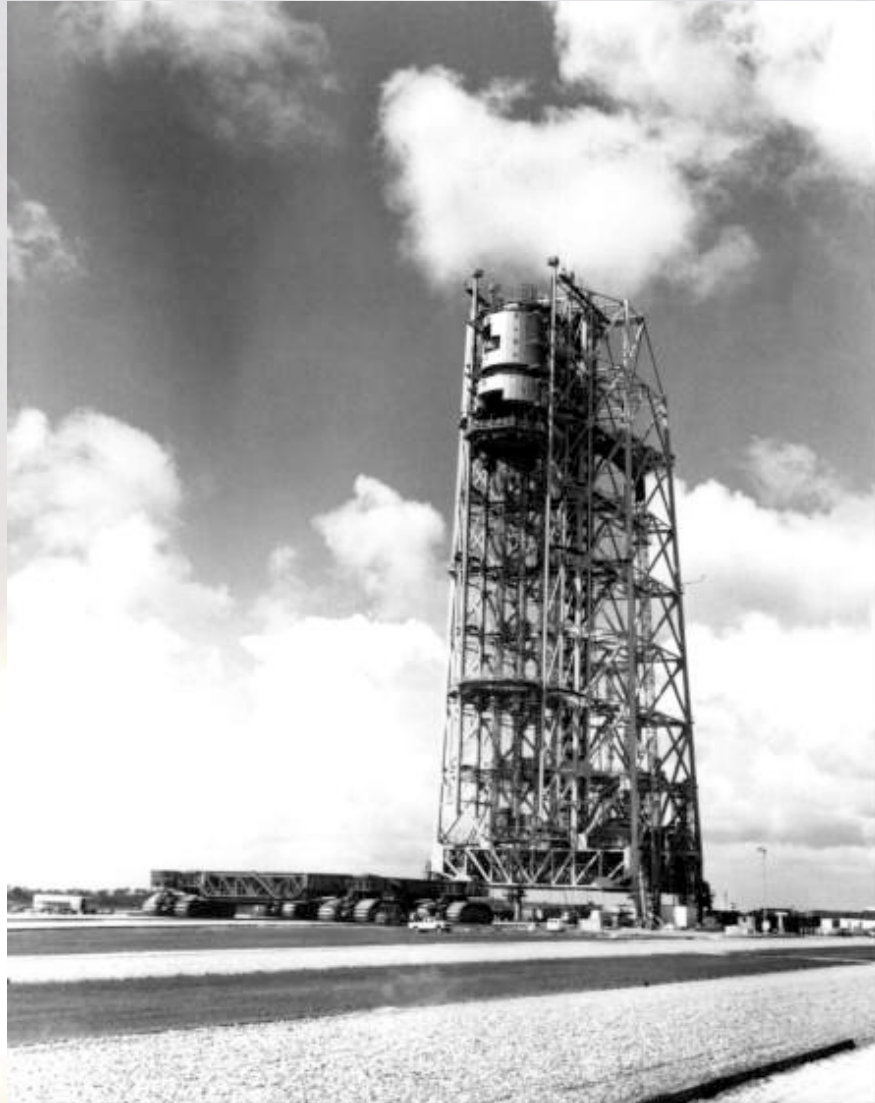
LC-39 Mobile Service Structure



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Ground Processing and Launch Facilities
ENAE 791 - Launch and Entry Vehicle Design

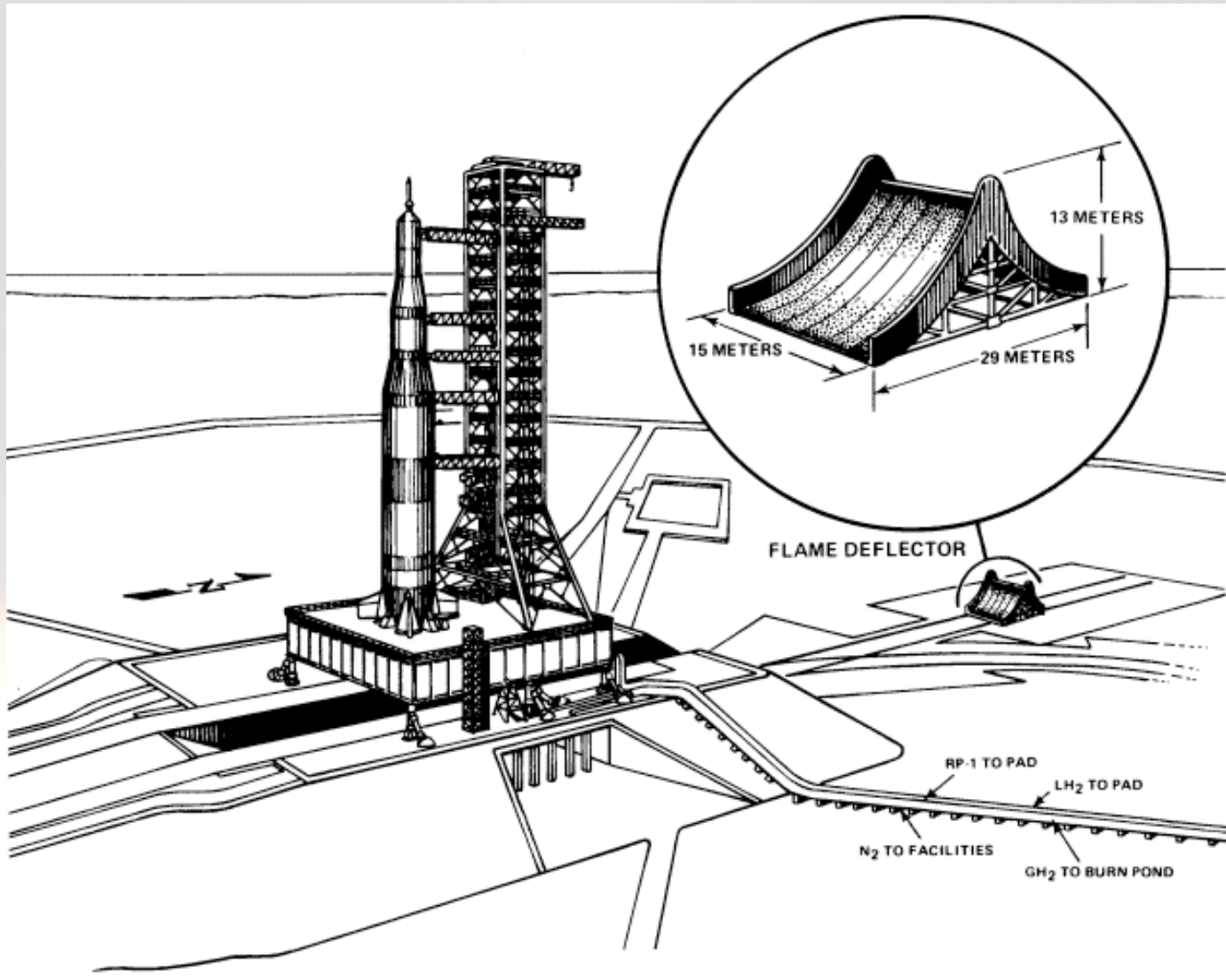
LC-39 Mobile Service Structure



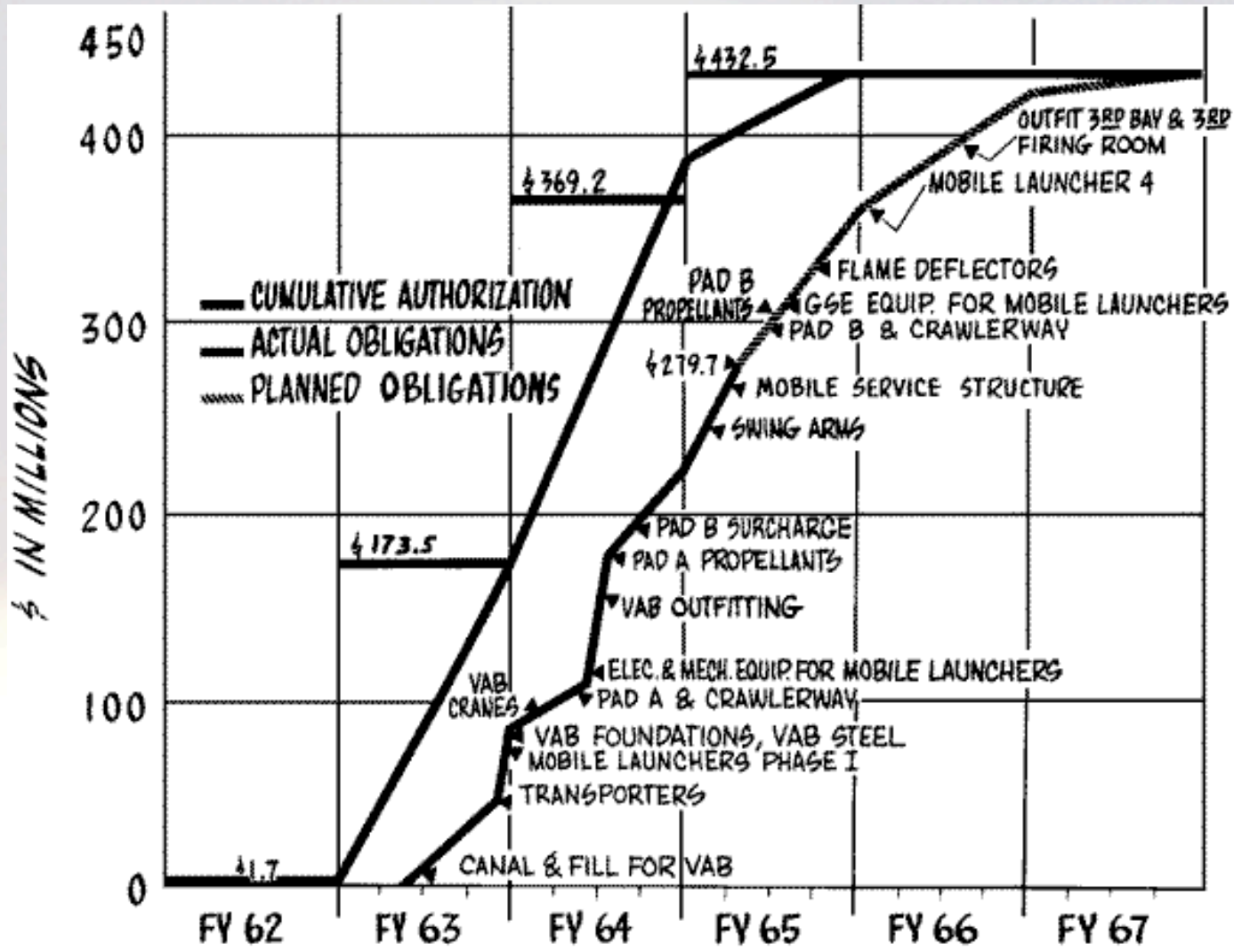
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Ground Processing and Launch Facilities
ENAE 791 - Launch and Entry Vehicle Design

Complex 39 Launch Mounts

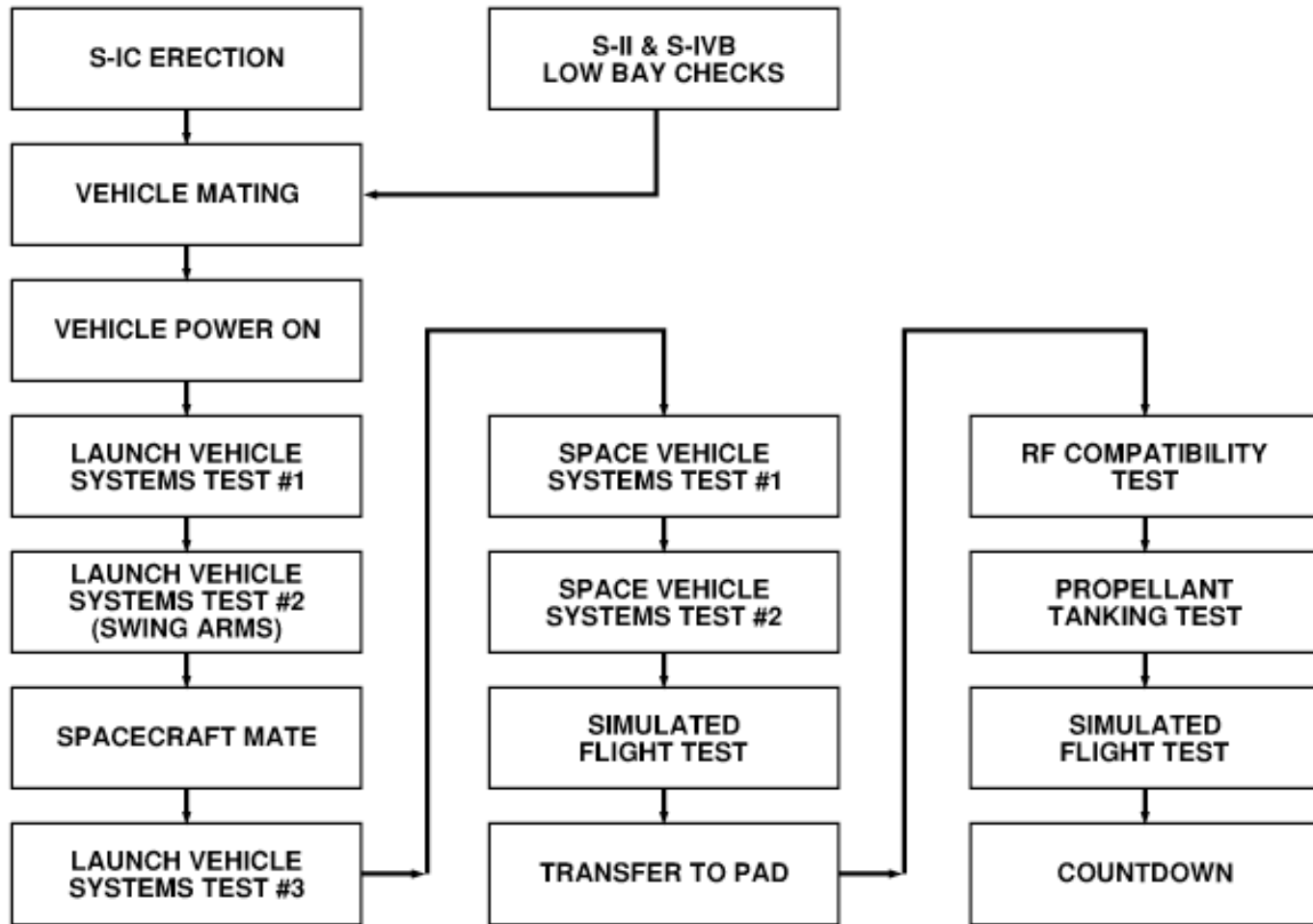


Expenditures for LC-39



Saturn V Vehicle Checkout Flow

SATURN V CHECKOUT SCHEDULE MILESTONES



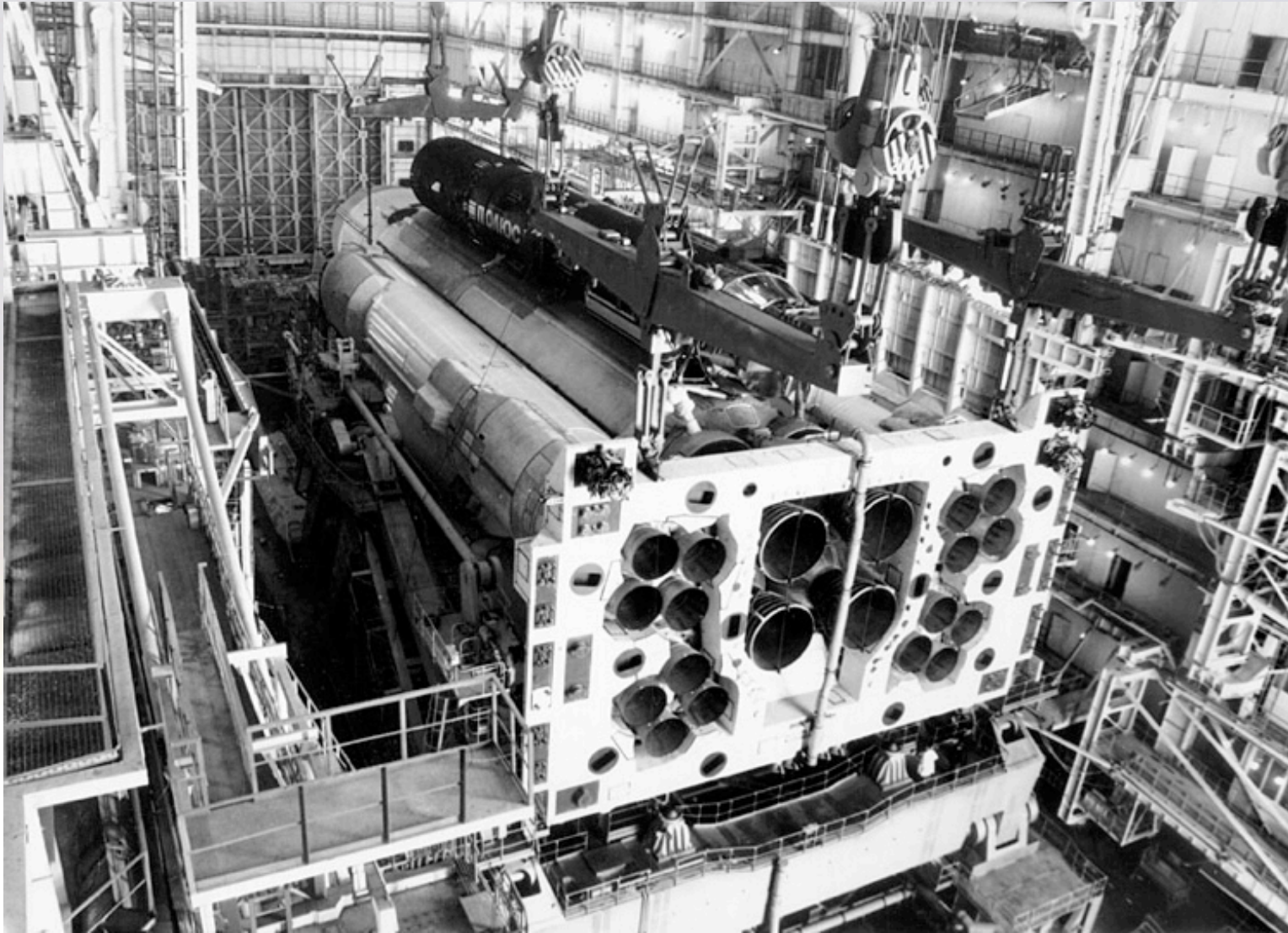
Soyuz Launch Vehicle Moving to Pad



Soyuz Launch Site



Energia in Horizontal Integration



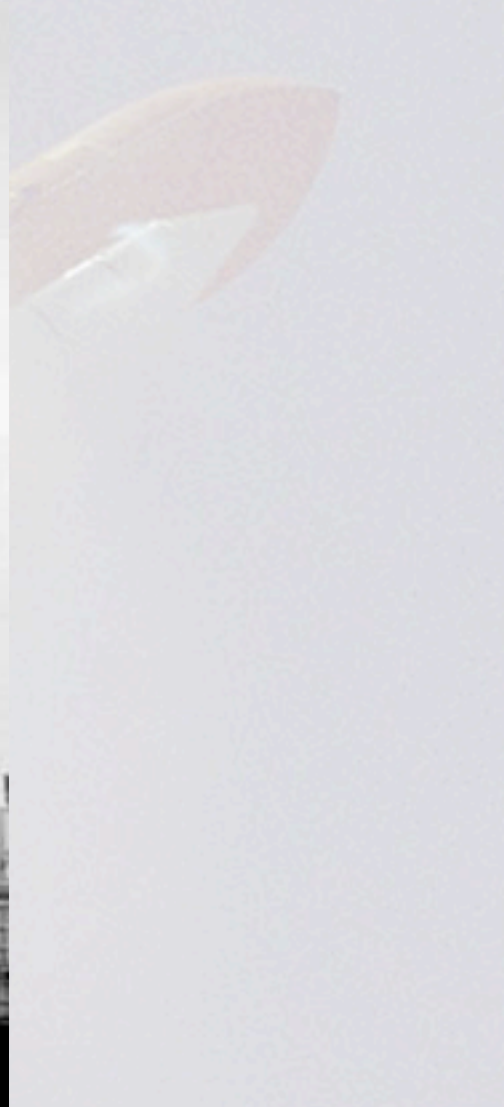
Energia Transported to Pad



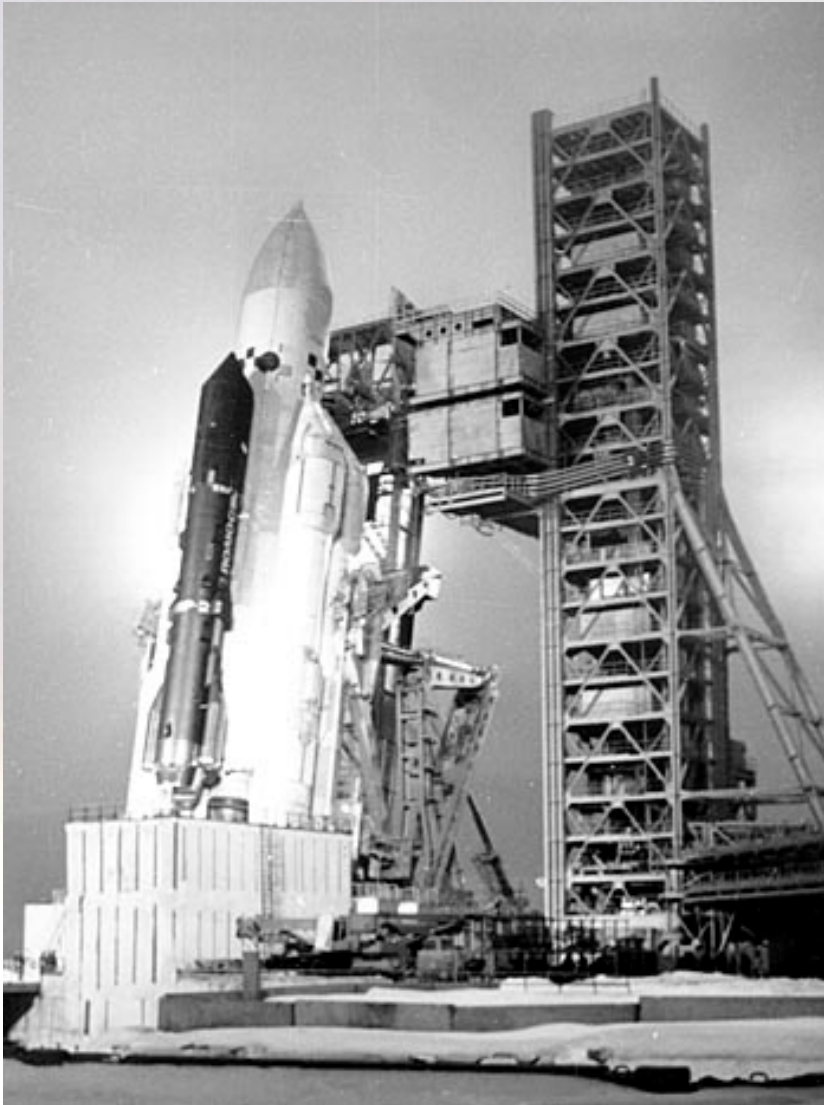
Energia at Pad



Energia Erection



Energia on Pad



Shuttle Landing Facility



Transport to Orbiter Processing Facility



Payload Bay Inspection in OPF



SSME Removal/Installation



Transfer to Vehicle Assembly Building



Attaching Hoisting Fixtures



Attaching Orbiter to Shuttle Stack



Shuttle Rollout



Delta IV Heavy Horizontal Integration



Delta IVH Horizontal Integration Facility



Delta IV Heavy Transporter



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Delta IV Heavy at LC34 Blockhouse



Delta IV Heavy Arrives at LC-34



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Delta IV Heavy Module Interconnects



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Delta IV Heavy at Pad



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Ground Processing and Launch Facilities
ENAE 791 - Launch and Entry Vehicle Design

Delta IV Heavy Rotation



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Ground Processing and Launch Facilities
ENAE 791 - Launch and Entry Vehicle Design

Delta IV Heavy Rotation



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Delta IV Heavy at Pad



DC-XA on Launch Pad

