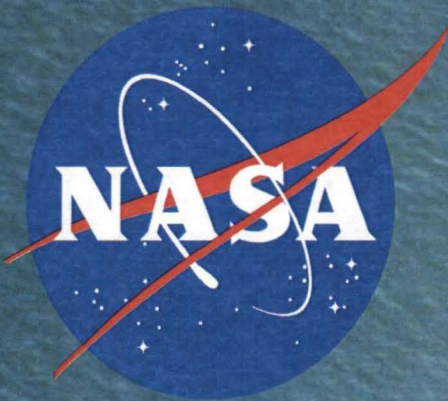


Project Management at NASA Kennedy Space Center



Charles A. Gambaro, FAC-P/PM, RMP

PMI Puerto Rico Chapter
11th Annual Symposium

November 3-4, 2011

Agenda



- ◆ **Kennedy Space Center – Past, Present & Future**
- ◆ **Overview of KSC Non-Conventional Facilities**
- ◆ **Other Non-Conventional Projects**
- ◆ **Project Approach at KSC**
- ◆ **Project Management Challenges**

Historical Programs at KSC

◆ Mercury (1961-1963)

- First American in Space

◆ Gemini (1965-1966)

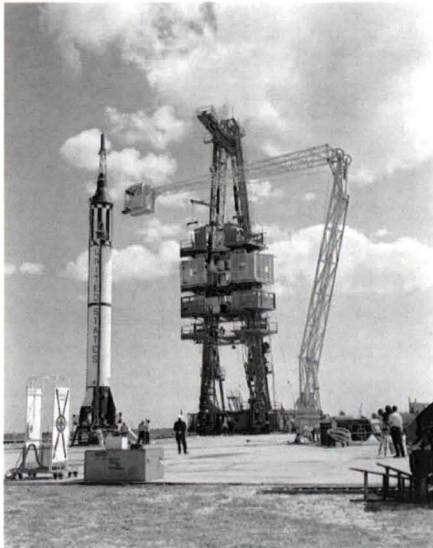
- First "Space Walk"

◆ Apollo (1968-1972)

- First Man on the Moon

◆ Space Shuttle (1981-2011)

- Service to Low Earth Orbit

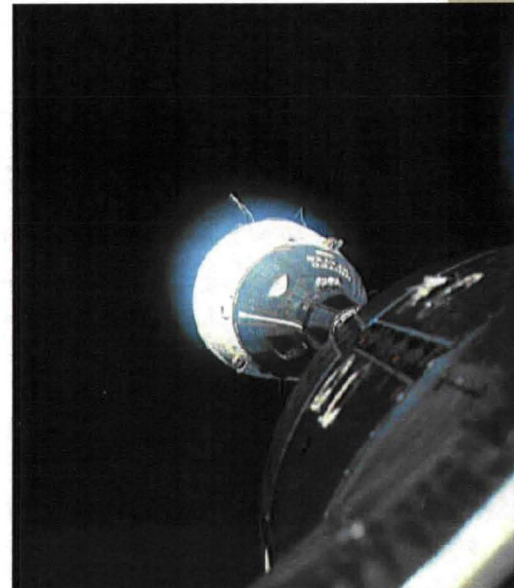


Kennedy Space Center



Historical Programs at KSC

- ◆ Mercury (1961-1963)
 - First American in Space
- ◆ **Gemini (1965-1966)**
 - **First Docking of 2 Spacecraft**
- ◆ Apollo (1968-1972)
 - First Man on the Moon
- ◆ Space Shuttle (1981-2011)
 - Service to Low Earth Orbit

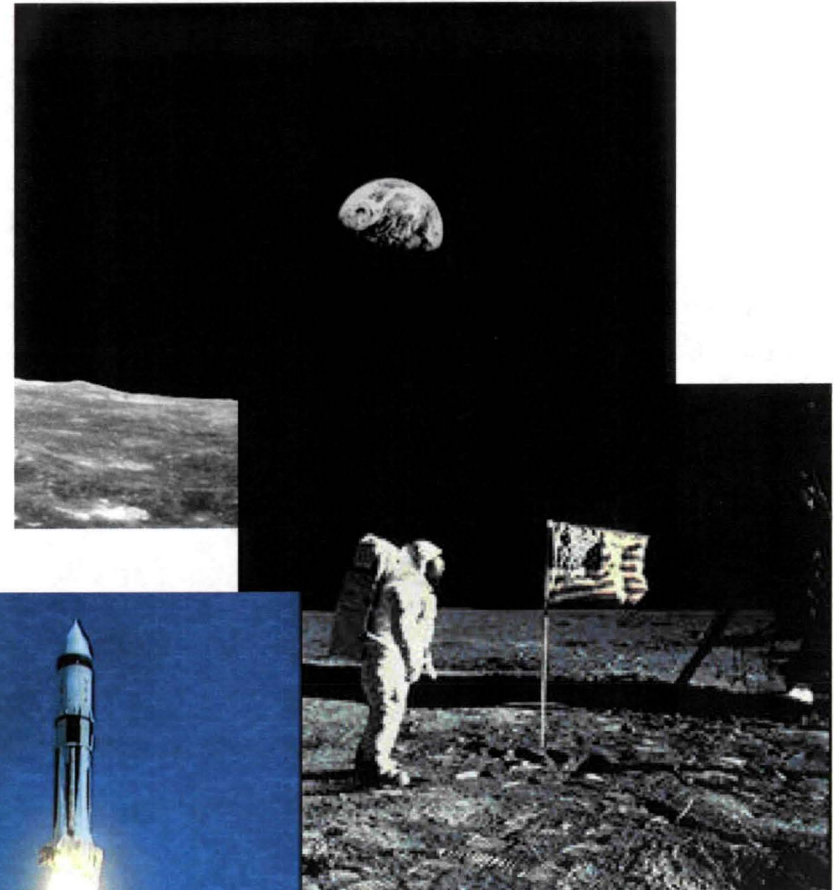


Kennedy Space Center



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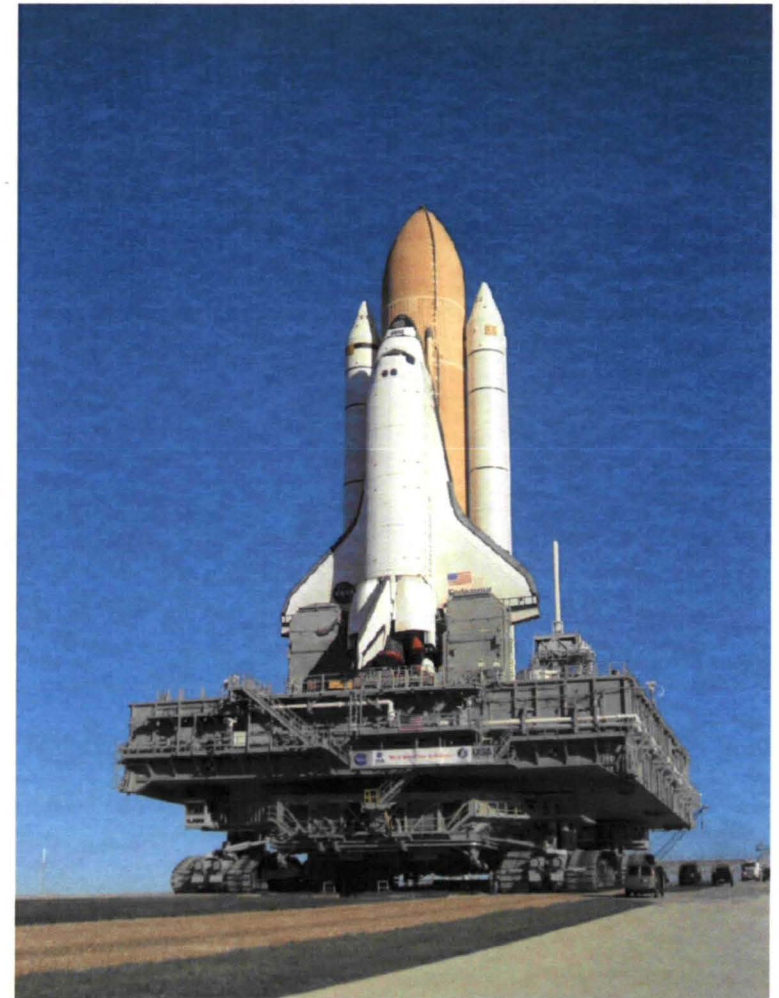


Kennedy Space Center



Historical Programs

- ◆ Mercury (1961-1963)
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 - **Service to Low Earth Orbit**

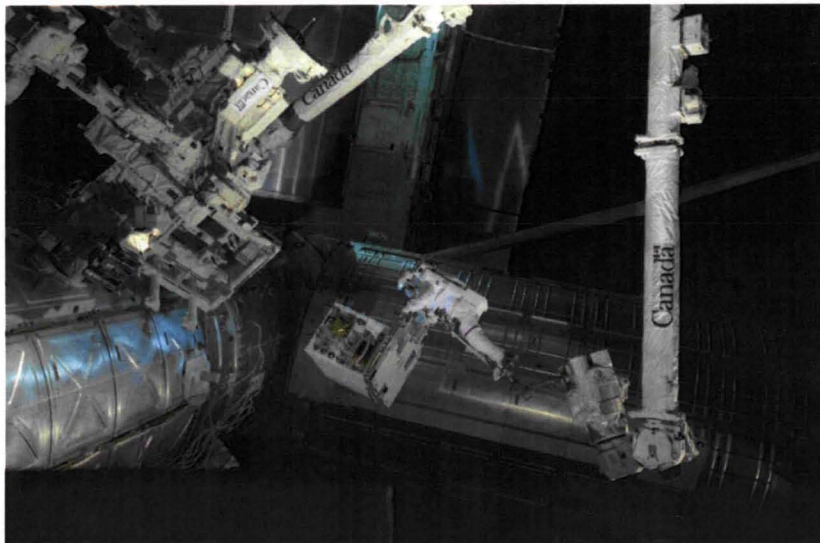
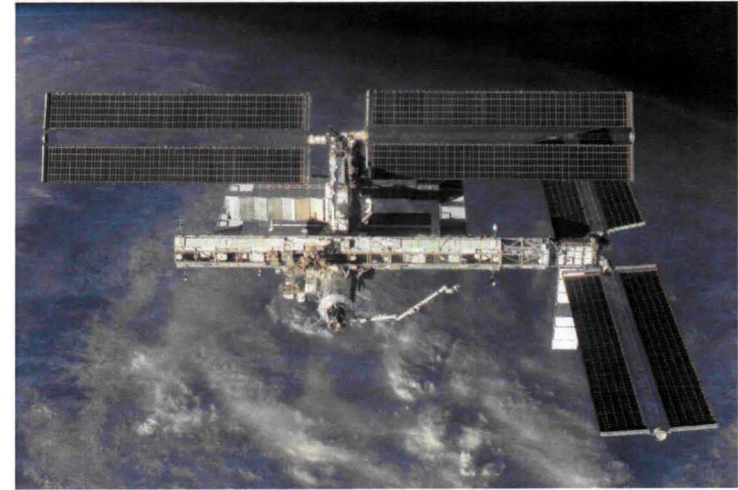


Kennedy Space Center



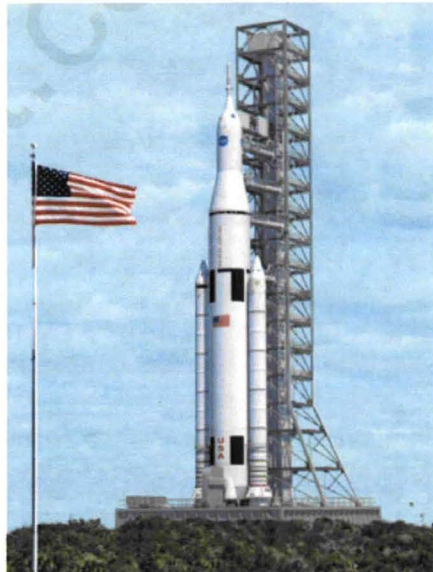
Future Programs

- ◆ **International Space Station**
 - **Science Research**
- ◆ Space Launch System (SLS)
 - Capability to Explore Beyond the Moon
- ◆ Commercial Partners
 - Reliable Service to Low Earth Orbit



Future Programs

- ◆ International Space Station
 - Science Research
- ◆ **Space Launch System (SLS)**
 - **Capability to Explore Beyond the Moon**
- ◆ Commercial Partners
 - Reliable Service to Low Earth Orbit



INITIAL



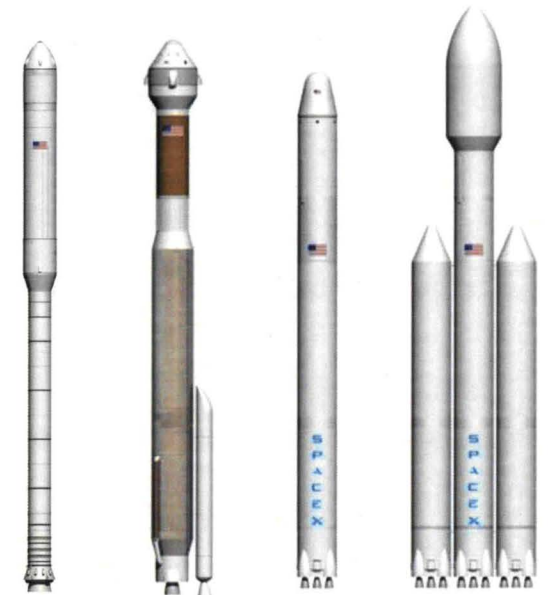
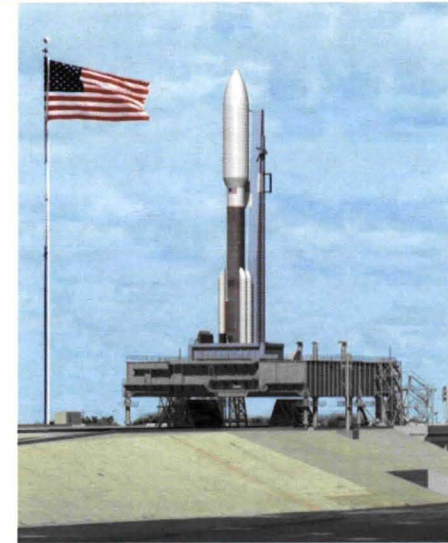
EVOLVED

Kennedy Space Center



Future Programs

- ◆ International Space Station
 - Science Research
- ◆ Space Launch System (SLS)
 - Capability to Explore Beyond the Moon
- ◆ **Commercial Partners**
 - **Reliable Service to Low Earth Orbit**



Not Your Ordinary Facilities



Facilities are designed to receive and process flight hardware

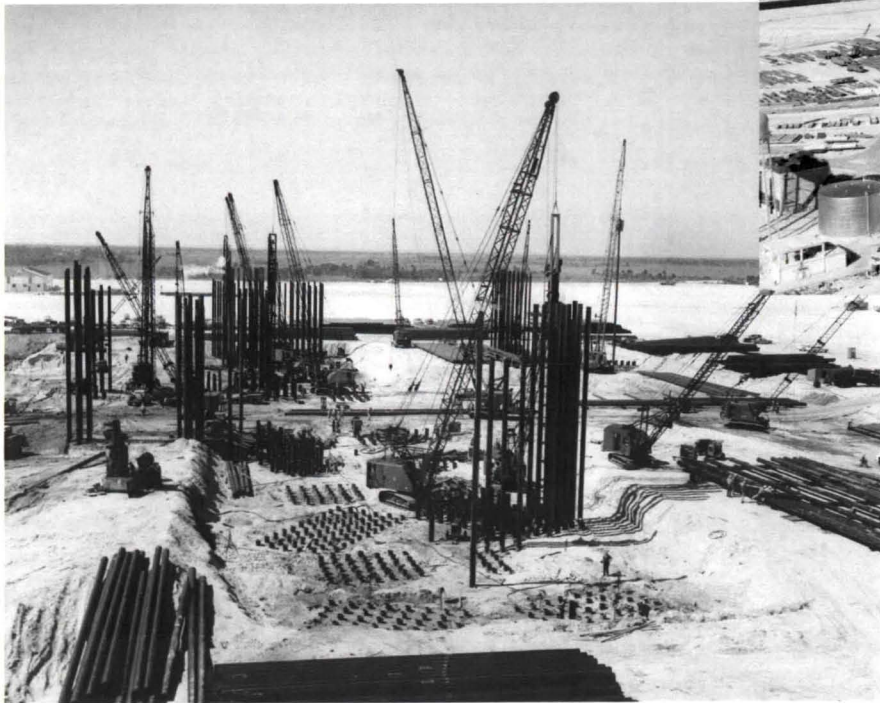
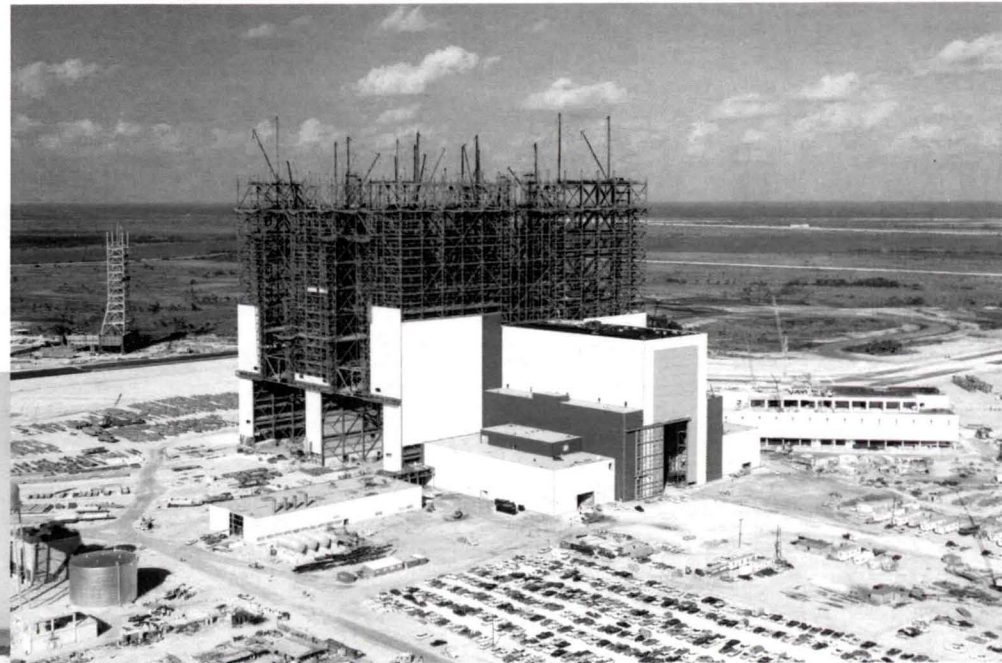
- ◆ **Vehicle Assembly Building (VAB)**
- ◆ **Launch Control Center (LCC)**
- ◆ **Crawlerway**
- ◆ **Launch Pads**
- ◆ **Crawler Transporter**
- ◆ **Mobile Launcher**

Not Your Ordinary Facilities



Vehicle Assembly Building

Built in 1960s
Occupies 8 acres

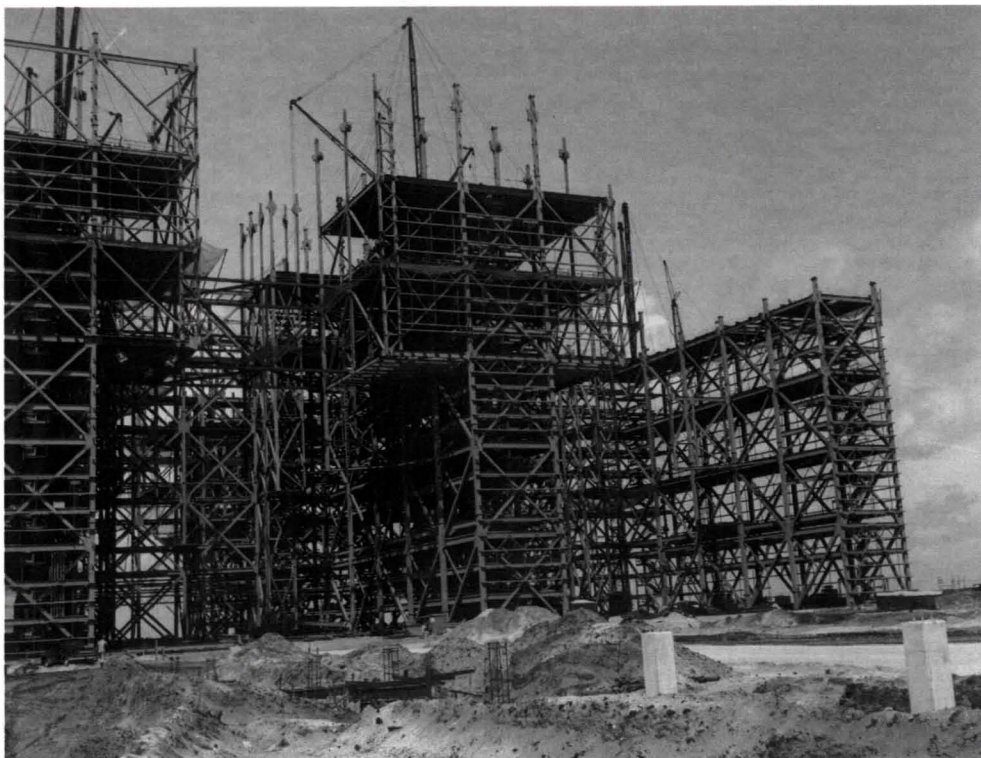


4225 steel piles
65,000 cy concrete

Not Your Ordinary Facilities

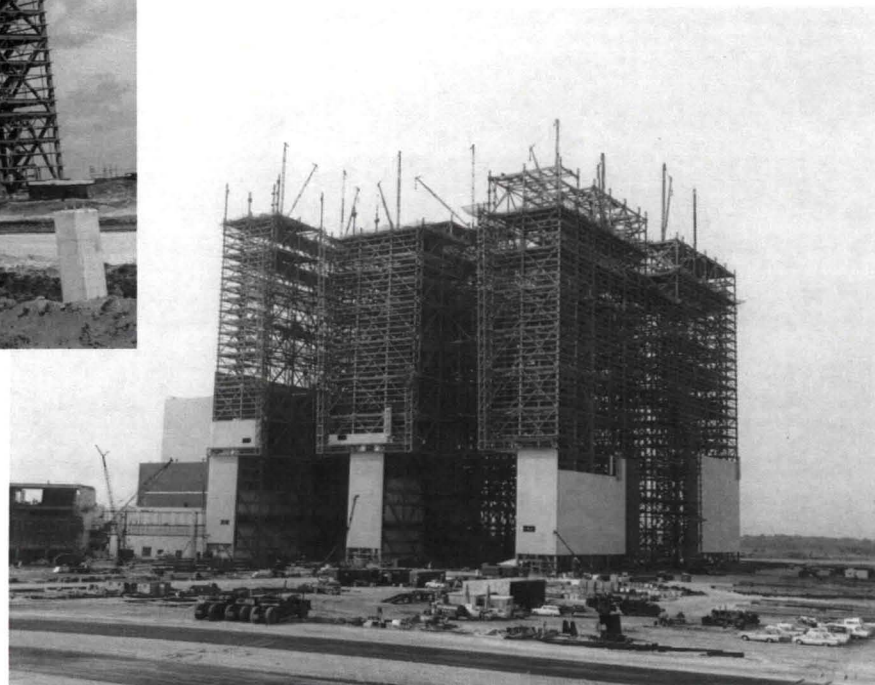


Vehicle Assembly Building



**525 feet high
4 high bays**

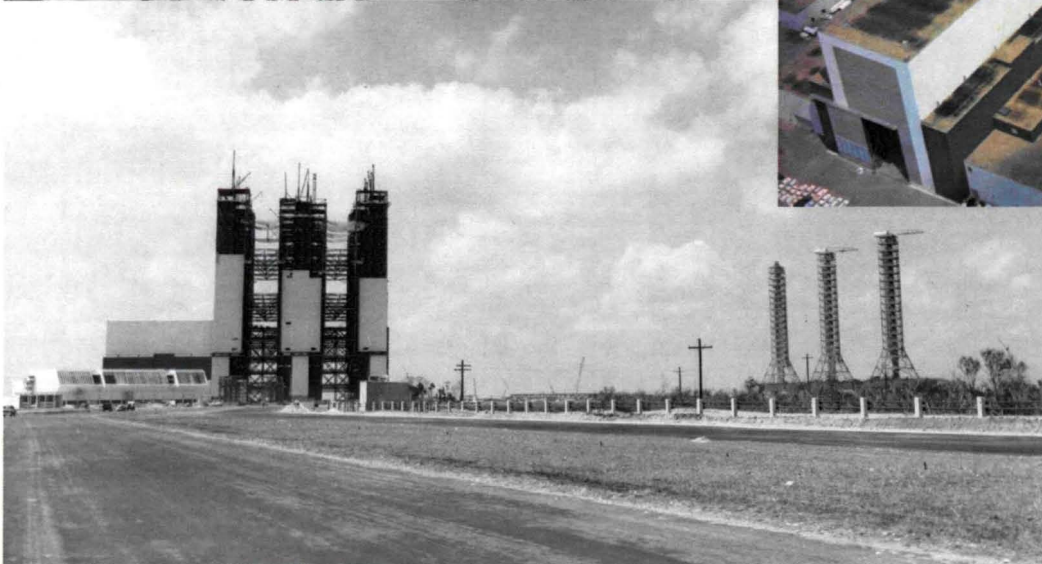
**5 bridge cranes
325-ton, 250-ton, 175-ton**



Not Your Ordinary Facilities



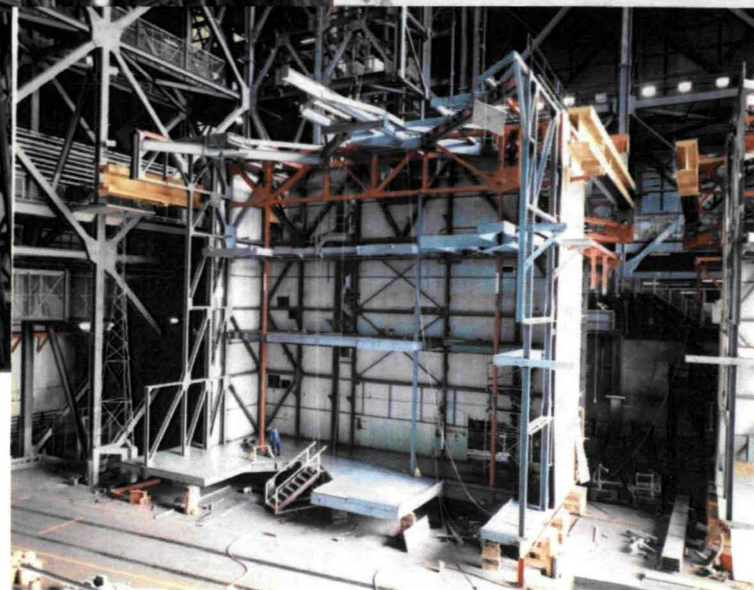
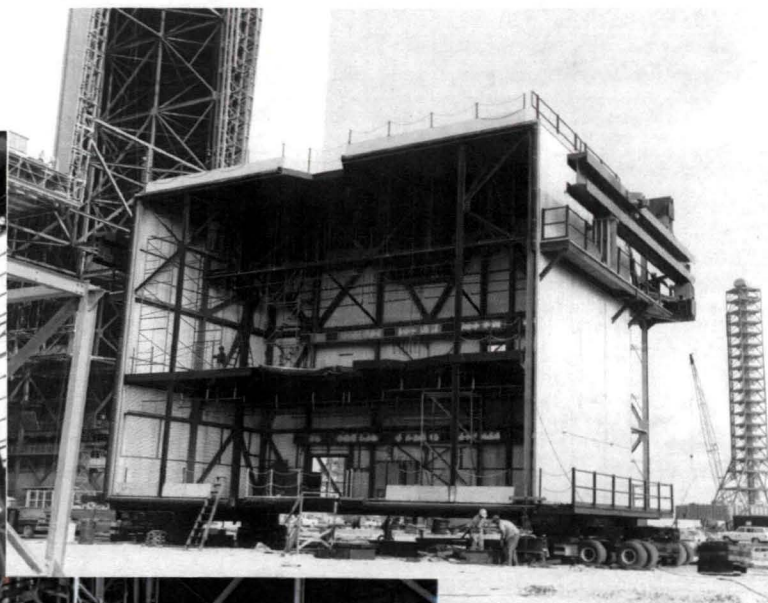
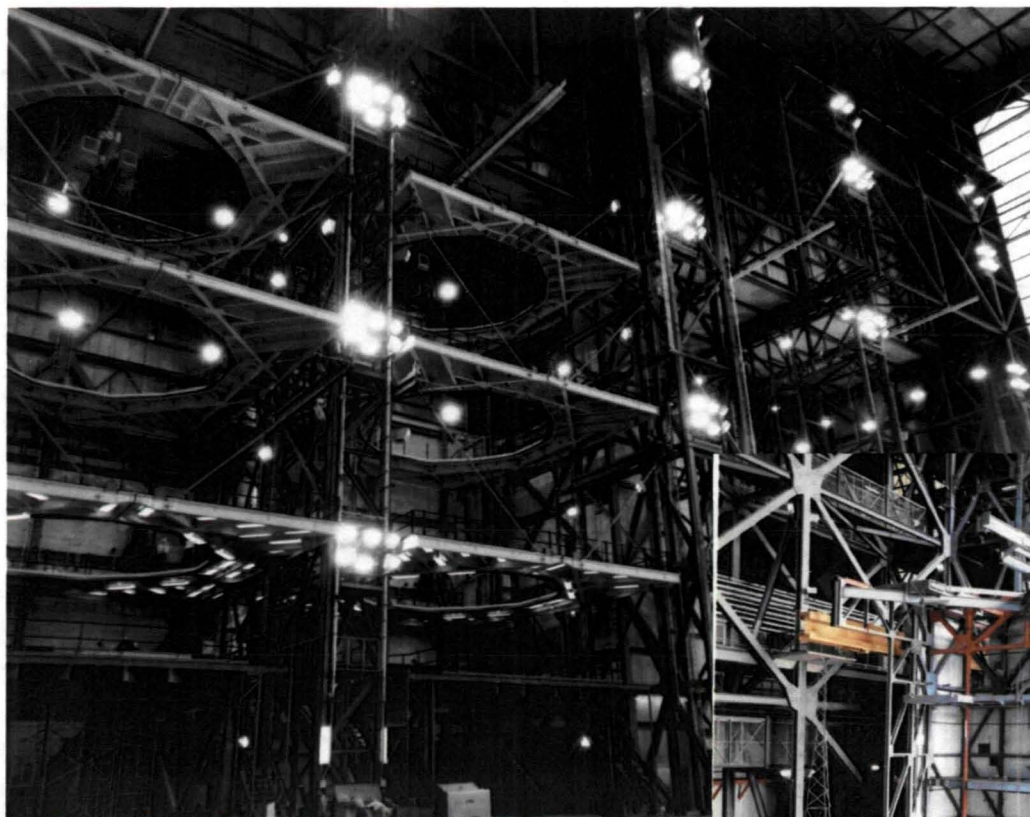
Vehicle Assembly Building



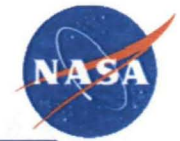
Not Your Ordinary Facilities



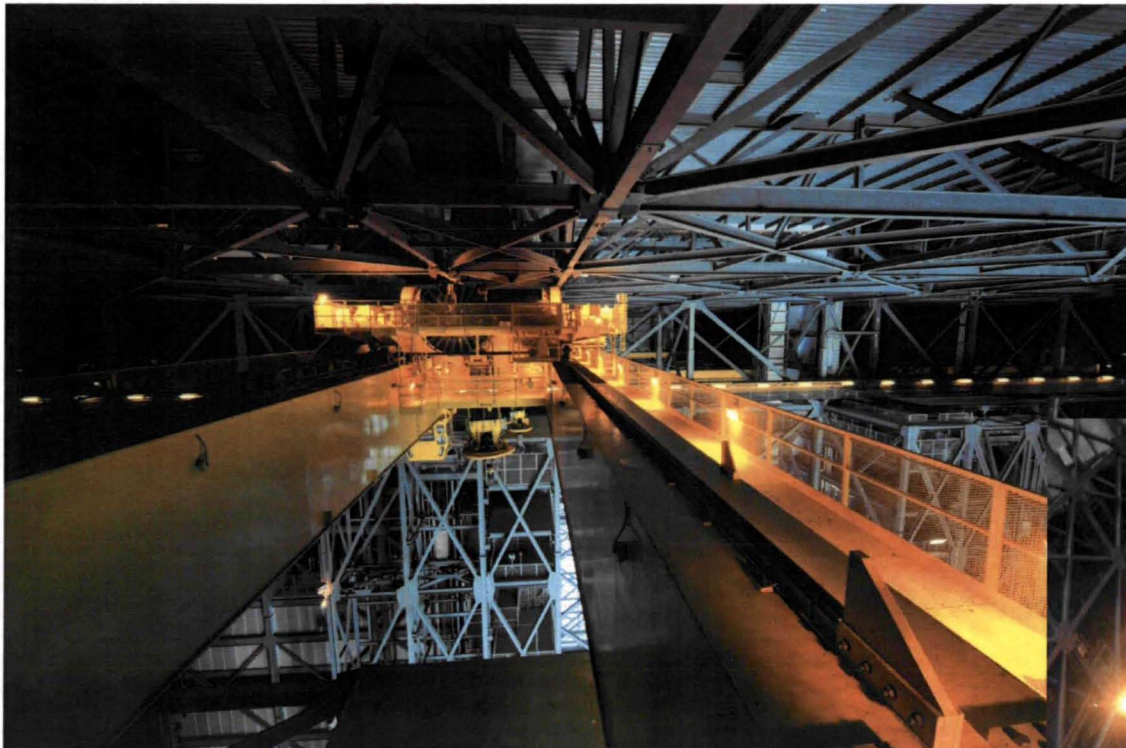
Vehicle Assembly Building



Not Your Ordinary Facilities



Vehicle Assembly Building



325 Ton Bridge Crane

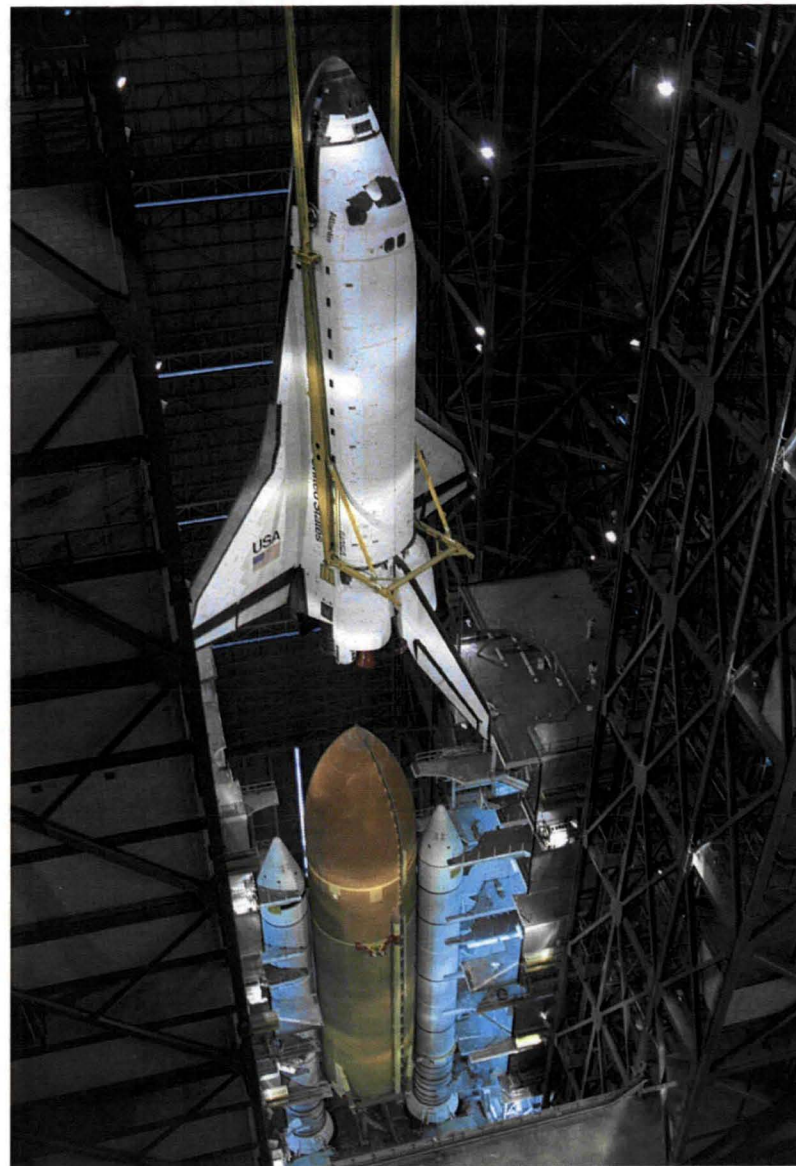
Not Your Ordinary Facilities



Not Your Ordinary Facilities



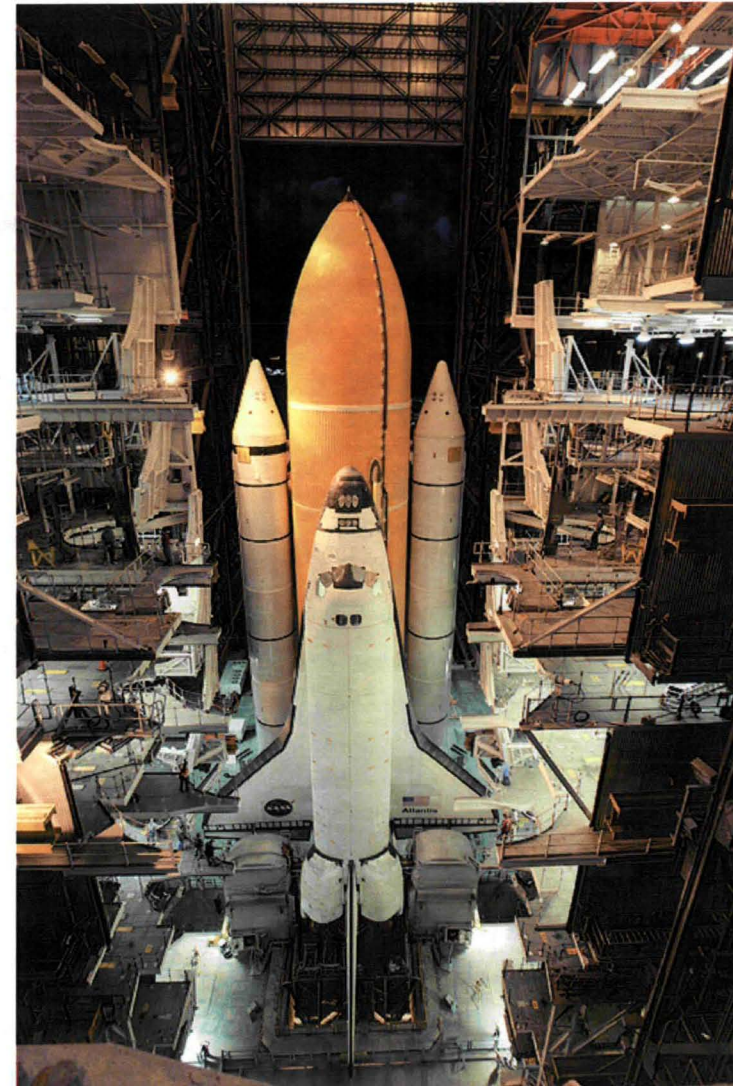
Vehicle Assembly Building



Not Your Ordinary Facilities



Vehicle Assembly Building



Not Your Ordinary Facilities



Not Your Ordinary Facilities



Vehicle Assembly Building



Not Your Ordinary Facilities



Launch Control Center (LCC)



Not Your Ordinary Facilities



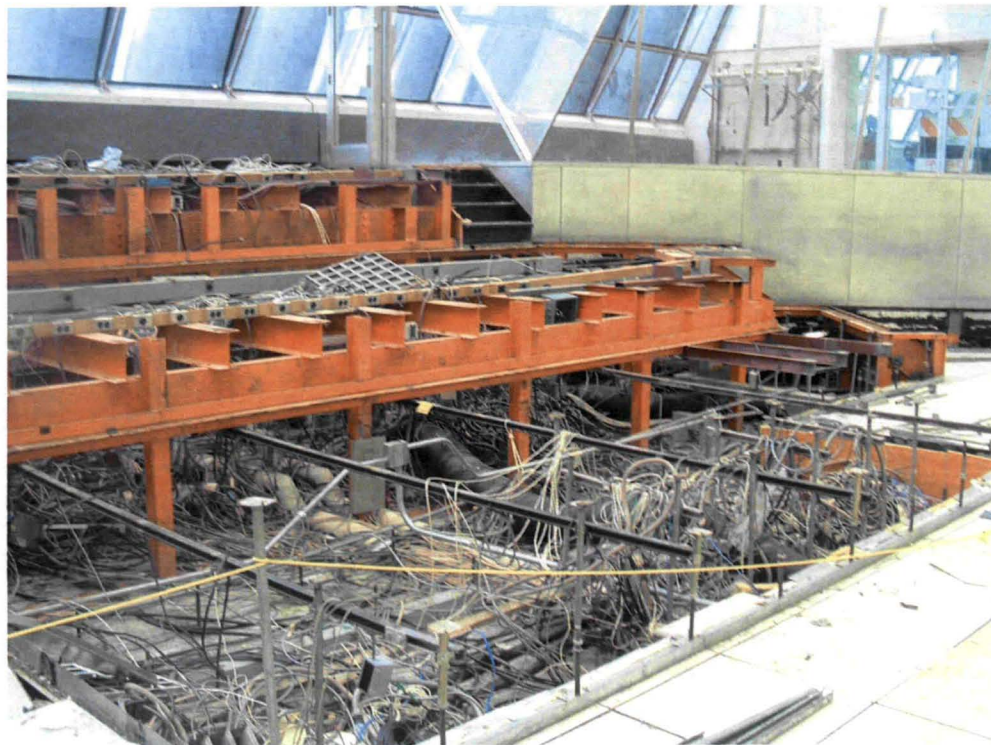
Launch Control Center (LCC)



Not Your Ordinary Facilities



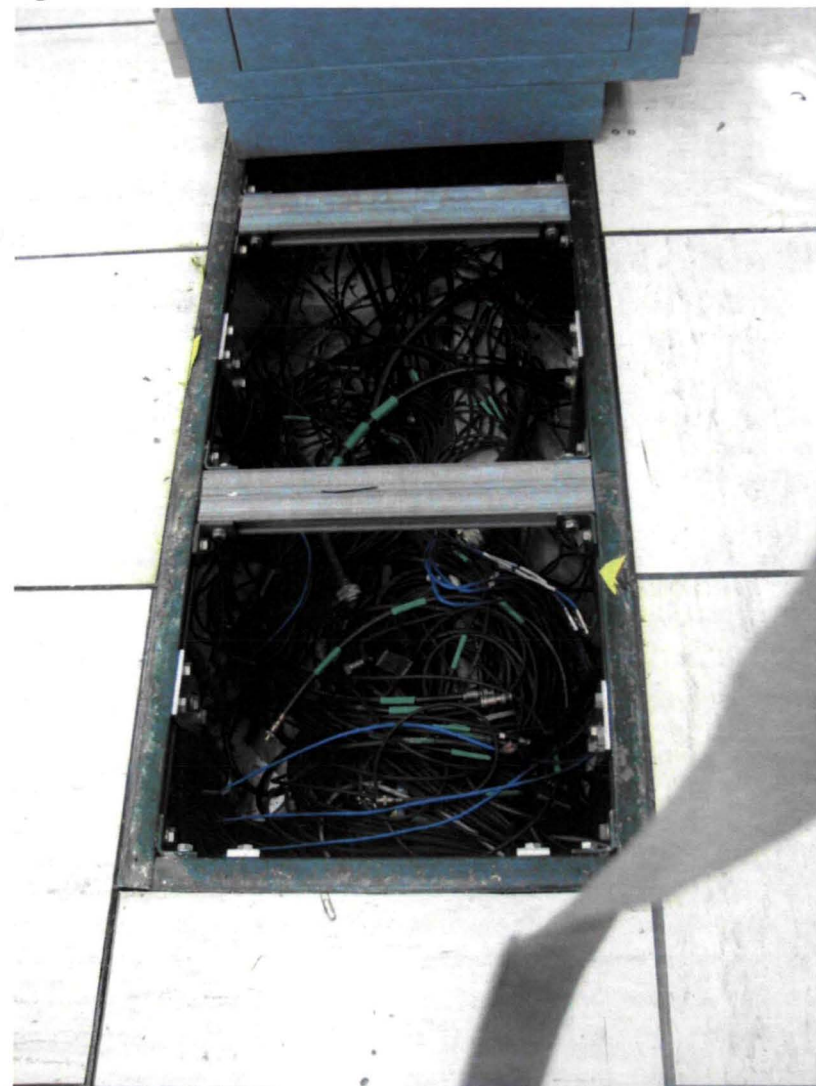
Launch Control Center (LCC)



Not Your Ordinary Facilities



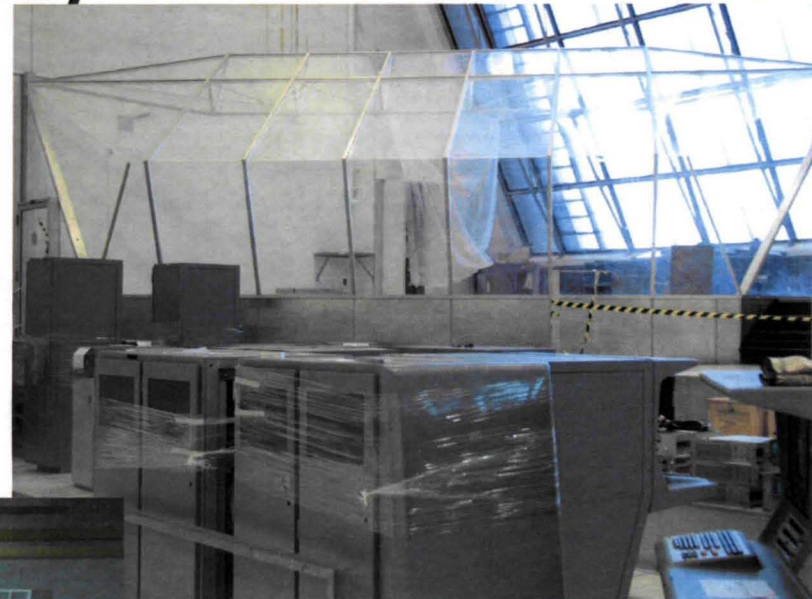
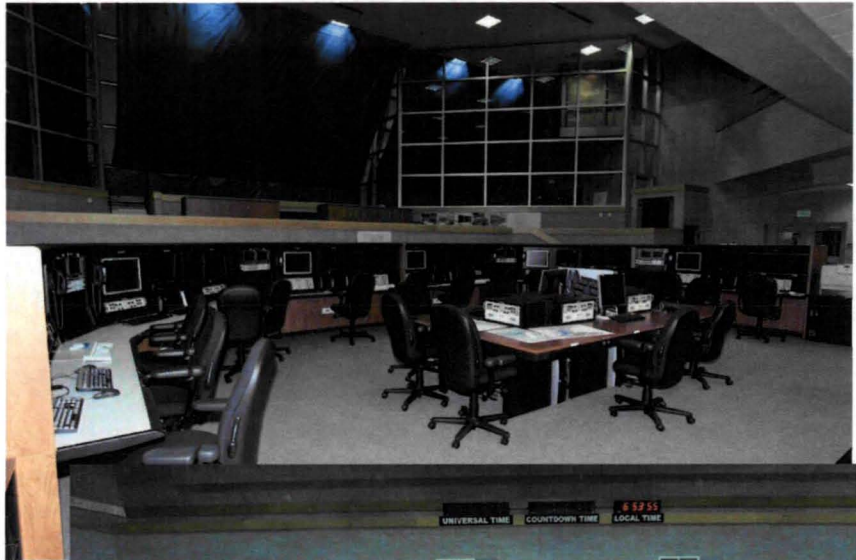
Launch Control Center (LCC)



Not Your Ordinary Facilities



Launch Control Center (LCC)

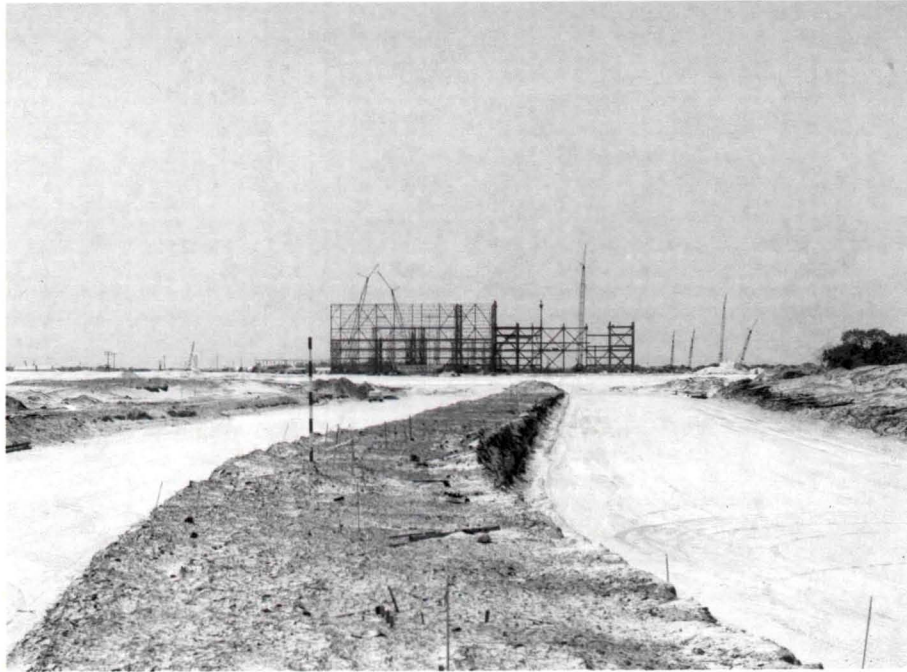


The Young – Crippen Firing Room

Not Your Ordinary Facilities



Crawlerway



**Approx 5 miles total
length from VAB to
Pads 39A & 39B**

Not Your Ordinary Facilities



Crawlerway

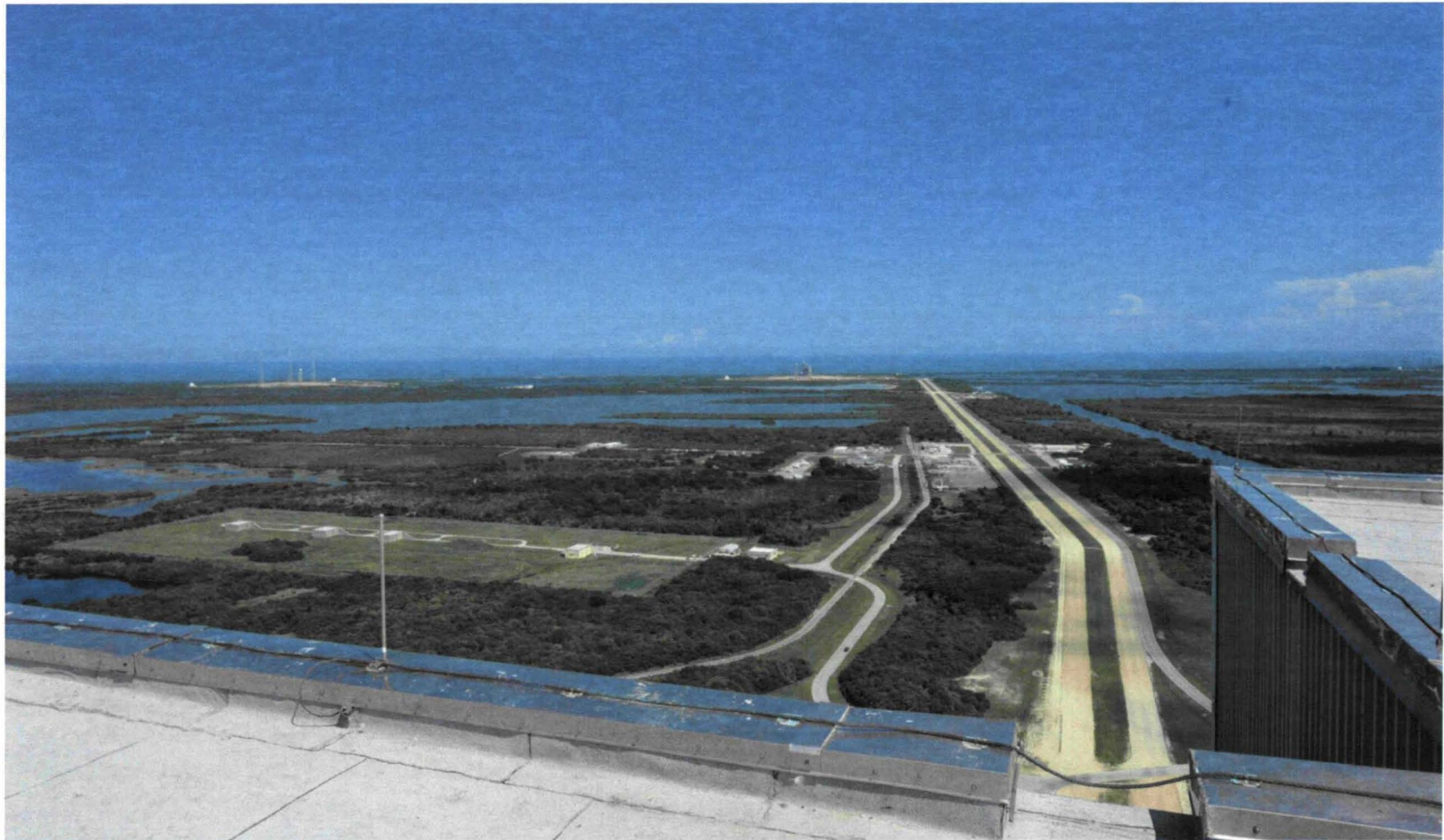


**130 feet wide
4 foot limerock base
4"-8" river rock surface**

Project Approach



Crawlerway

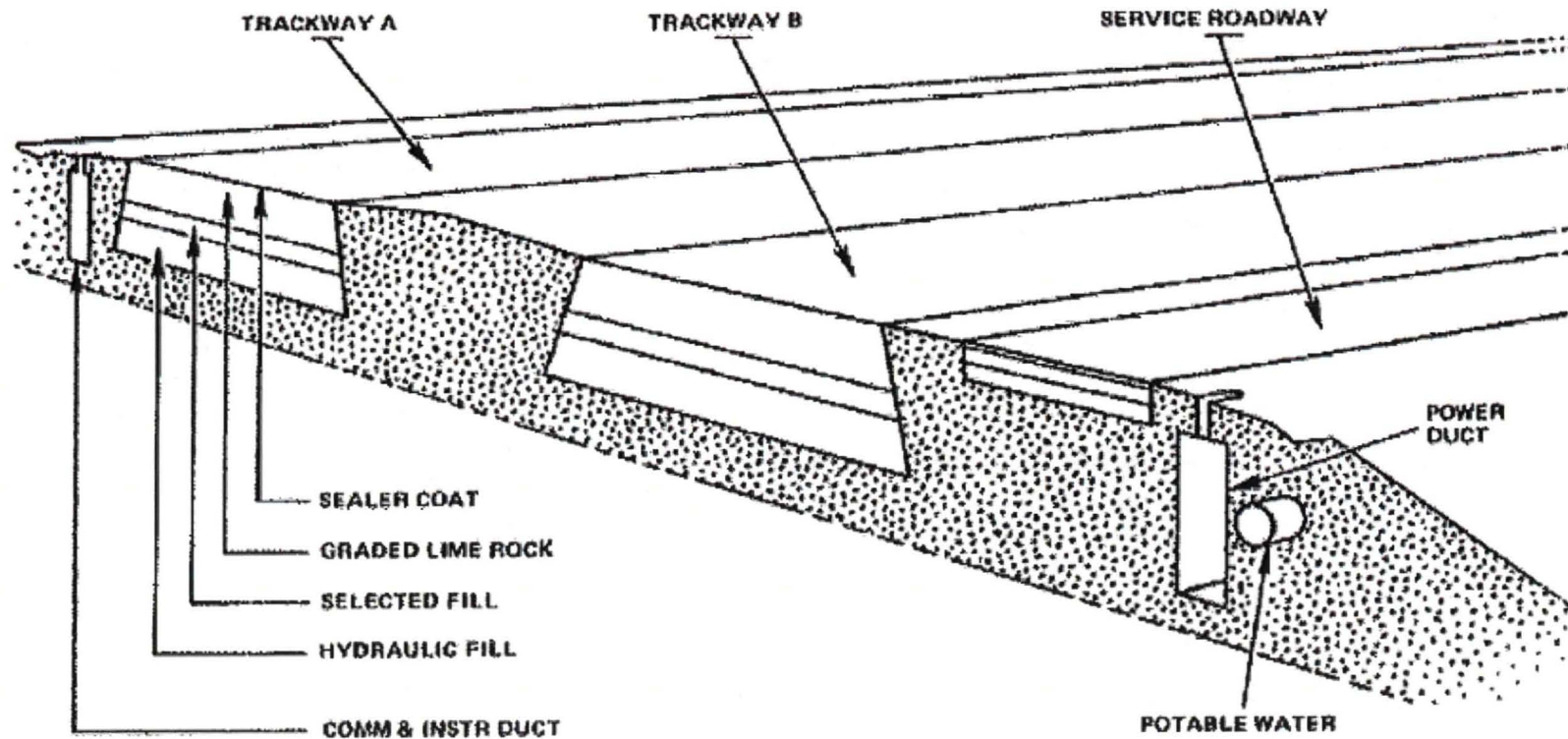


Project Approach



Crawlerway

PROFILE OF TYPICAL CRAWLERWAY SECTION



(NOT TO SCALE)

Typical cross section of crawlerway, as the design took shape in early 1963.

Not Your Ordinary Facilities



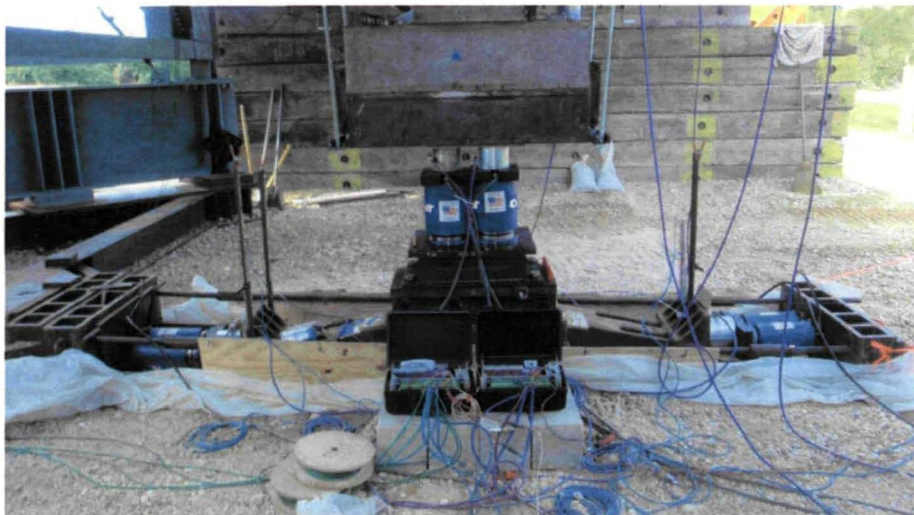
Crawlerway Testing



Not Your Ordinary Facilities



Crawlerway



Testing various gravel surfaces with a Crawler Shoe

Not Your Ordinary Facilities



Launch Pads



**Each Pad encompasses 160 acres
Built 50 feet above sea level**



Not Your Ordinary Facilities



Launch Pads



FSS 347 feet tall
RSS rotates 120°
LO2 and LH2 Fuel Farms

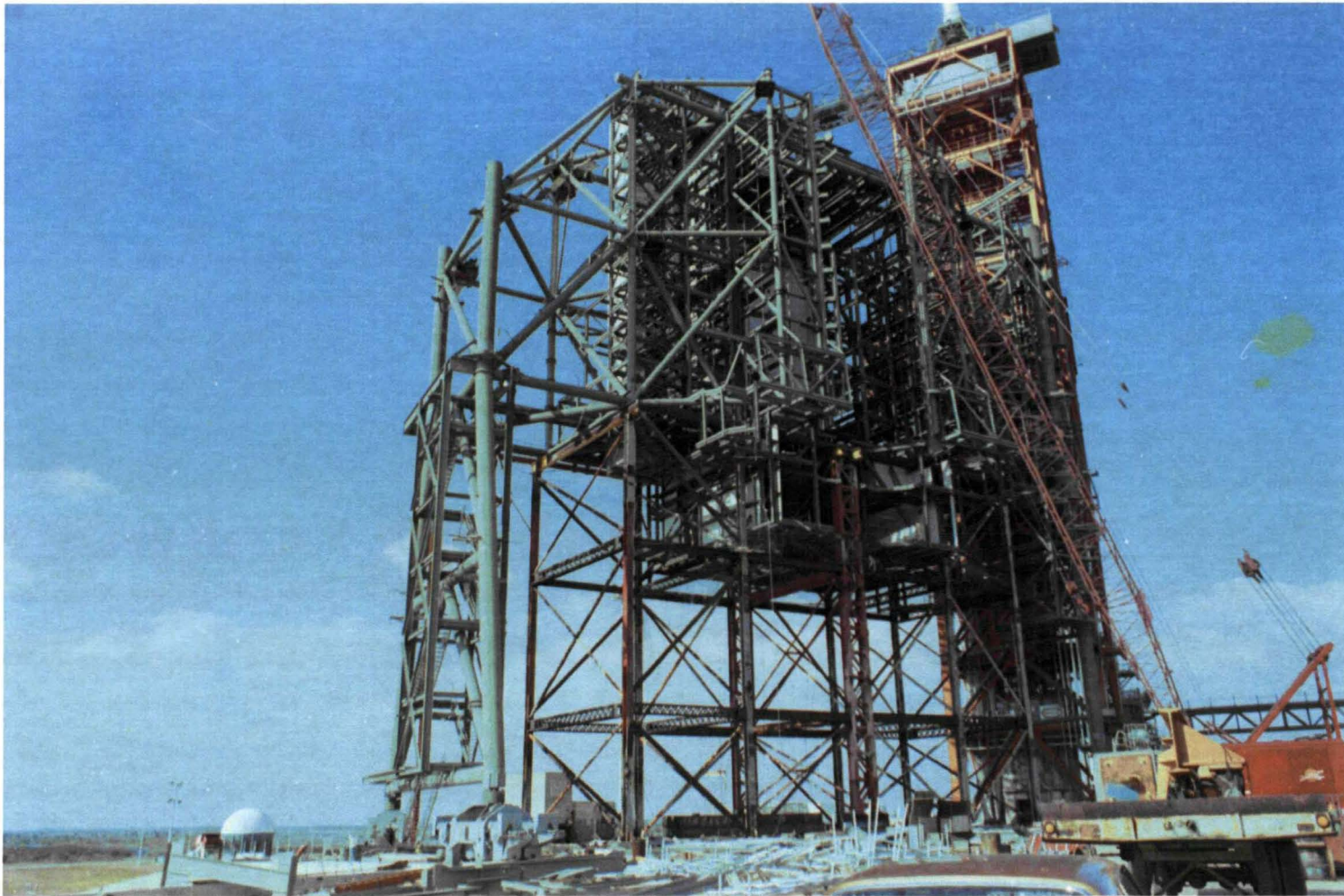
**Flame Trench 42 feet deep,
450 feet long**



Not Your Ordinary Facilities



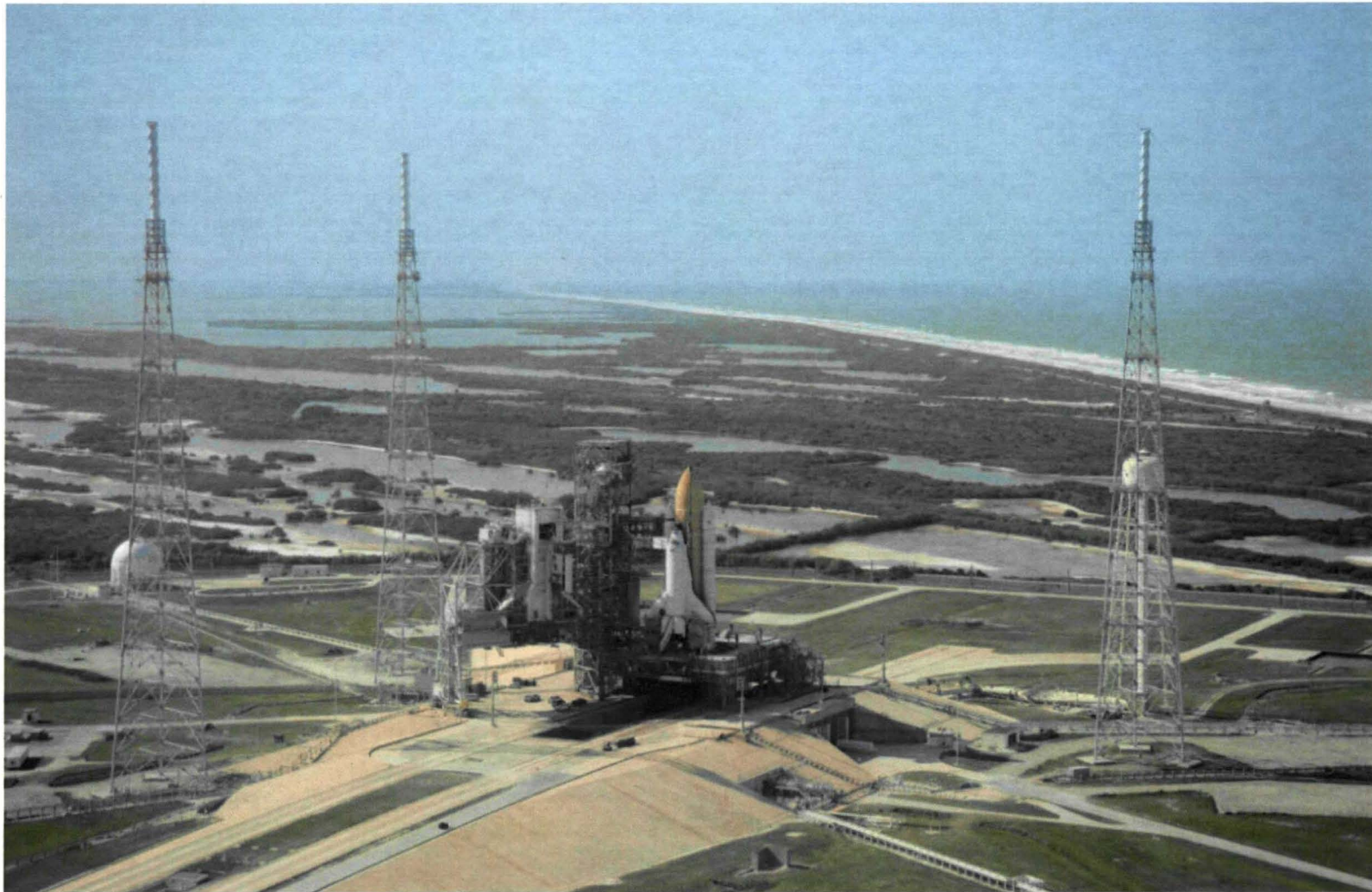
Launch Pads



Not Your Ordinary Facilities



Launch Pads



Not Your Ordinary Facilities



Launch Pads



Not Your Ordinary Facilities



Launch Pads



Not Your Ordinary Facilities



Crawler Transporter

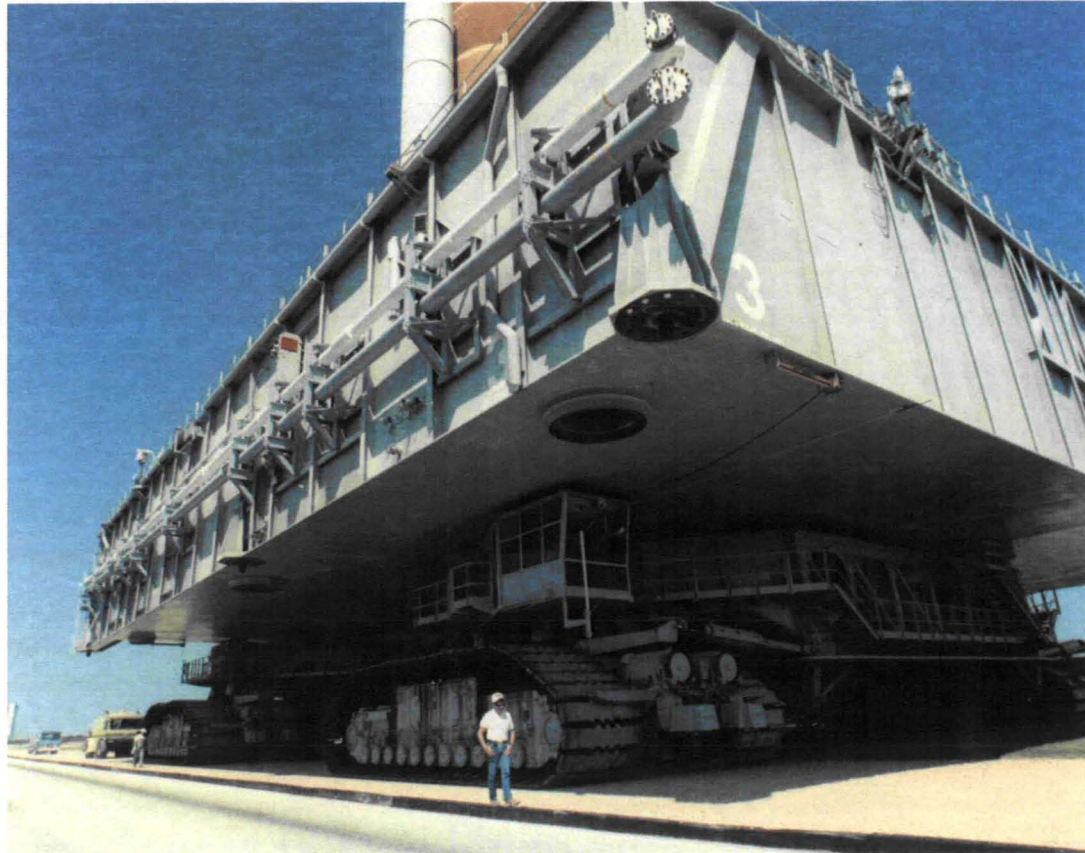


**8 tracks, 57 shoes per track
Each shoe weighs 1 ton**

Not Your Ordinary Facilities



Crawler Transporter & Mobile Launch Platform



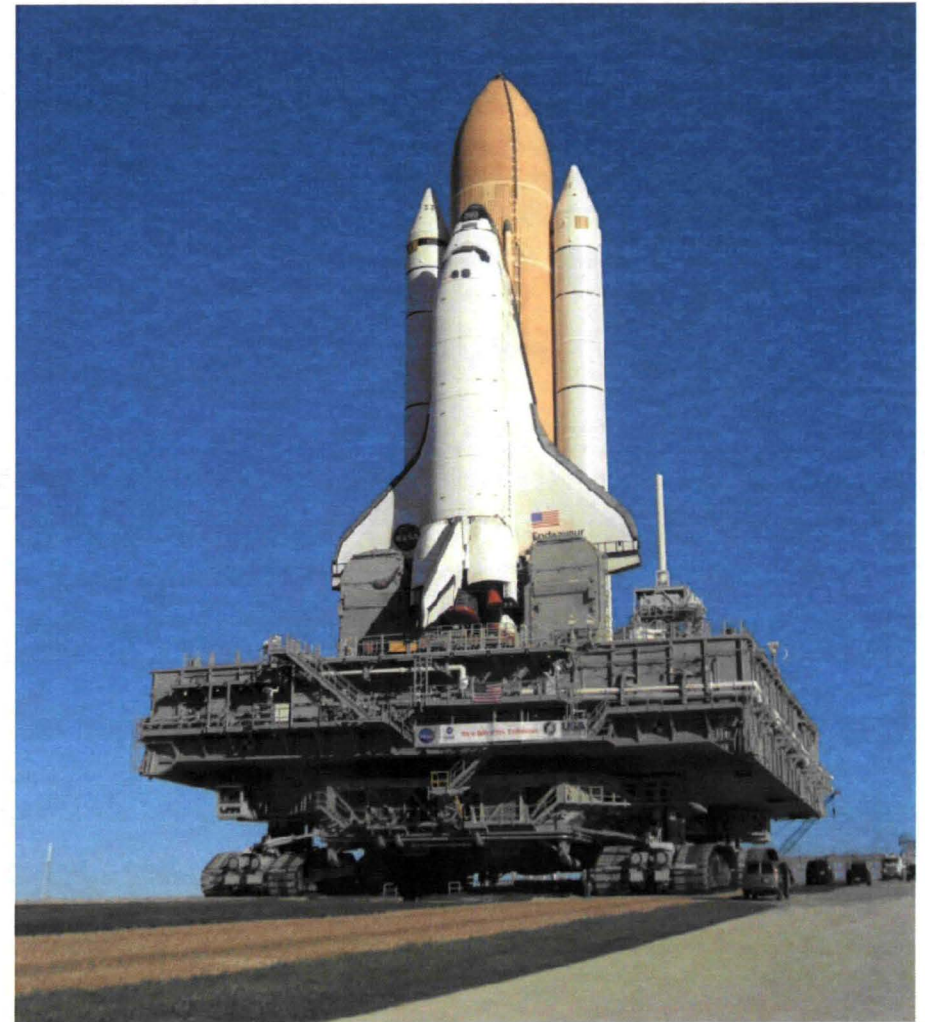
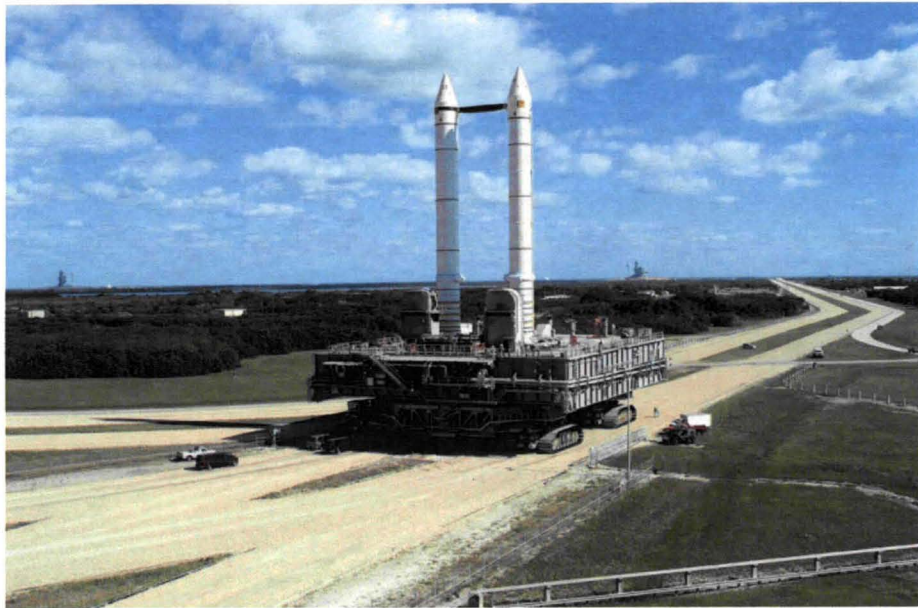
**Travels at 1 mph
Gets 35 feet/gal
Level up to 5% grade**

**Weights 6 million pounds
131 feet long, 114 feet wide**

Not Your Ordinary Facilities



Mobile Launch Platform & Mobile Launcher



Not Your Ordinary Facilities



Not Your Ordinary Facilities



Not Your Ordinary Facilities



Not Your Ordinary Facilities



Not Your Ordinary Facilities



Not Your Ordinary Facilities



Not Your Ordinary Facilities



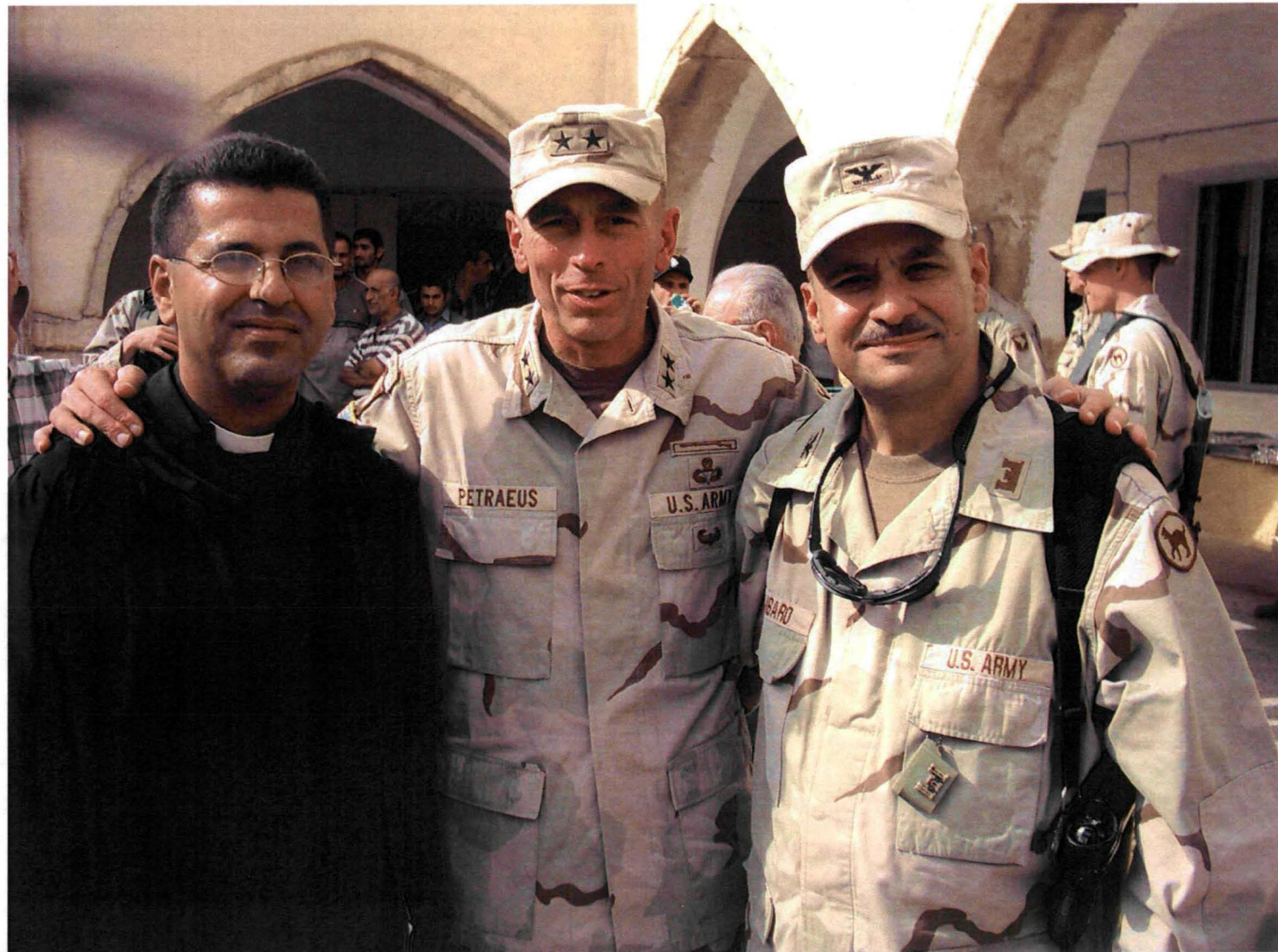
Not Your Ordinary Facilities



Not Your Ordinary Facilities



Not Your Ordinary Facilities



Project Approach



The successful project manager must:

- ◆ **Gain Knowledge from Previous Project Managers and Mentors**
- ◆ **Apply Lessons Learned from Previous Project Experiences**
- ◆ **Draw on experience to provide a vision of the End State required to satisfy known and assumed requirements based on Concept of Operation**
- ◆ **Ensure that all stakeholders are engaged throughout the process**
- ◆ **Must fully understand what must be done to successfully accomplish each activity**
- ◆ **Assemble and Trust a project team with the right skills to bring the project in on time and within budget.**
- ◆ **Allow project team to develop a strategy to design, procure, implement , verify, validate and turn over project for operations to process intended need. Make final decision on strategy to employ**
- ◆ **Develop schedule that supports development and operational readiness dates**
- ◆ **Develop budget that provides for all phases of the project, equipment, labor force, and contingencies . Develop yearly operating Plan (Plan vs. Actual expenditures). Be able to explain variances against your operating plan.**

Project Approach



The successful project manager must:

- ◆ Must be able to sustain audit
- ◆ Own all Project requirements
- ◆ Must have a Project Integrator that understands all project requirements and acts a gate keeper to insure that requirements, schedule and budget are in balance. Insures that requirements creep does not occur
- ◆ Hold Regular Status Reviews for Budget, Schedule, Design and Construction progress. Perform regular field inspections.
- ◆ Assign actions and follow up on due date
- ◆ Bring in consultants to give you independent assessments
- ◆ Manage Risk, Anticipate the Unknowns by making assumptions based on past experience and anticipated requirements
- ◆ Remain Flexible
- ◆ Utilize Technology Effectively
- ◆ Manage Staff Effectively
- ◆ See the Big Picture and Work Toward the Success of the Overall Goal
- ◆ Lead by Example
- ◆ Celebrate Accomplishments



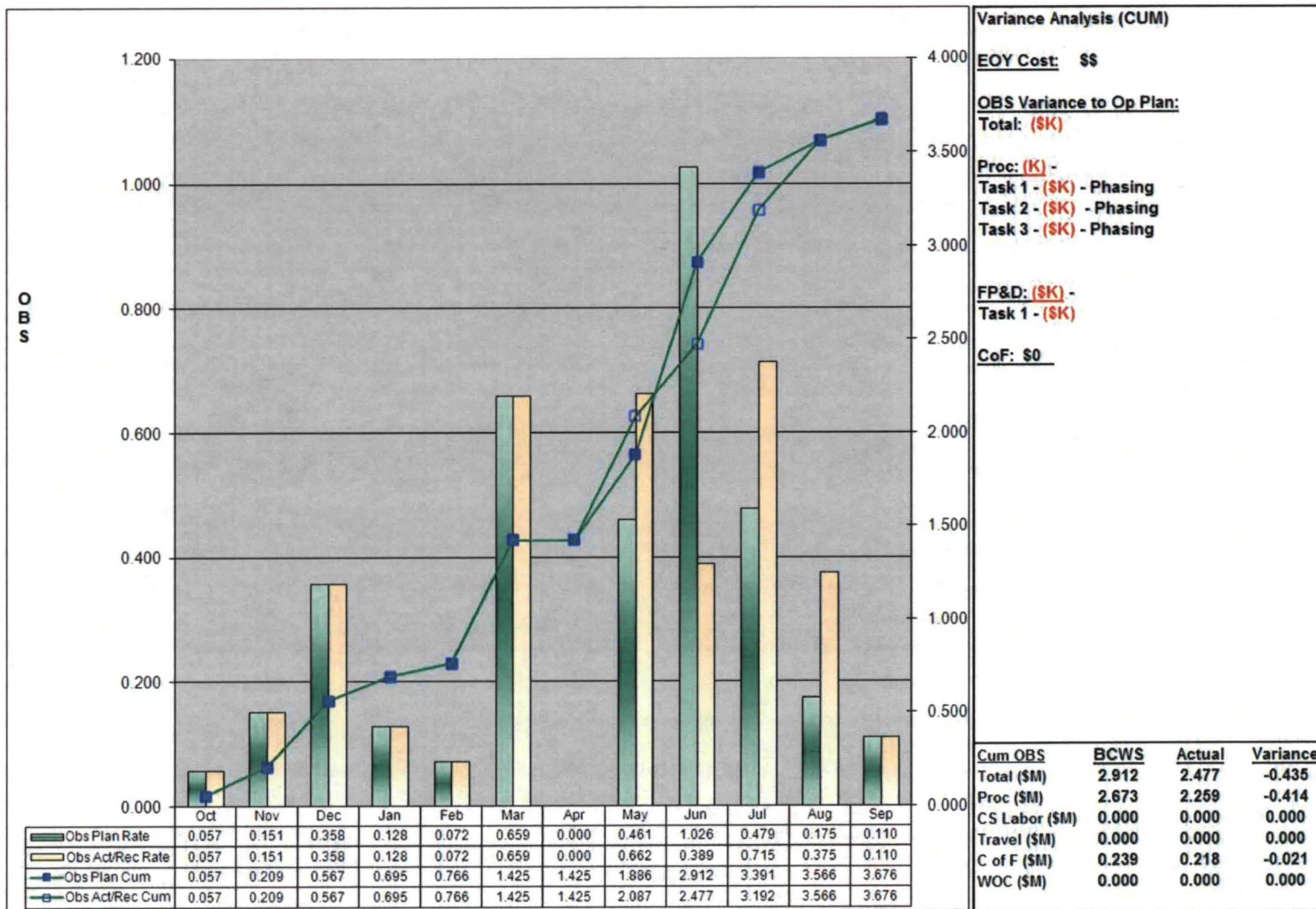
Projects at KSC Follow a Specific Approach:

- ◆ **Develop Preliminary Requirements**
- ◆ **Conduct a Study**
- ◆ **Further Requirements Development**
- ◆ **Advance the Design**
- ◆ **Construct, Fabricate and Install**
- ◆ **Activate**
- ◆ **Facility Outfitting**
- ◆ **Support Equipment Construct, Fabricate and Install**
- ◆ **Activate**
- ◆ **Verify and Validate**
- ◆ **Extensive Reporting at Each Phase**
 - **Program Reviews**
 - **Design Certifications**
 - **Operational Readiness Reviews**
 - **Status Reviews for Budget, Schedule, Design and Construction**

Project Performance Tools



Obligations Performance Metric



Variance Analysis (CUM)

EOY Cost: \$\$

OBS Variance to Op Plan:

Total: (\$K)

Proc: (K) -

Task 1 - (\$K) - Phasing

Task 2 - (\$K) - Phasing

Task 3 - (\$K) - Phasing

FP&D: (\$K) -

Task 1 - (\$K)

CoF: \$0

	Cum OBS	BCWS	Actual	Variance
Total (\$M)	2.912	2.477	-0.435	
Proc (\$M)	2.673	2.259	-0.414	
CS Labor (\$M)	0.000	0.000	0.000	
Travel (\$M)	0.000	0.000	0.000	
C of F (\$M)	0.239	0.218	-0.021	
WOC (\$M)	0.000	0.000	0.000	

Project Management Challenges



- ◆ **Requirements not fully mature (creates risk)**
 - Assumptions change during design / construction
- ◆ **Schedule**
 - ORDs / Project Interdependencies
- ◆ **Budget / Funding Profiles**
 - Design and Construction activities are Affected by Funding
- ◆ **Changing Political Climate**
 - Administration Sets Policy
- ◆ **Servicing Multiple Customers**
 - Accommodating NASA and Commercial Interests

Common Denominators



- ◆ **Project Scope**
 - Requirements
 - Documentation Process
- ◆ **Schedule**
 - Operational Readiness Dates
 - Project Interdependencies
- ◆ **Budget**
 - Funding Profiles
 - Contract Vehicles

Project Approach



Questions?