A-3 Altitude Test Facility
Tulane Engineering Forum
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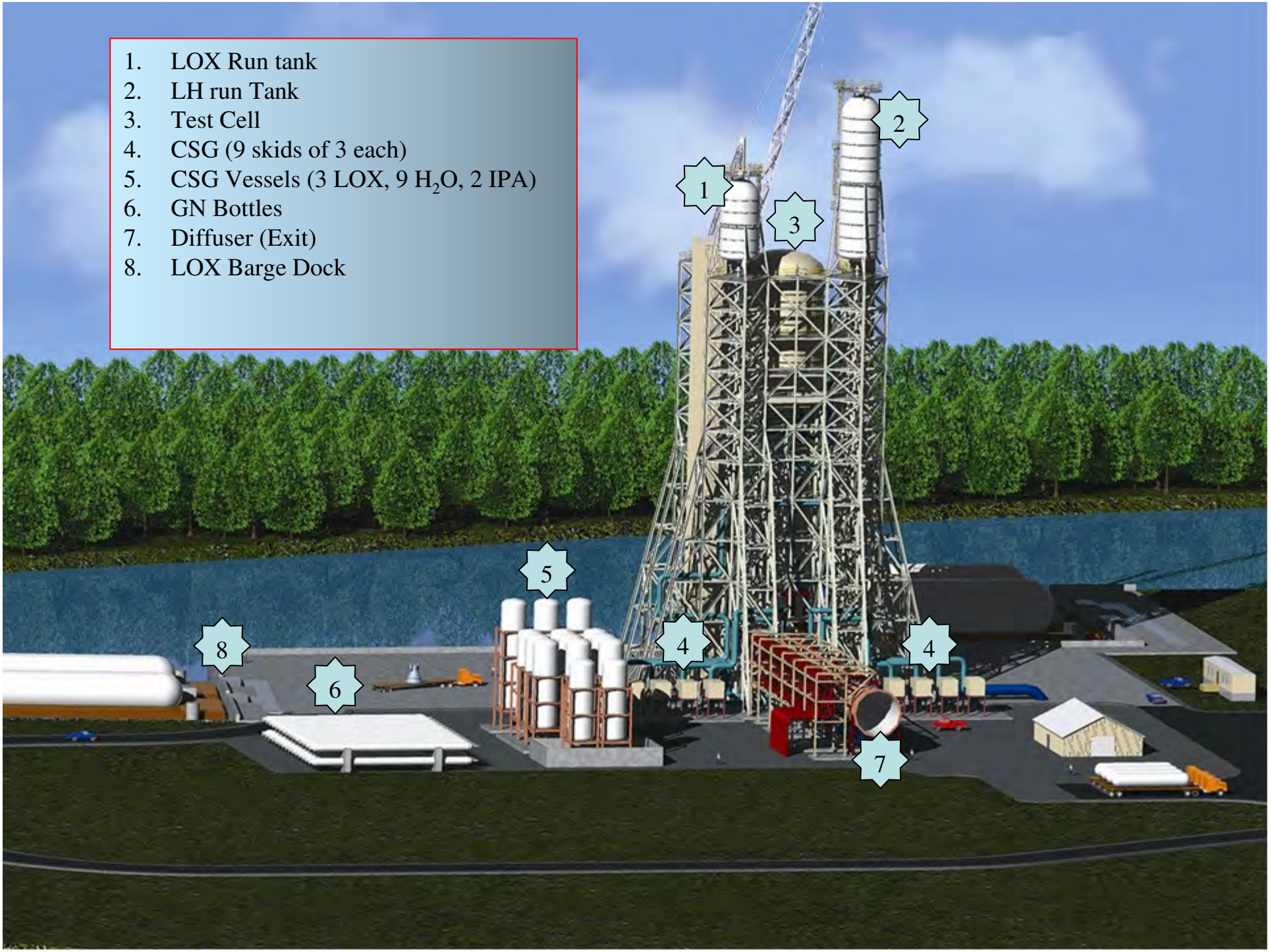
Lonnie Dutreix A3 Project Manager


1. LOX Run tank
2. LH run Tank
3. Test Cell
4. CSG (9 skids of 3 each)
5. CSG Vessels (3 LOX, 9 H_2O, 2 IPA)
6. GN Bottles
7. Diffuser (Exit)
8. LOX Barge Dock
1
2
3
4
4
5
6
7
8

Constellation Launch Vehicle Elements

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LAS

Crew Exploration Vehicle (CEV)
(Crew Module / Service Module)

Instrument Unit

Spacecraft Adapter

Forward Skirt

Upper Stage

J-2X Upper Stage Engine

Interstage

Forward Frustum

First Stage
(5-Segment Reusable Solid
Rocket Booster (RSRB))

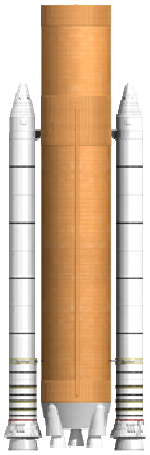
Crew Launch Vehicle

Composite Shroud

LSAM

EDS Stage
LOx/LH2
One J2S+ Engine
Al-Li Tanks/Structures

Interstage

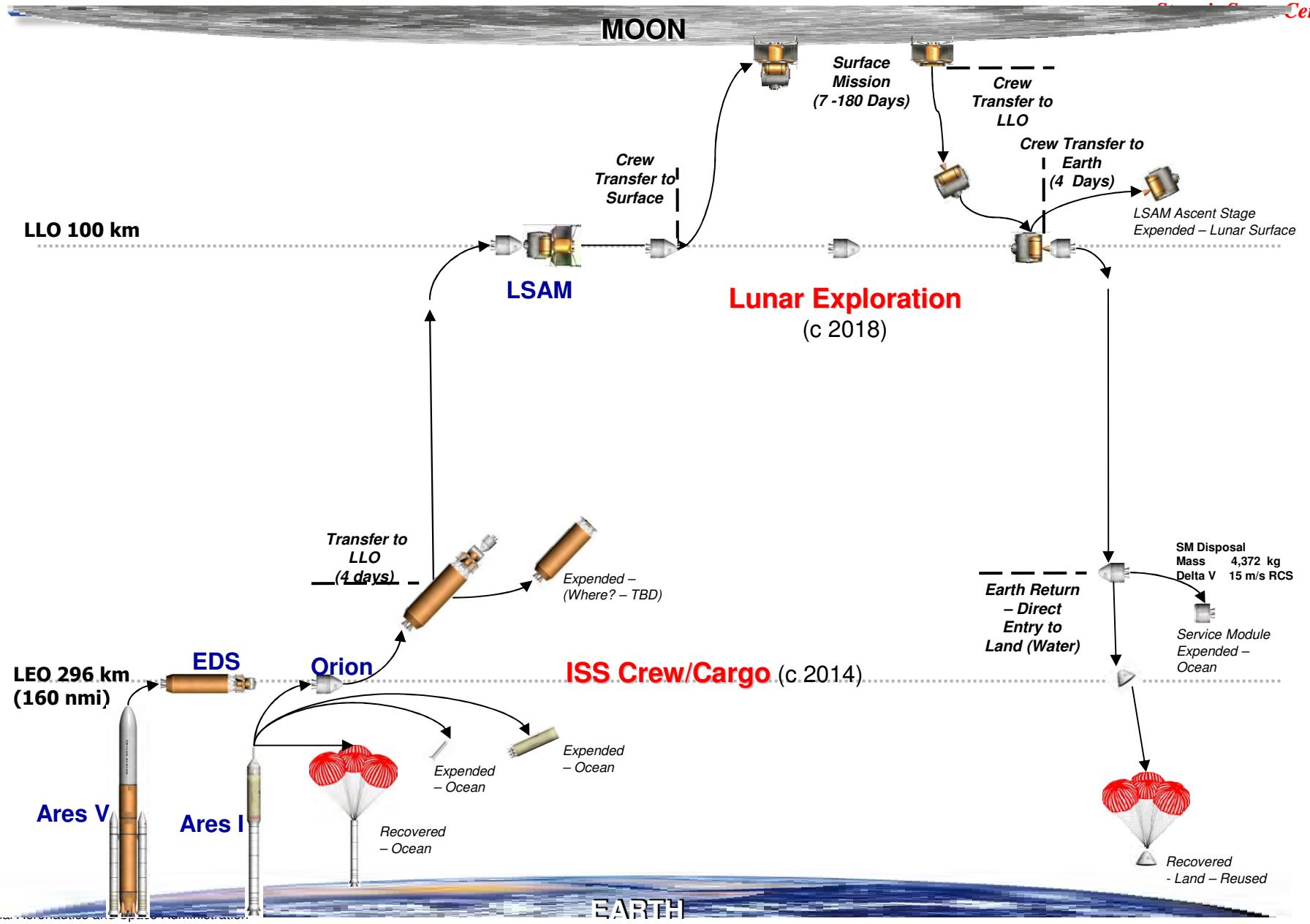


Core Stage
LOx/LH2
Five RS-68 Engines
Al-Li Tanks/Structures

Two 5-Segment RSRBs

Cargo Launch Vehicle

CxP ISS and Lunar Reference Mission



Propulsion Test Facility Trades for J-2X Altitude Testing

Altitude Test Facility Requirements

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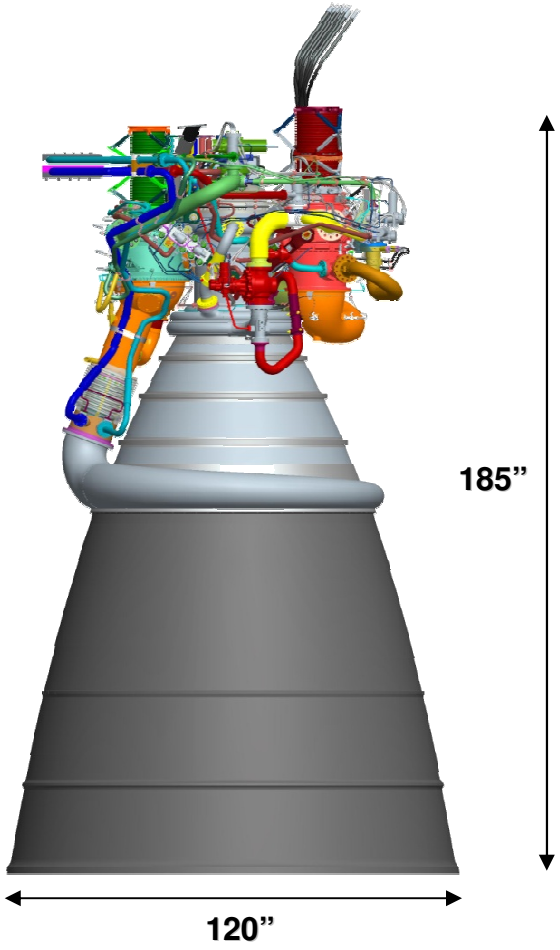

- **A3 Facility Requirements**
  - **Start/Run Pressure: 0.16-0.4 psia (100-80 Kft)**
  - **Run Duration: 550 sec**
  - **Gimbal Angle: 5° (square pattern)**
  - **Maximum Thrust Load: 1.0 Mlbf (vertical)**
  - **Provide maximum flexibility for future test configurations**
    - Sea-level testing
    - Stage testing
  - **Utilize existing propulsion test infrastructure, including cryogenics, barges, high pressure water, high pressure gas, engine assembly and warehousing facilities, skilled workforce, etc.**

A-3 Altitude Test Facility

Meeting J-2X Project Requirements

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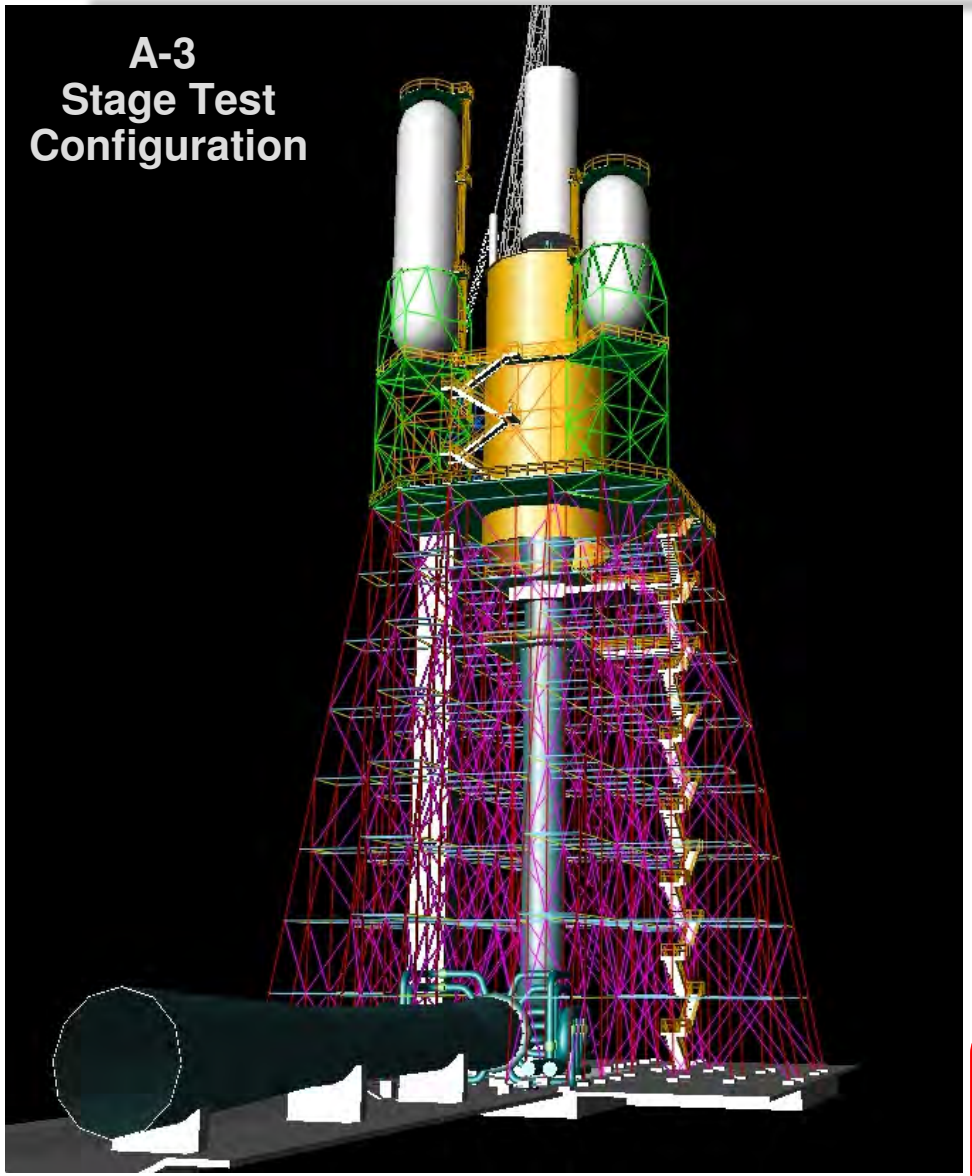

- **Design**
  - Simplicity of "open diffuser" eliminates need for complex spray condensing chamber, dewatering & exhaust systems
  - Design maximizes use of commercially available industrial components
  - Key design elements based on established traditional rocket diffuser and chemical steam generator concepts supported by extensive operational data (40+ years)
  - Early design risk mitigation thru testing of subscale diffuser and chemical steam generators at SSC
- **SSC Location Benefits**
  - Experienced test crews available
  - Enables workforce flexing across test stands
  - Enables efficient utilization of SSC's extensive propulsion test infrastructure
  - Collocation of J-2X test facilities with engine assembly, integration and warehousing facility reduces logistics costs

A-3 gives NASA at least one new large sea level & altitude capable test stand for the next 40 years

A-3 Test Stand 3-D Layout

Test Cell and Thrust Takeout

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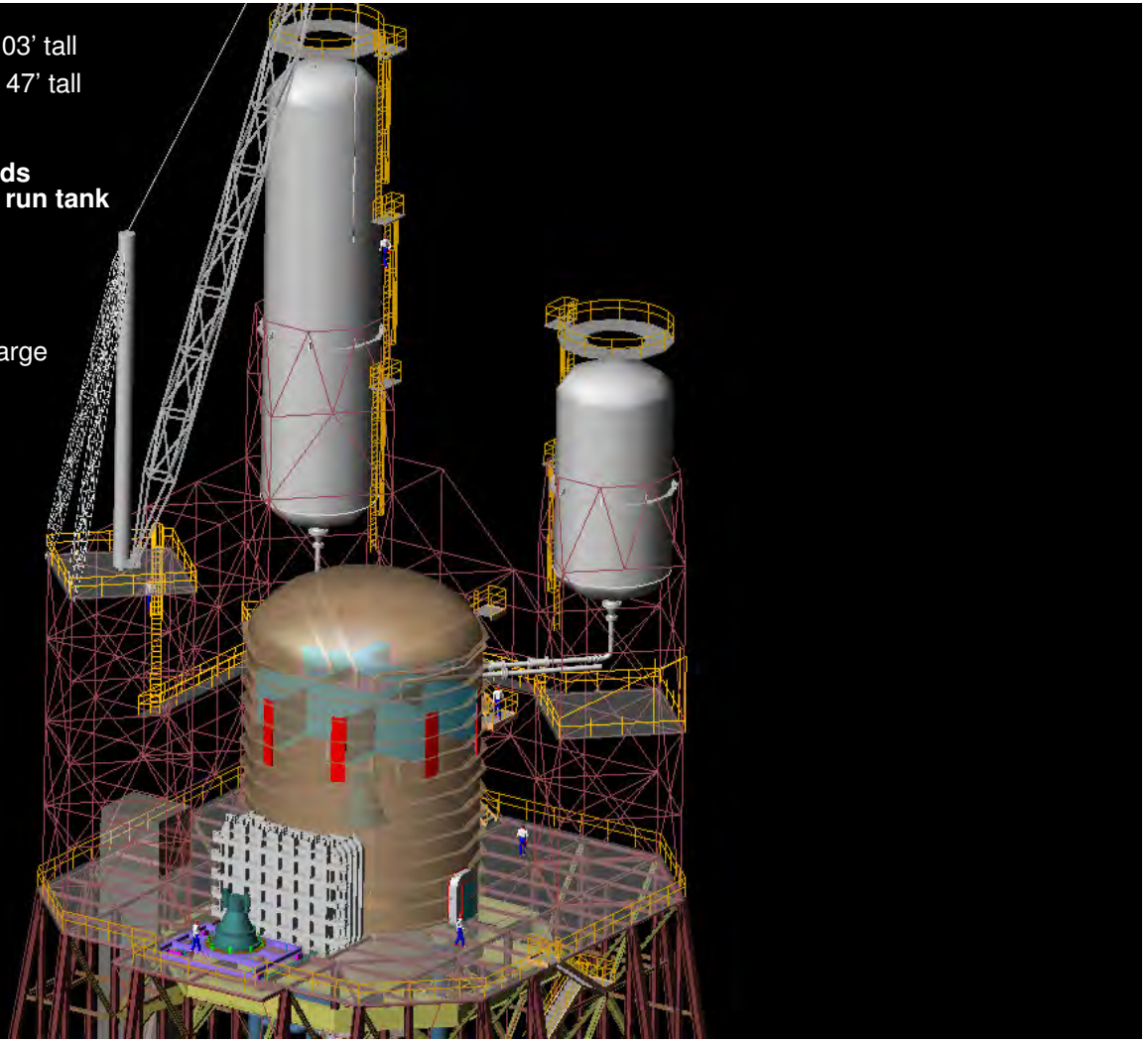
- 80,000 gallon LH tank, 13’ O.D., 103’ tall
- 35,000 gallon LOX tank: 13’ O.D., 47’ tall
- Volume includes:
  - **10% ullage**
  - **Test duration: 600 seconds**
  - **10% remaining in heel of run tank**
- Volume not included:
  - **Chill down of run line**
  - **Fill run line**
  - **Chill test article**
- Tank will be topped off from the barge after chilling and filling



A-3 Test Stand 3-D Layout

Engine Deck and Superstructure

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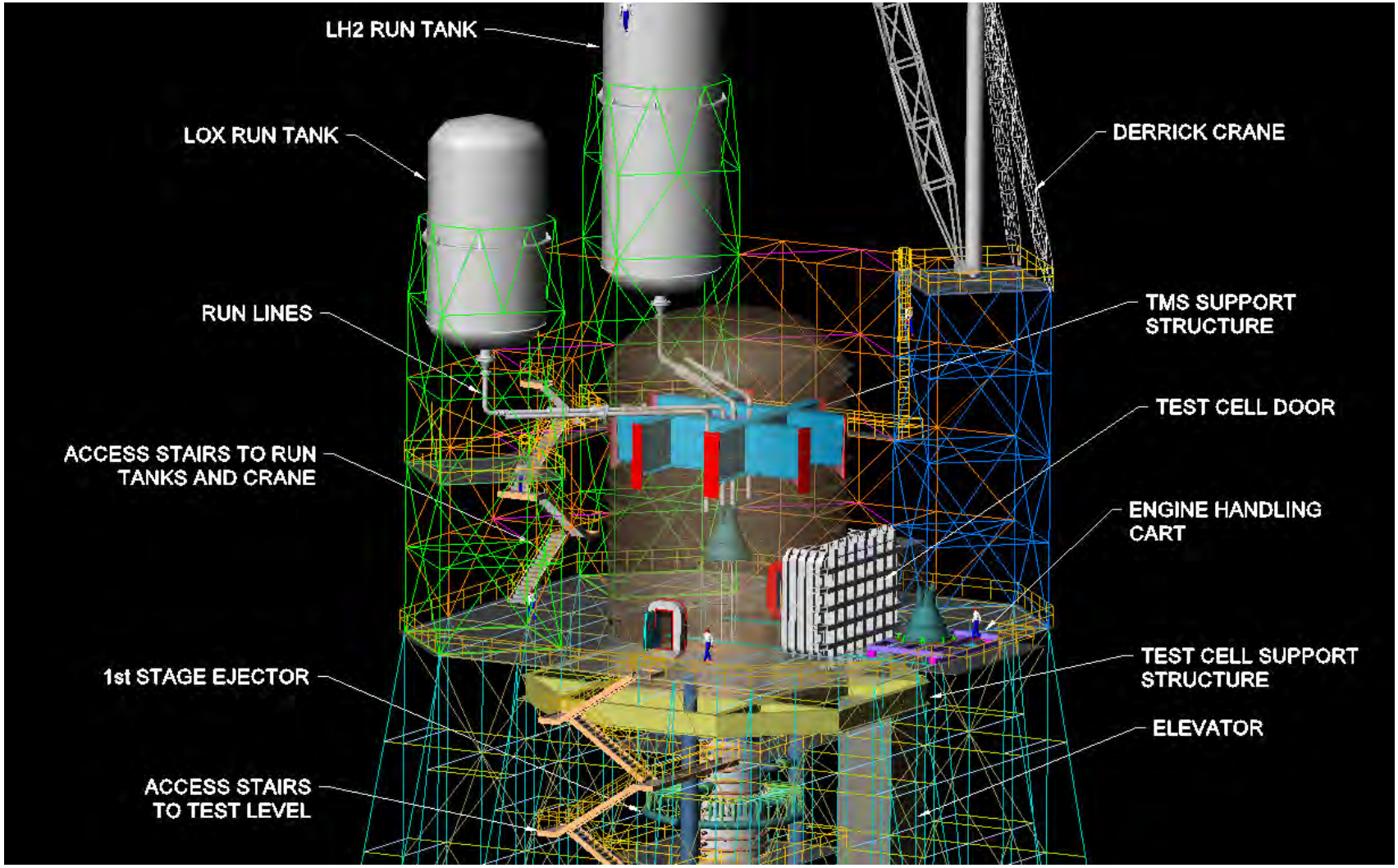

A-3 Test Stand 3-D Layout

Structure and Altitude Support Systems

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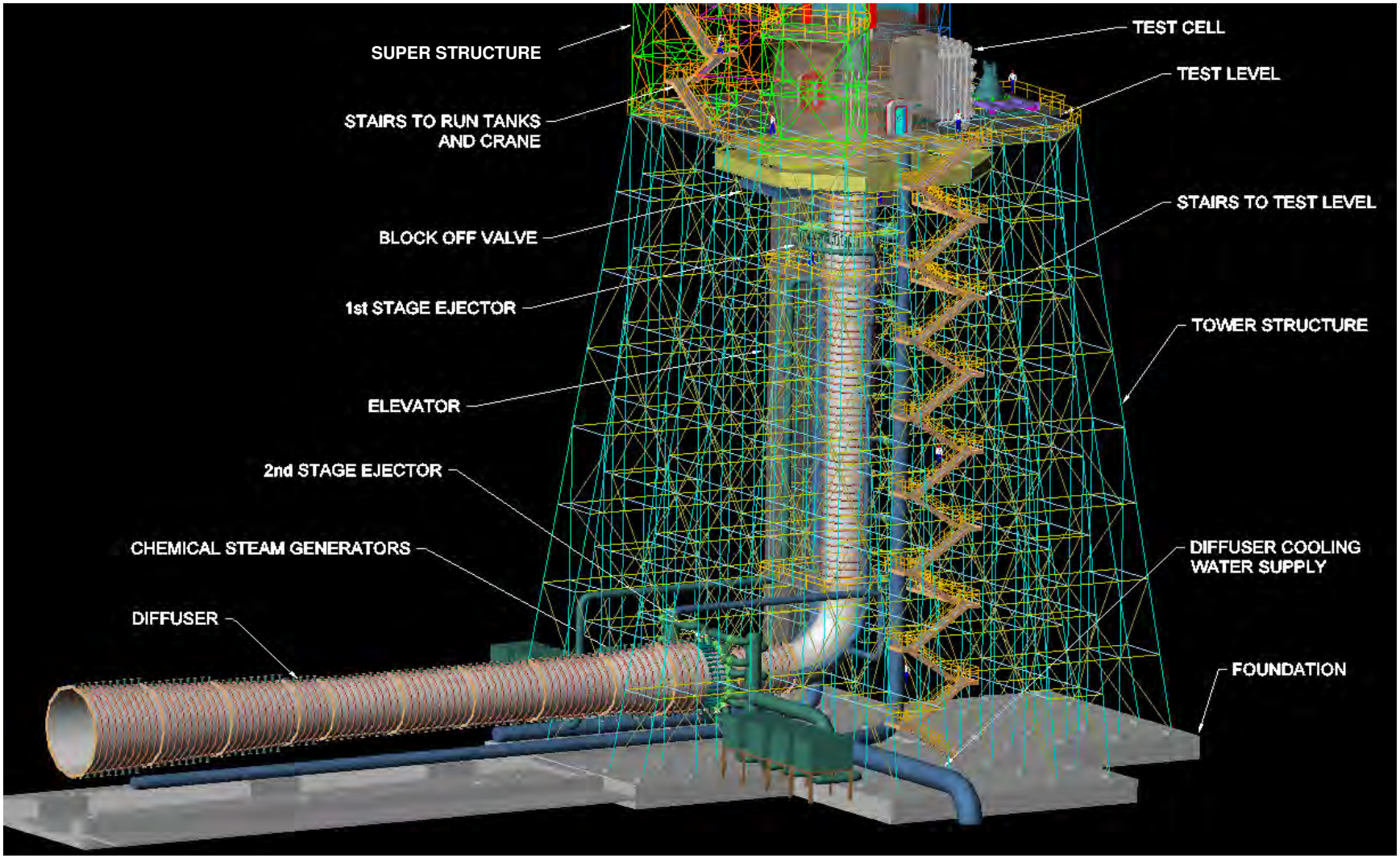

Steam System

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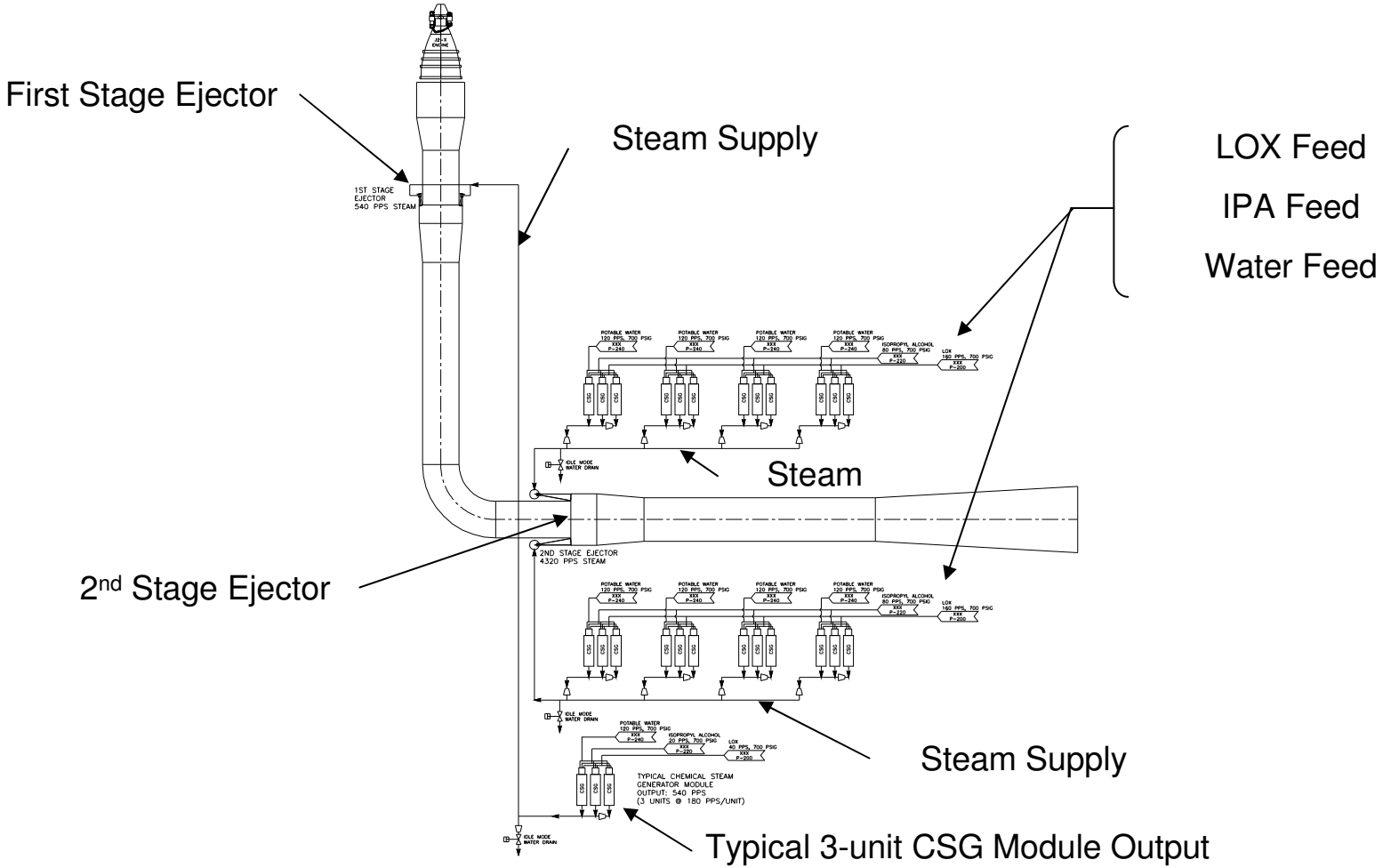
- **A-3 Steam System Schematic Diagram**



Chemical Steam Generators

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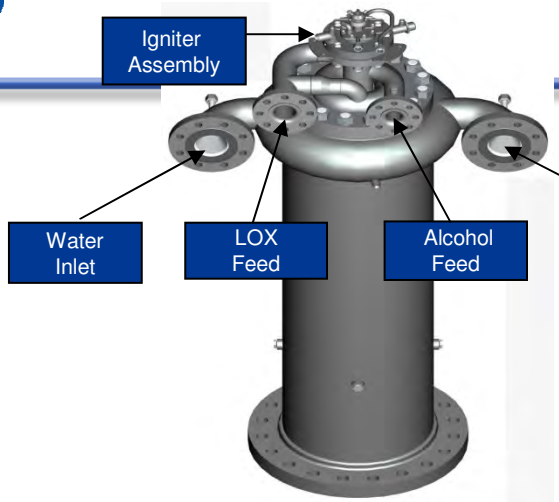

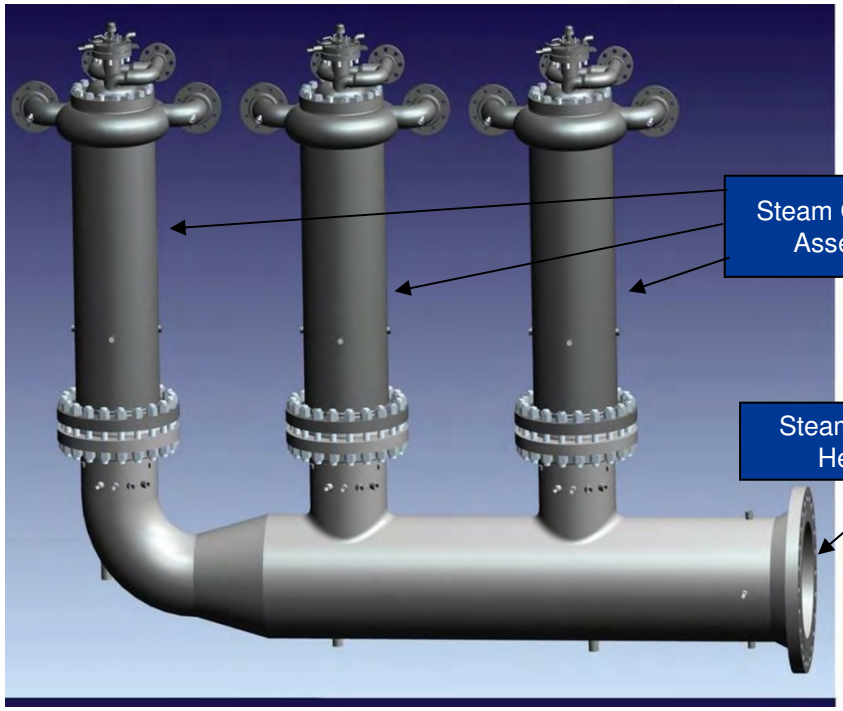

Chemical Steam Generators

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- **CSG cans for facility operation risk mitigate testing have been fabricated and tested**

Development CSG Can

Subscale Diffuser

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Stennis A-3 Site Location

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A3 Construction Site

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A3 Construction Site

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