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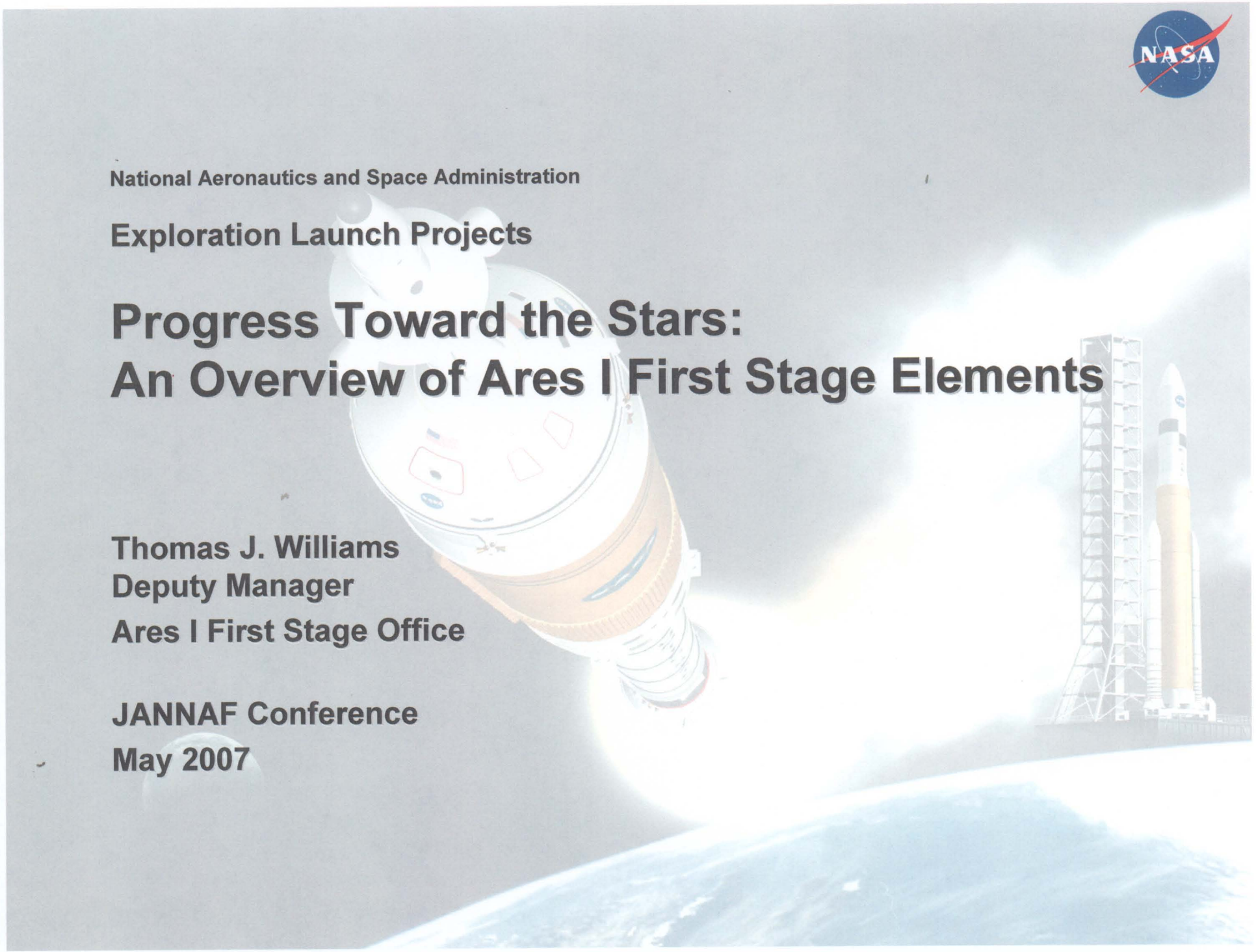

National Aeronautics and Space Administration

Exploration Launch Projects

Progress Toward the Stars: An Overview of Ares I First Stage Elements

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Ares I First Stage Office

JANNAF Conference
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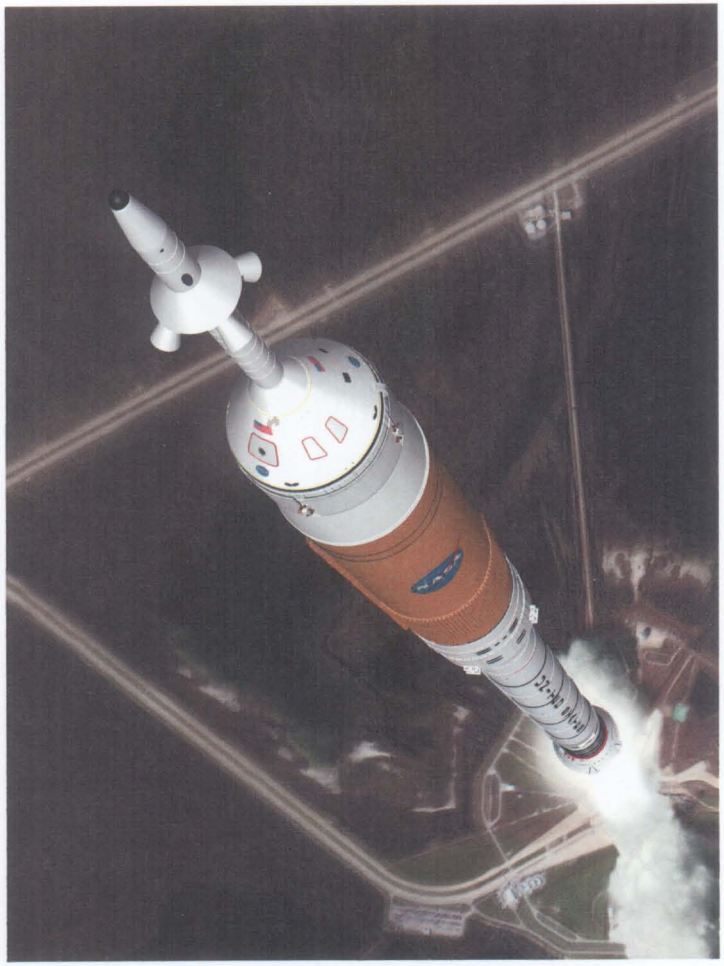
Agenda

- Overview of the Ares Launch Vehicles
- Progress toward Preliminary Design Review (PDR)
- Progress on design, development, test, and evaluation
- Ares I First Stage subsystem technical progress

Overview of the Exploration Launch Projects Architecture



- Carries Crew Exploration Vehicle (CEV) to orbit to rendezvous with International Space Station or Ares V
- Ares I propulsion:

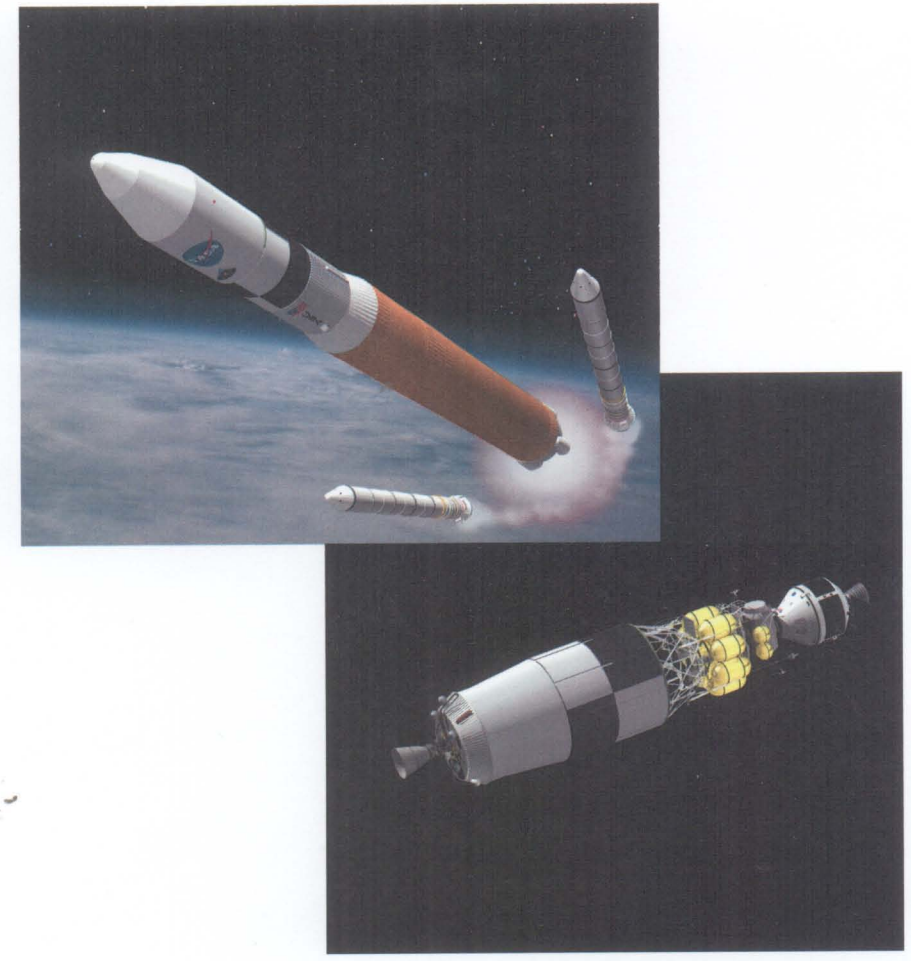
  First Stage

  – 5-segment Reusable Solid Rocket Booster (RSRB)

  Upper Stage

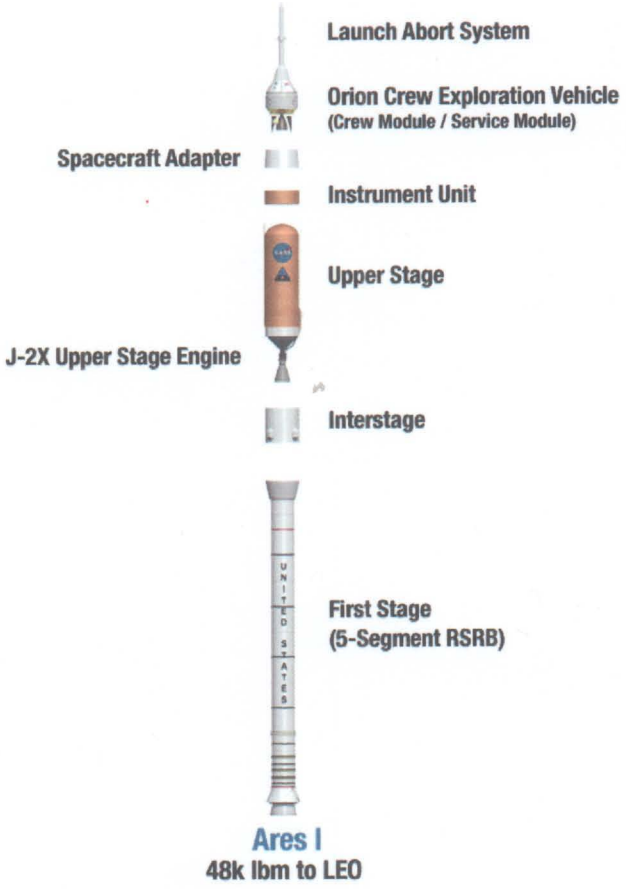
  – J-2X

Exploration Launch Projects Architecture, Continued



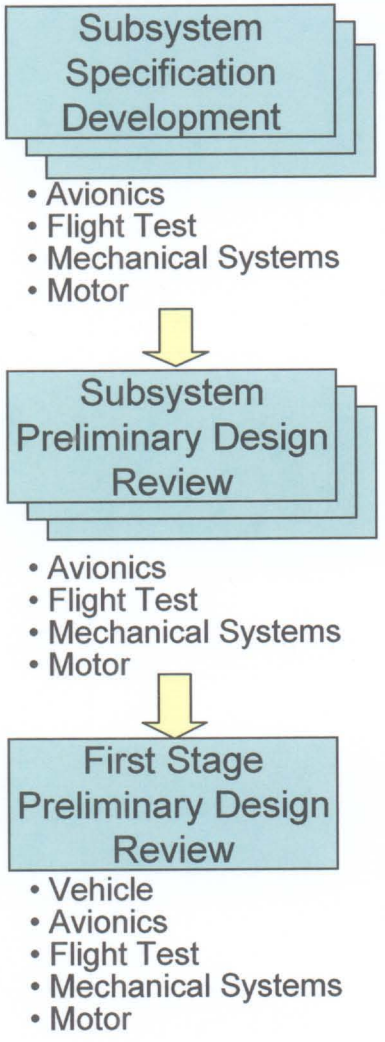
- Ares V carries cargo to ISS or Lunar Surface Access Module (LSAM) and Earth Departure Stage to orbit
- Ares V Propulsion:
  - *Core Stage*
    - 2 RSRBs
    - 5 RS-68
    - 33-foot (10 meter) diameter
  - *Earth Departure Stage*
    - J-2X for orbit circularization and Trans-lunar injection (TLI) burn
- Common hardware and procedures with Ares I to reduce development and operations costs

First Stage Participants



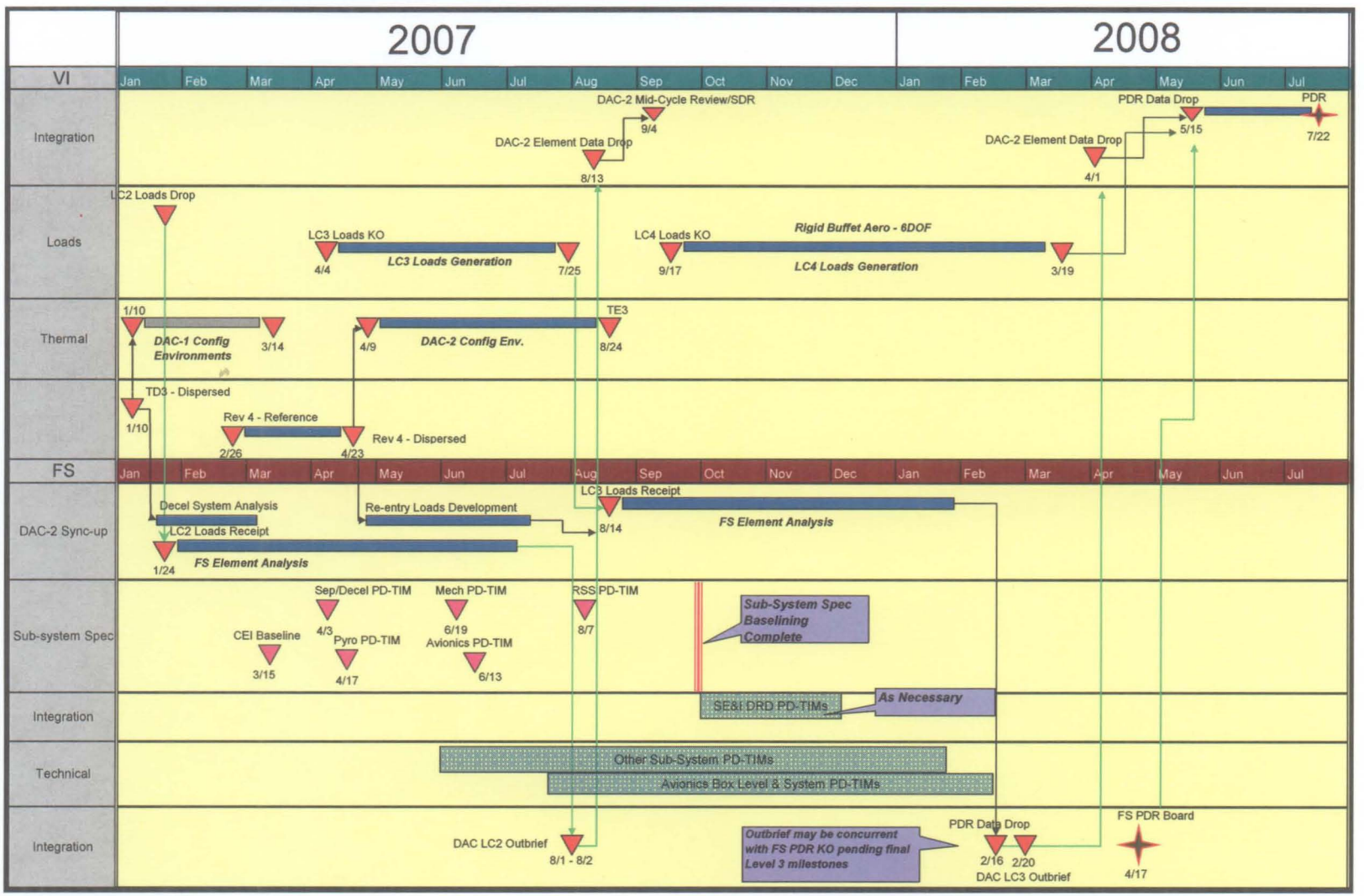
- *The Exploration Launch Projects Office*
  Managing design, development, and manufacturing of Ares
- *The First Stage Element Office*:
  Manages First Stage Design, development, and manufacturing of the First Stage booster
- *ATK Launch Systems*
  Performing First Stage Design, Development and Manufacturing
- *Kennedy Space Center (KSC) Ground Operations*
  Performing Ares I physical integration and launch operations

PDR Planning

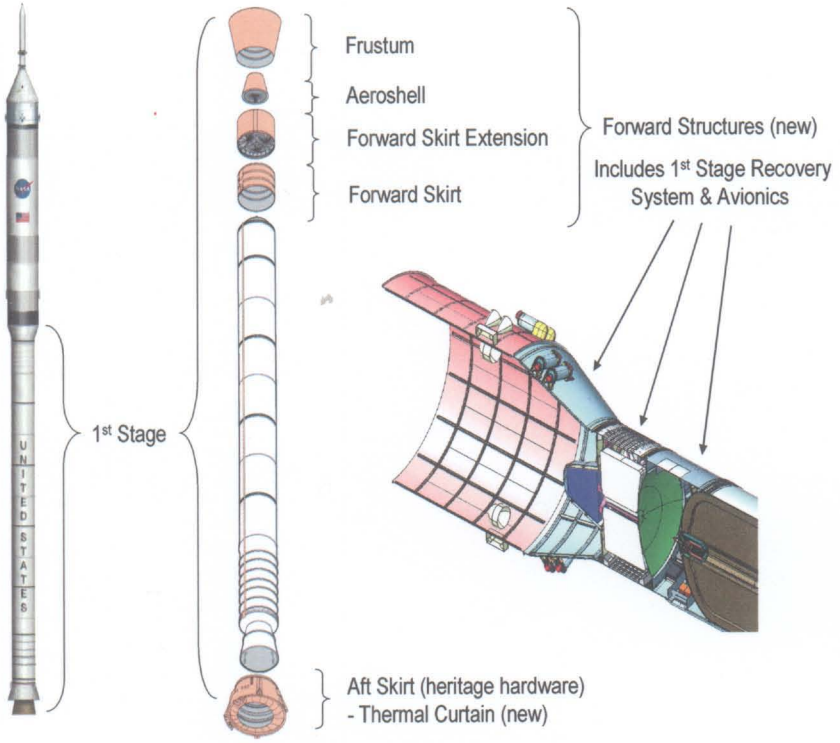


- First Stage Element System Requirements Review (SRR) was held in December 2006, recommended PDR
- First Stage PDR objectives:
  - Subsystem and component specifications developed
  - Review Drawings
  - Design evaluations
    - Test and Analyses Reports review
    - Safety factor assessments
- Successful PDR will lead to full vehicle design for Critical Design Review (CDR) in September 2009

DDT&E Schedule Progress

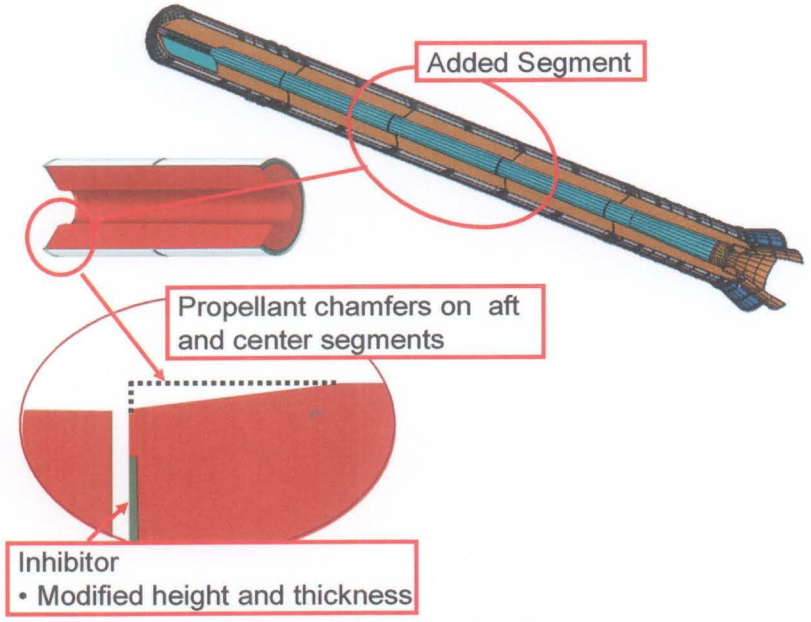


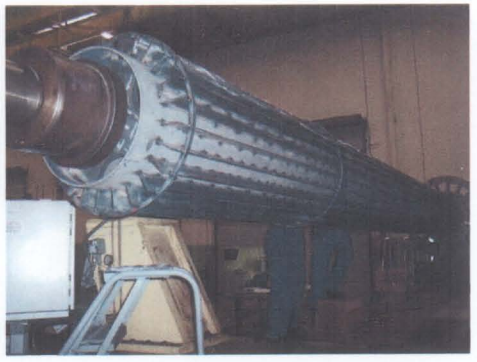
Structures



- *Frustum* - The frustum's primary function is to provide the physical transition from the smaller diameter of the First Stage and the larger diameter of the Upper Stage.
- *Forward Skirt Extension* - The forward skirt extension houses the Main Parachute Support System (MPSS) and main parachutes for First Stage recovery.
- *Forward Skirt* – The forward skirt of the Ares I houses the First Stage avionics
- *Aeroshell* – Contains pilot and drogue chutes
- *Aft Skirt* – Houses TVC system and provides vehicle launch pad interface
- *Motor case and nozzle structures* – Provides motor pressure vessel and structural support for nozzle insulators

Motor and Propellant





- Modified propellant grain shape – 12 fins
- Added chamfers and modified vertical inhibitor height
- Nozzle throat increased
- Modified propellant burn rate
- Core mandrels in fabrication
- Nozzle process articles in fabrication
- Subsystem specification 70% complete

Avionics, Flight Termination System (FTS), and Pyro Shock Testing

LSC Extension

Avionics & Controls

- Preliminary architecture defined
- Conducted assessment of the Thrust Vector Control (TVC) system's requirements

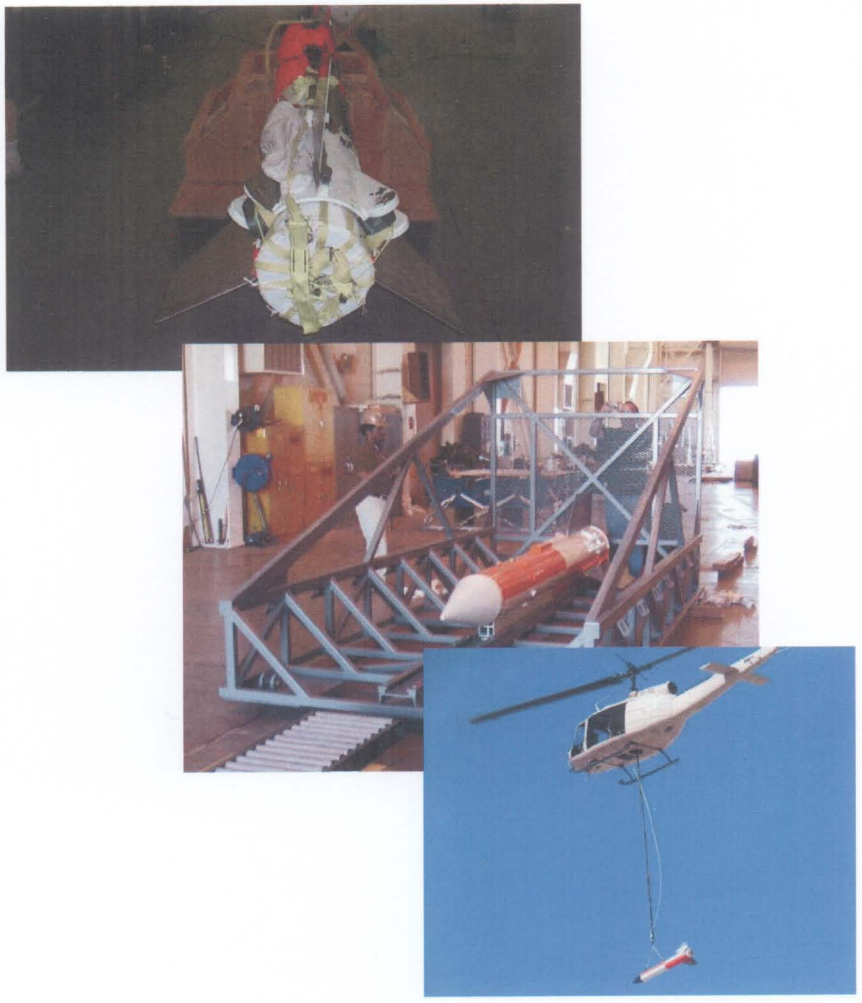
FTS

- Linear Shaped Charge (LSC) extended to fourth segment for Ares I-X—will reach all five segments on operational Ares I
- Requirements tailoring with the 45th Space Wing is progressing

Pyro Shock Testing

- Conducting pyro shock testing to characterize shock loads on avionics and reaction control thrusters
- Trade study complete regarding confined detonating fuse vs. flexible confined detonating cord (FCDC)

Parachute Testing



- Three sets of parachutes:
  - Pilot
  - Drogue
  - Main
- Drop testing of pilot parachutes at Yuma Proving Grounds
- Two successful tests, one failure; more tests of pilot and drogue scheduled for later this year

Summary

- Because the Ares I First Stage builds upon Space Shuttle legacy hardware, significant hardware design has been accomplished
- Critical design efforts associated with new avionics, structures and range safety systems
- The First Stage team is confident and picking up momentum moving into PDR

Contact Information

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Questions?