

Progress on Ares First Stage Propulsion

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Abstract

The mission of the National Aeronautics and Space Administration (NASA) is not simply to maintain its current position with the International Space Station and other space exploration endeavors, but to build a permanent outpost on the Moon and then travel on to explore ever more distant terrains. The Constellation Program will oversee the development of the crew capsule, launch vehicles, and other systems needed to achieve this mission. From this initiative will come two new launch vehicles: the Ares I and Ares V. The Ares I will be a human-rated vehicle, which will be used for crew transport; the Ares V, a cargo transport vehicle, will be the largest launch vehicle ever built. The Ares Projects team at Marshall Space Flight Center (MSFC) in Huntsville, Alabama is assigned with developing these two new vehicles. The Ares I vehicle will have an in-line, two-stage rocket configuration. The first stage will provide the thrust or propulsion component for the Ares rocket systems through the first two minutes of the mission. The First Stage Team is tasked with developing the propulsion system necessary to liftoff from the Earth and loft the entire Ares vehicle stack toward low-Earth orbit. Building on the legacy of the Space Shuttle and other NASA space exploration initiatives, the propulsion for the Ares I First Stage will be a Shuttle-derived reusable solid rocket motor. Progress to date by the First Stage Team has been robust and on schedule. This paper provides an update on the design and development of the Ares First Stage Propulsion system. The presentation provides an overview of the information presented in the paper.



Ares V and Ares I. (NASA artist's concept)

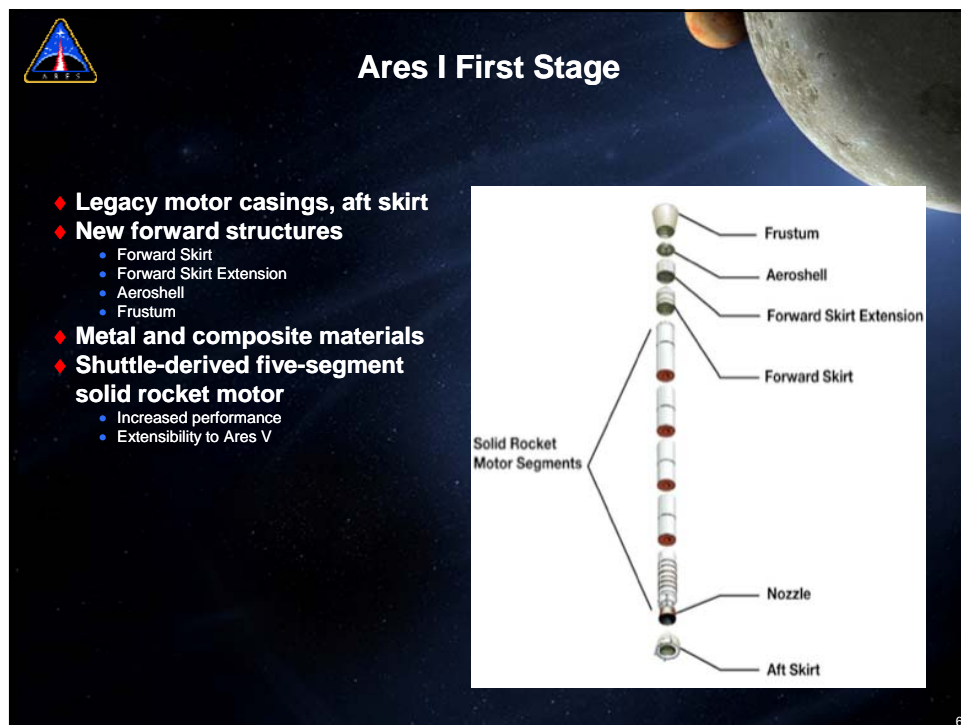
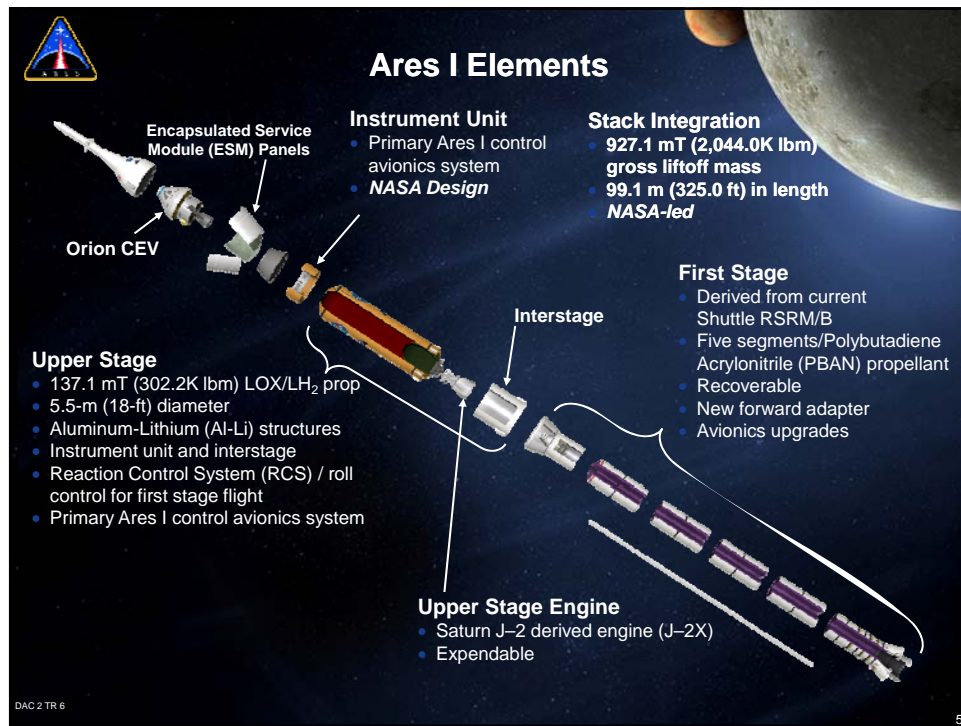
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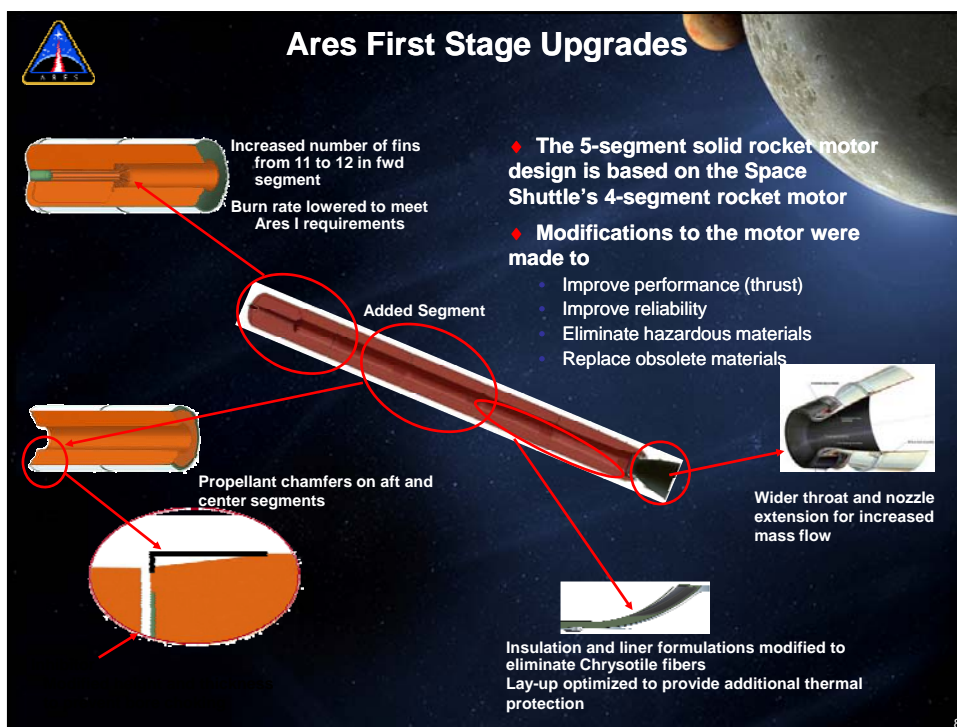
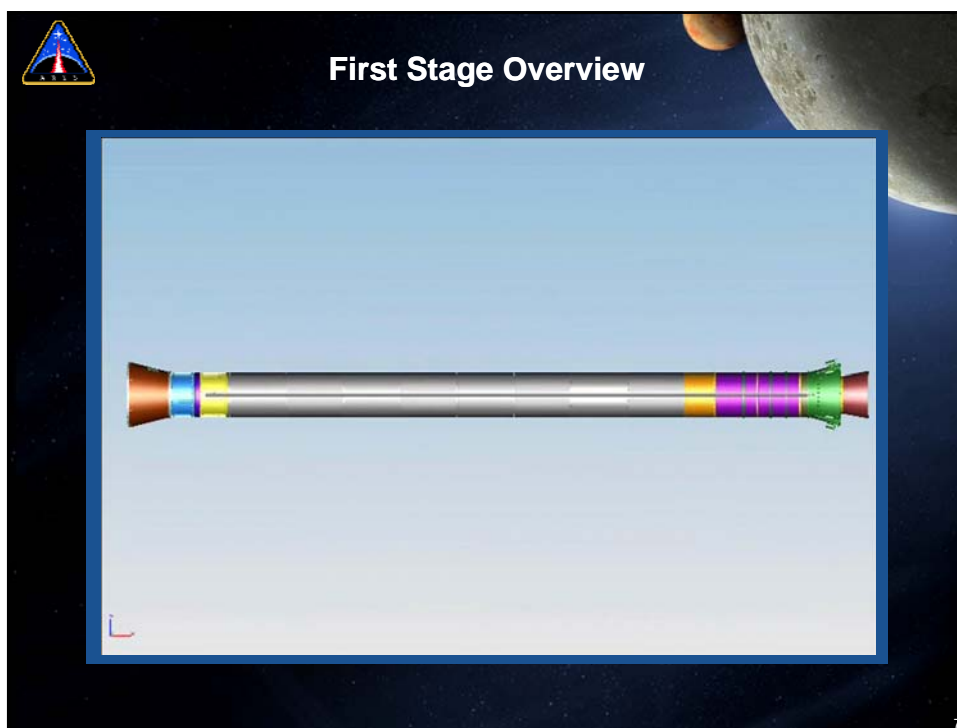
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First Stage Testing

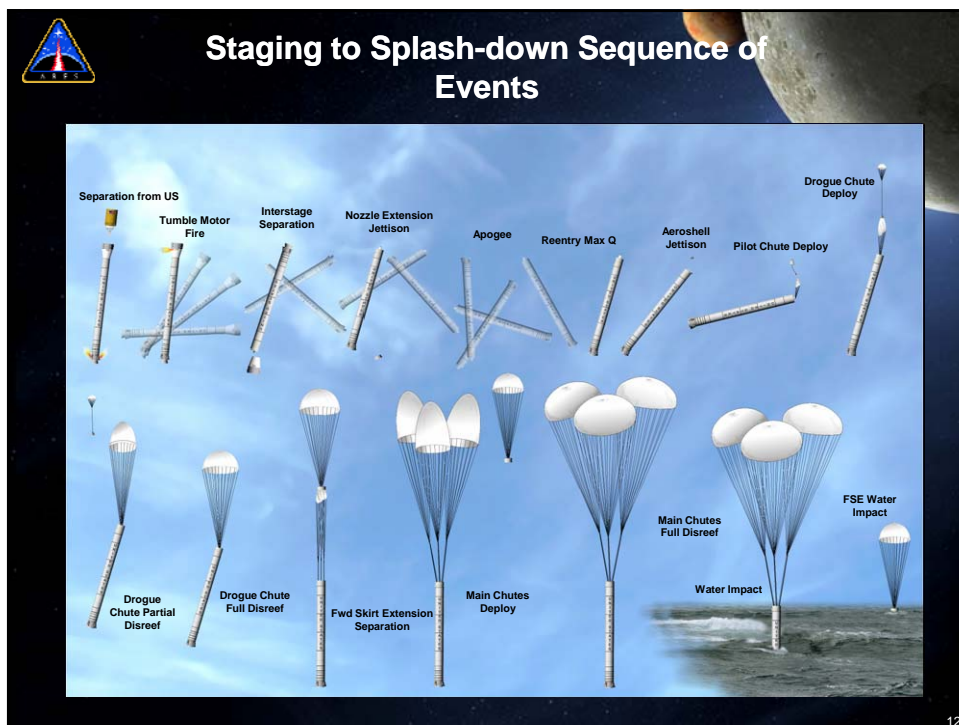
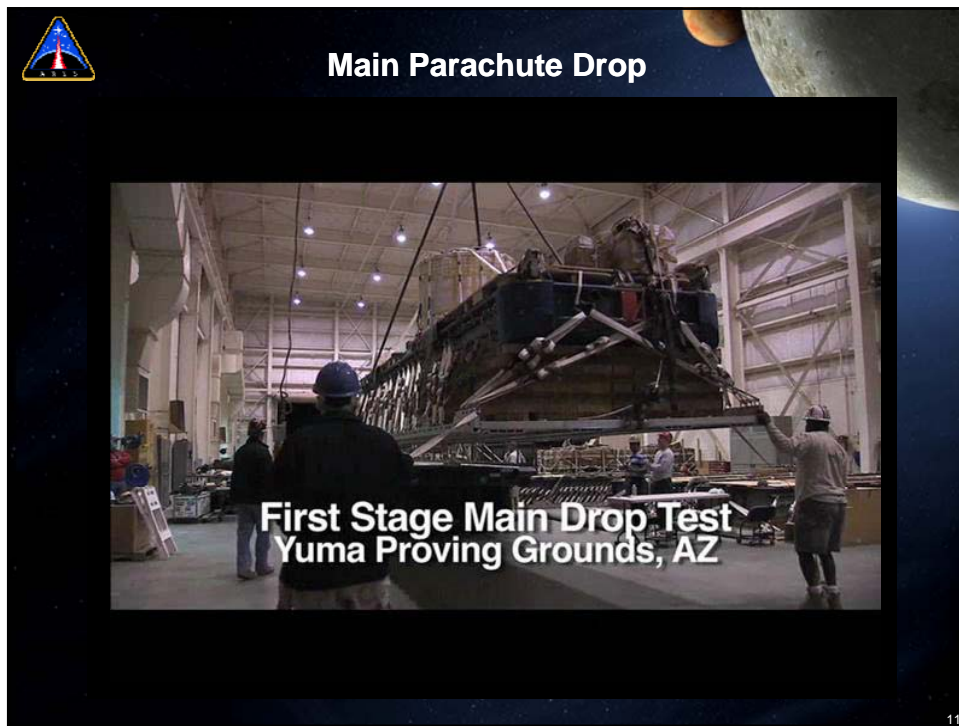
- ◆ **Three-stage recovery system**
 - Pilot
 - Drogue
 - Main
- ◆ **Pilot and main parachutes tested**
- ◆ **Parachutes being fabricated for Ares I-X test flight in 2009—first qualification flight**
- ◆ **First development motor being manufactured—testing in 2009**

9

Ares I Drop Test Status

- ◆ **The Ares I Deceleration Subsystem consists of a 11.5 ft. pilot, a 68 ft. drogue, and three 150 ft. main parachutes**
- ◆ **We have completed 3 pilot and 2 single main basic performance drop tests to date**
 - Measure parachute drag areas and inflation loads at various reefed positions
- ◆ **Will conduct two drogue basic performance tests in July & October 2008**
- ◆ **Will conduct first basic performance test of a cluster of 3 main parachutes in January 2009**
- ◆ **One design load and one overload test for the pilot, drogue, and main will be conducted in 2009 & 2010**
- ◆ **All remaining drogue and main tests will be heavy drops using the Jumbo Drop Test Vehicle (JDTV)**
 - JDTV drop weight will be between 36K to 80K lbs.

10





Separation Test



The first of a series of three tests, this ground test was ATK's first ever demonstration of joint severance on a simulated First Stage. The test was a success. The other two are in process.

13



Design Reviews

- ◆ **The System Requirements Review (SRR) is complete**
- ◆ **The First Stage Preliminary Design Review (PDR) cycle has been successfully completed**
 - Project risks are understood
 - Any required new technology has been developed to an adequate state of readiness
 - Safety and Mission Assurance (S&MA) has been adequately addressed in preliminary designs and any applicable S&MA products approved
 - The operational concept is technically sound
- ◆ **Successfully completed Constellation Safety and Engineering Review Panel (CSERP) Phase 0**
 - Presented overview of FS hardware, hazard process, fault tree, and preliminary rid of hazards
 - Successfully completed 2 CSERP TIMS
 - Prep for PDR
 - Presented hazards for in-depth review
 - Currently dropped all hazard reports for CSERP Phase 1
 - Detailed review and buy off of hazards and fault tree
- ◆ **The Ares Preliminary Design Review is in progress**

14



Summary

- ◆ Ares First Stage design progress is robust.
- ◆ The Ares I and I-X teams are pursuing the design and development of propulsion hardware for the next generation of human-rated launch vehicles.
- ◆ Ares I-X hardware is in fabrication.
- ◆ DM-1 is in manufacturing with static firing slated for the middle of 2009.
- ◆ Recovery system testing is well underway.
- ◆ Separation testing has begun.
- ◆ The Ares I-X launch is scheduled for 2009 and the Ares I Critical Design Review will follow.

15



Questions



16