Ares I First Stage Progress

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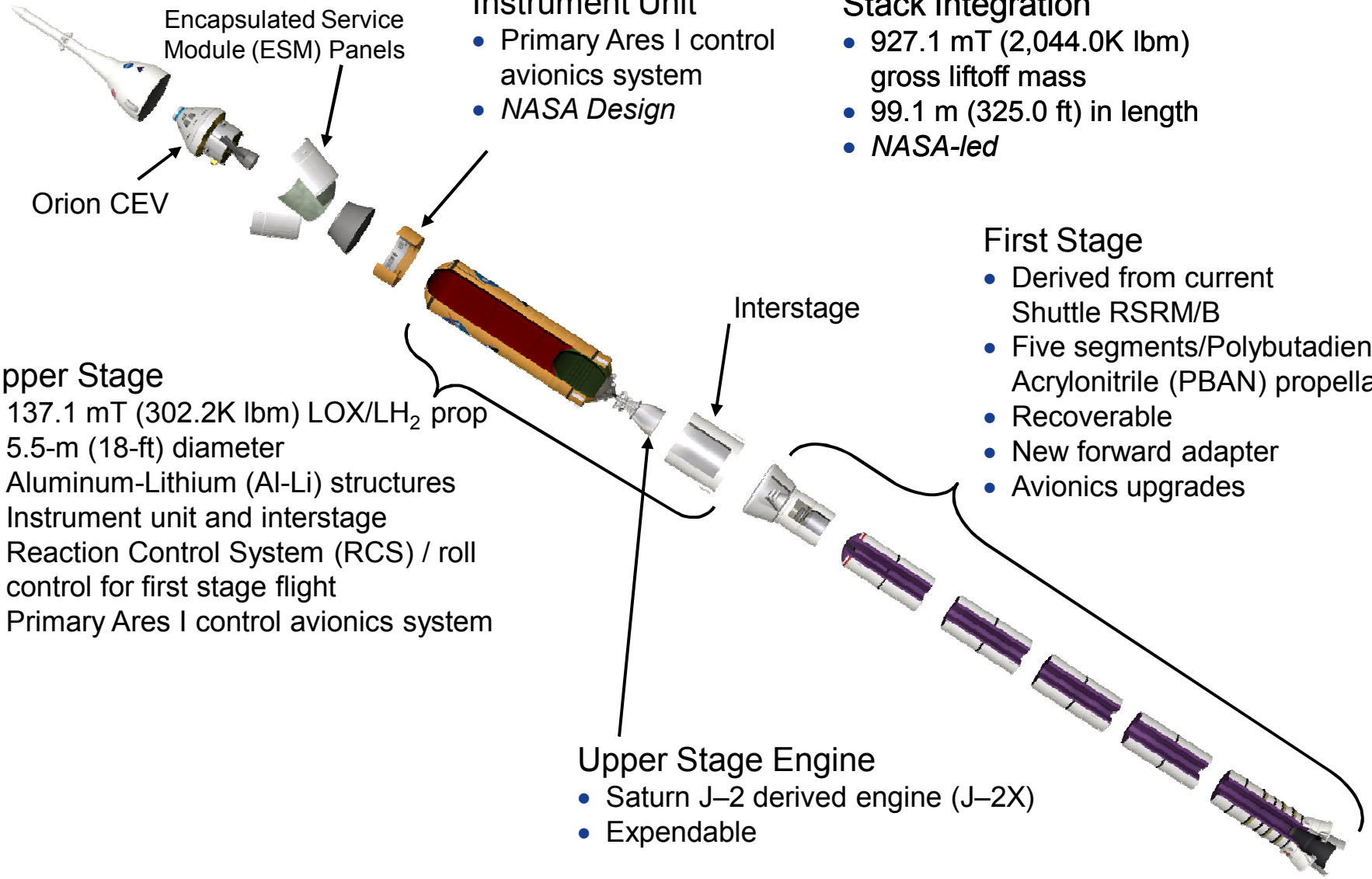
Introduction

- 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.
- Significant progress has been made to date by the Ares First Stage Team.
- This brief status provides an update on the design and development of the Ares First Stage propulsion system.

Ares I Elements



Instrument Unit

- Primary Ares I control avionics system
- *NASA Design*

Stack Integration

- 927.1 mT (2,044.0K lbm) gross liftoff mass
- 99.1 m (325.0 ft) in length
- *NASA-led*

First Stage

- Derived from current Shuttle RSRM/B
- Five segments/Polybutadiene Acrylonitrile (PBAN) propellant
- Recoverable
- New forward adapter
- Avionics upgrades

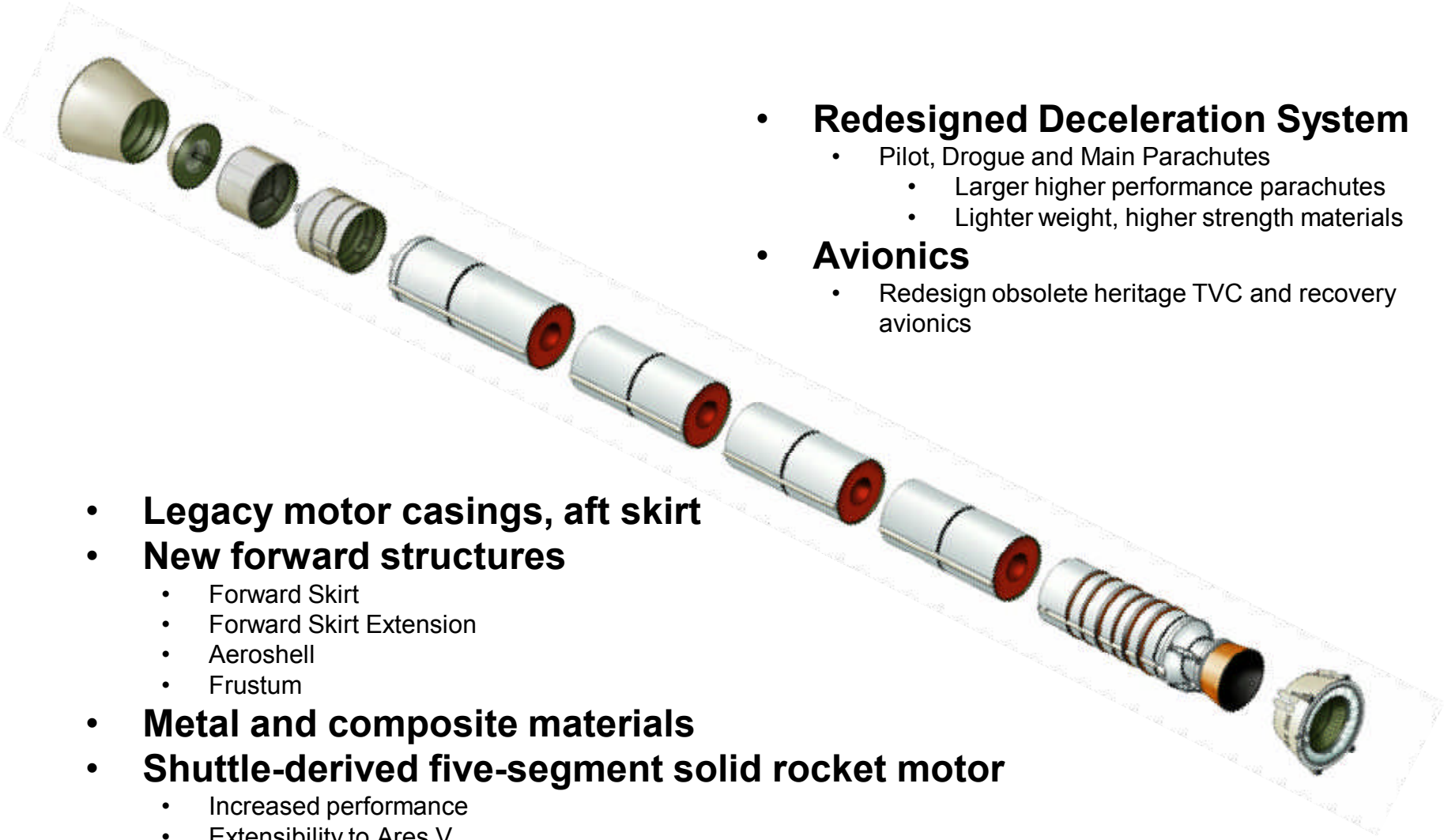
Upper Stage

- 137.1 mT (302.2K lbm) LOX/LH_2 prop
- 5.5-m (18-ft) diameter
- Aluminum-Lithium (Al-Li) structures
- Instrument unit and interstage
- Reaction Control System (RCS) / roll control for first stage flight
- Primary Ares I control avionics system

Upper Stage Engine

- Saturn J–2 derived engine (J–2X)
- Expendable

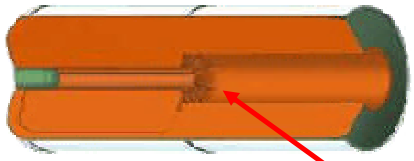
Ares I First Stage Overview



- **Redesigned Deceleration System**
  - Pilot, Drogue and Main Parachutes
    - Larger higher performance parachutes
    - Lighter weight, higher strength materials
- **Avionics**
  - Redesign obsolete heritage TVC and recovery avionics

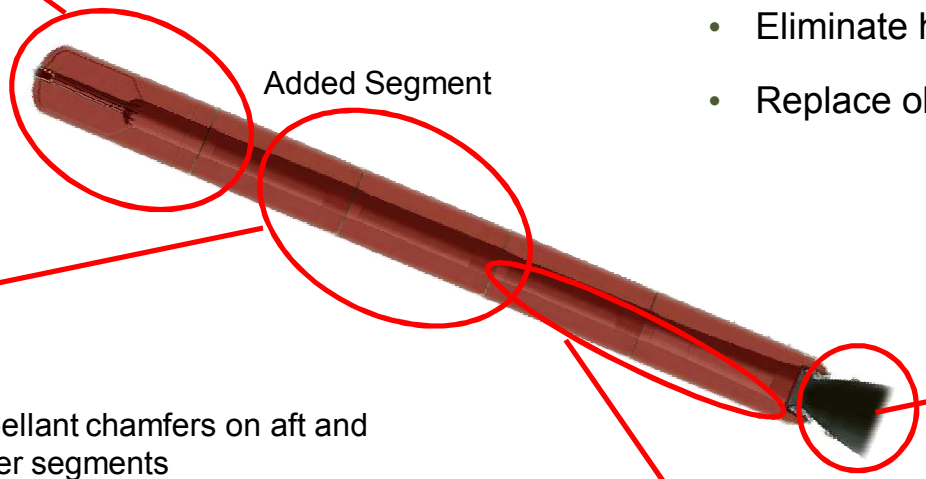
- **Legacy motor casings, aft skirt**
- **New forward structures**
  - Forward Skirt
  - Forward Skirt Extension
  - Aeroshell
  - Frustum
- **Metal and composite materials**
- **Shuttle-derived five-segment solid rocket motor**
  - Increased performance
  - Extensibility to Ares V

Ares First Stage Upgrades

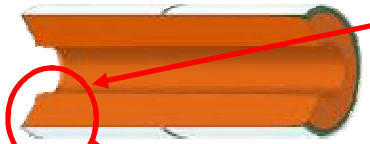


Increased number of fins from 11 to 12 in fwd segment

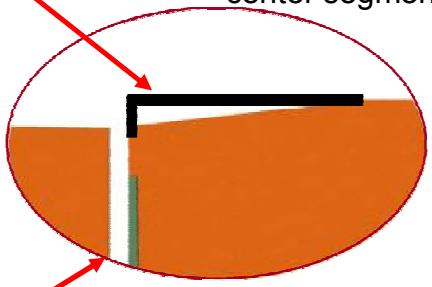
Burn rate lowered to meet Ares I requirements



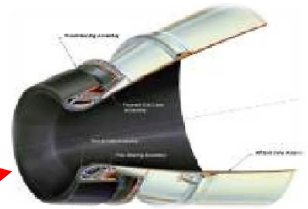
Added Segment



Propellant chamfers on aft and center segments



Modified height and thickness to prevent bore choking



Wider throat and nozzle extension for increased mass flow

Insulation and liner formulations modified to eliminate Chrysotile fibers
Lay-up optimized to provide additional thermal protection

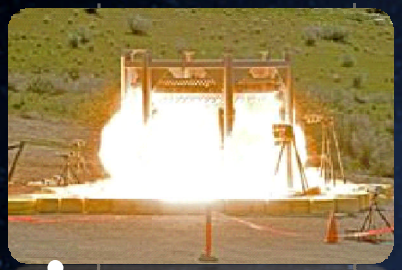
Modifications to the motor were made to:

- Improve performance (thrust)
- Improve reliability
- Eliminate hazardous materials
- Replace obsolete materials

Progress — Ares I 1st Stage Project

FSE
Separation Test
Jan 29, 2009

1st Stage
PDR Complete
5 June 2008



Frustum Separation Test
May 7, 2009

Ares I-X Vehicle Stacking Nearing
Completion at KSC

CDR
April 2011

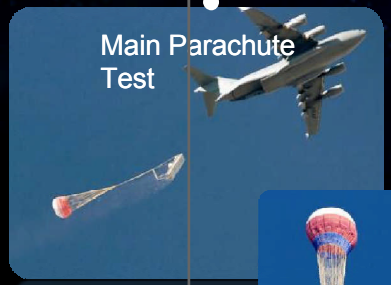
QRR
April 2012

Ares I-Y
Flight Test
March 2014

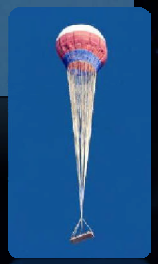
Ares I 1st Stage Significant Accomplishments

2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013

Orion I
Flight Test
Sept 2014



Main Parachute
Test

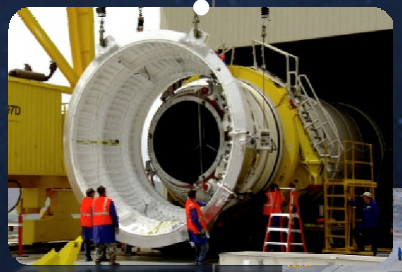


New 150-ft-Diameter
Parachutes
November 15, 2007

Development Motor
Igniter Test
March 10, 2009

Main parachute cluster
(Largest parachutes ever
flight tested)
May 20, 2009

Systems Integration and
Verification Lab (SIVL)
13 July 2009



Completed assembly
of DM-1 On the Test
Stand for Aug 2009
Static Firing Test

Ares I 1st Stage Project making Significant Progress to First Human Flight

Forward Skirt Extension Separation Test

Ares Demonstration Motor Test #1

Next Ares I First Stage Major Test
August 25, 2009

Conclusion

- Ares First Stage design is progressing per plan and schedule
- Ares I-X hardware is fabricated and being stacked.
- Recovery system testing is well underway.
- Separation testing has begun.
- DM-1 static firing on schedule for August 25, 2009.