Ares Launch Status Update

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Upper Stage
- 302k lbm LOX/LH2 prop
- 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
- *NASA Design / Boeing Production* ($1.12B)

Instrument Unit
- Primary Ares I control avionics system
- *NASA Design / Boeing Production* ($0.8B)

Stack Integration
- 2.0 M lbm gross liftoff weight
- 325 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
- *ATK Launch Systems* ($1.8B)

Upper Stage Engine
- Saturn J–2 derived engine (J–2X)
- Expendable
- *Pratt and Whitney Rocketdyne* ($1.2B)
Ares V Elements

Stack Integration
- 7.4M lb gross liftoff weight
- 360 ft in length

First Stage
- Two recoverable 5-segment PBAN-fueled boosters (derived from current Ares I first stage)

Core Stage
- Five Delta IV-derived RS–68 LOX/LH₂ engines (expendable)
- 33-ft diameter stage

Earth Departure Stage (EDS)
- One Saturn-derived J–2X LOX/LH₂ engine (expendable)
- 33-ft diameter stage
- Aluminum-Lithium (Al-Li) tanks
- Composite structures
- Instrument unit and interstage
- Primary Ares V avionics system

Vehicle 51.0.39
Some Ares I “Myths” Debunked

• The Ares I is underpowered to lift the Orion CEV
  – Today, Ares I has ~ 4,400lbm of total performance margin above the requirement for a driving lunar mission
  – Constellation maintains an additional 3,000 lbm of margin over Orion’s maximum mass requirement (which also contains margin)
  – That’s 15% of margin coming into PDR. That’s in addition to mass growth allowances on all systems

• The Ares I will violently shake apart during 1st stage flight
  – Solid-based stages exhibit a phenomenon called thrust oscillation - on Ares I, particularly in the last ~20 sec of 1st stage flight
  – The Ares I is a relatively “quiet” motor (~0.5% variation in pressure) and analysis is ongoing to characterize this environment and effect on the launch stack
  – Recent results suggest this is well within our design capabilities to mitigate, if necessary

• The Ares I is too long and thin and will not be controllable
  – NASA has spent significant effort analyzing and testing in wind tunnels the flight dynamics of Ares I.
  – The vehicle has control margin above the requirements using the heritage TVC and while long/thin, is well within the experience base of previous launch vehicles

• Ares I is behind schedule
  – The Ares team has met all of its key milestones over the last 2.5 years (including 4 major acquisitions) and is on track to meet its PDR milestone in August, 2008
First Stage Accomplishments

- Nozzle Process Simulation Article
  Promontory, UT

- Installation of New SRM Insulation
  Promontory, UT

- Main Parachute Fabrication/Columbia, MS
  Main Parachute Test/Yuma, AZ

- Solid Rocket Motor Testing
  Promontory, UT
Upper Stage Accomplishments

- Friction Stir Weld Process Development System
  MSFC, AL

- Liquid Hydrogen Tank Dome Gore
  Los Angeles, CA

- Bench-Level S-IVB Testing
  MSFC, AL

- New Vertical Weld Tool
  Elkhart, IN
Upper Stage Engine Accomplishments

- J-2X Materials Testing
  MSFC, AL
- Test Stand A-3 Foundation
  SSC, MS
- E-3 Subscale Diffuse Testing
  SSC, MS
- J-2X Powerpack 1A Testing
  Stennis Space Center (SSC), MS
- J-2X Materials Testing
  MSFC, AL
Vehicle Integration Accomplishments

Ares I System Definition Review
Huntsville, AL

3% First Stage Reentry Testing
Arnold Air Force Base, TN

Wind Tunnel Testing
Boeing, LaRC, Ames Research Center (ARC), CA

3% Model Reentry Heat Testing

Ares I-X Rigid Buffet Model
Langley Research Center (LaRC), VA

Ares I System Definition Review
Huntsville, AL

Boeing, LaRC, Ames Research Center (ARC), CA
Summary

• The Ares family will provide the U.S. with unprecedented exploration capabilities.
  – Can inject ~40% more mass to the moon than Apollo/Saturn

• The Ares team has made significant progress since inception in October, 2005.
  – Full team is onboard
  – Have met all major milestones to-date and working to PDR in late Summer
  – The Ares I–X test flight is on schedule for April 2009

• We are making extensive use of lessons learned to minimize cost, technical, and schedule risks.

• The NASA-led / Contractor partnership is very effective in developing the Ares I.