Ares V Elements
Current Point-of-Departure

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

Core Stage
- Six Delta IV-derived RS-68B LOX/LH₂ engines (expendable)
- 33 ft diameter stage
- Composite structures
- Al-Li tanks

Gross Liftoff Mass: 8,167.1K lbm
Performance to TLI: 157K lbm
Integrated Stack Length: 381.1 ft

Solid Rocket Boosters
- Two recoverable 5.5-segment PBAN-fueled, steel-case boosters (derived from current Ares I first stage)
- Option for new design

National Aeronautics and Space Administration
Ares I and Ares V Commonality

- Elements from Shuttle
- Upper Stage-Derived Vehicle Systems
- J-2X Upper Stage Engine
- U.S. Air Force RS-68B from Delta IV RS-68

♦ Builds Up Flight Reliability on the Smaller Vehicle Earlier
♦ Lowers Life Cycle Cost

Ares I
First Stage (5-Segment RSRB)
Range: full stage to case/nozzle/booster systems

Ares V

Elements from Ares I

National Aeronautics and Space Administration

Original ESAS Capability
- 45.0 mT Lander
- 20.0 mT CEV
- No Loiter in LEO
- 8.4m OML
- 5 SSMEs / 2 J2S

CY-06 Budget Trade to Increase
- Ares I / Ares V Commonality
- Ares I : 5 Seg RSRB / J2-X instead of Air-Start SSME
- Ares V: 1 J2-X

Detailed Cost Trade of SSME vs RS-68
- $4.25B Life Cycle Cost Savings for
- 5 Engine Core
- Increased Commonality with Ares I Booster
- 30-95 Day LEO Loiter Assessed

IDAC 3 Trade Space
- Lunar Architecture Team 1/2 (LAT)
- Mission Delta V’s increased
- Increase Margins From TLI Only to Earth through TLI
- Loiter Penalties for 30 Day Orbit Quantified
- Change from 8.4m to 10m - Lunar Architecture Team 1/2 (LAT) Studies
- Lunar / Mars Systems Benefits
- Tank Assembly Tooling Commonality

EDS Diameter Change from 8.4m to 10m
- Lunar Architecture Team 1/2 (LAT) Studies
- Lunar / Mars Systems Benefits
- Tank Assembly Tooling Commonality

Incorporate Ares I Design Lessons Learned / Parameters
- Core Engine / SRB Trades to Increase Design Margins
- Increase Subsystem Mass Growth Allowance (MGA)
- 6 Core Engines
- 5.5 Segment PBAN
- Updated Capability
- 45.0t Lander
- 20.2t CEV
- -6t Perf. Margin
- 4 Day LEO Loiter
- Ares I Common MGAs
- Booster Decision Summer 2010

Recommended Option

2005
220 Concepts Evaluated
Ares I ATP

2006
320 Concepts Evaluated
Orion ATP
Ares I SRR

2007
730 Concepts Evaluated
Orion SRR
Ares I SDR

2008
460 Concepts Evaluated
Ares V MCR
Current Activities

♦ Ares V concept definition/requirements development industry proposals
♦ Structural test approach
♦ Structural test articles
♦ Ares V-Y flight test objectives
♦ Ares V aerodynamic characterization
♦ Manufacturing, test, and launch facilities
♦ Core Stage and EDS propulsion test approach and facilities assessment
♦ Technology prioritization
♦ Ares V Cost threat risk assessment
♦ Ares V performance risk assessment
Architecture Flexibility Enables New Science Applications

Large Payload Volume and Lift Capability

At 5.7 mT, the Cassini spacecraft is the largest interplanetary probe and required a C3 of 20 km²/s² and several planetary flyby 'gravity assist' maneuvers. Ares V can support about 40 mT for this same C3.

Ares V will have the largest payload volume capability of any existing launch system.

“Exciting new science may be enabled by the increased capability of Ares V. The larger launch mass, large volume, and increased C3 capability are only now being recognized by the science community.”

– National Academy of Science’s “Science Opportunities by NASA’s Constellation Program”

“Exciting new science may be enabled by the increased capability of Ares V. The larger launch mass, large volume, and increased C3 capability are only now being recognized by the science community.”

– Workshop on Ares V Solar System Science

“It is very clear from the outset that the availability of the Ares V changes the paradigm of what can be done in planetary science.”

– Workshop on Ares V Solar System Science

"It is very clear from the outset that the availability of the Ares V changes the paradigm of what can be done in planetary science.”

– Workshop on Ares V Solar System Science

Current Capability

Ares V Enabled Capability
 (>10x Collection Area)

HST 2.4-m JWST 6.5-m
8-9 m 16+ m

New Science

Ares V

Cassini

spacecraft

~ to scale

for comparison
Range of Architecture Options Enabled
A Few Examples (Payload to TLI)

- Baseline (71 mT with Ares I)
- Common First Stage with Ares I (68 mT with Ares I)
- Crew Capability using Ares I Upper Stage with Ares V Core (35 mT)
- Crew Capability (45–51 mT)
- Advanced Solid First Stage (75 mT with Ares I)
- Single Launch Capability (55–63 mT)
Ares V Summary

- NASA has begun preliminary concept work on vehicle. Over 1,700 alternatives investigated since ESAS
- Focused on design of EDS, payload shroud, core stage, and RS-68 core stage engines
- Recent point of departure update following the Lunar Capability Concept Review
  - Adds additional performance margin using an additional RS-68
  - Adds half segment on the first stage boosters
- Shroud size dictated by eventual size of Altair lunar lander
- Also investigating alternate uses for Ares V not related to human space exploration
  - Astronomy applications (e.g., large aperture telescopes)
  - Deep space missions
  - DoD applications
  - Other applications