



ESMD Technology Needs for Altair and Ares V

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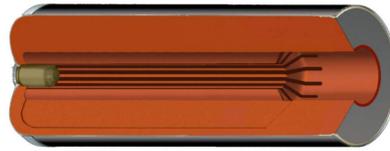
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Ares V Technology Needs



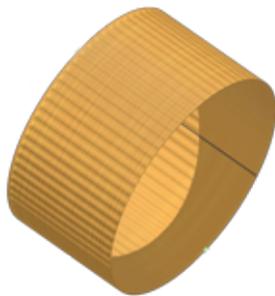
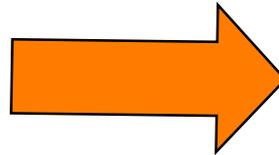
Nose Cone/Forward Skirt



Loaded Motor

Ares Value Stream

Key Technology Areas
Composites
Cryo Fluid Management
Solids
Automation
Liquid Propulsion
Control/Separation



Core Stage Aft Skirt



Point of Departure Shroud (Biconic)

ETDP Technology Prioritization Process (TPP)

Ares V Technology Priorities

1. Large Composite Manufacturing
2. HTPB Propellant
3. Long Term CFM
4. Composite Damage Tolerance/Detection
5. EDS State Determination & Abort
6. Composite Joining Technology
7. Liquid Level Measurement
8. Multi Layer Insulation
9. Leak Detection
10. Non Autoclave Composites
11. SRM Composite Metal Technology
12. Composite Dry Structure Development
13. Composite Damage Failure Detection for Abort
14. Nozzle Sensitivity to Pocketing (High Heat Flux from HTPB)
15. LH2 Tank Micro Cracking

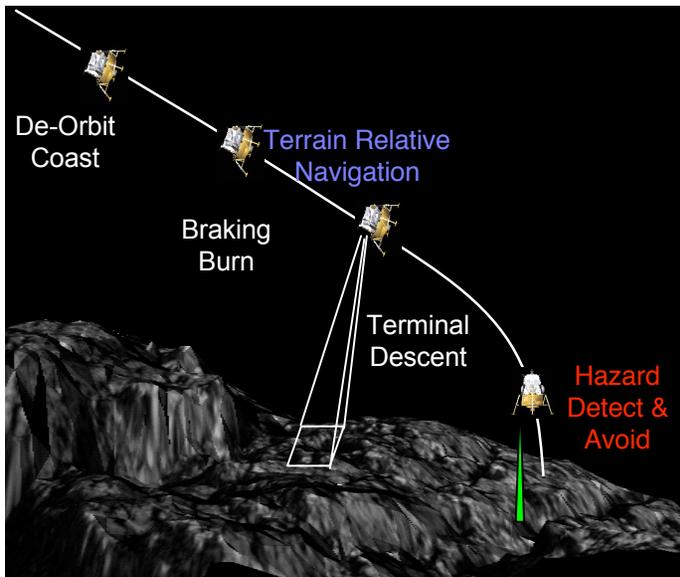
Altair Technology Needs



Zero boil off cryogenic propellant storage



Prototype deep throttling engines for descent stage



Altair Technology Priorities
1. Highly Reliable LOX/LH2 Throttling Engine
2. Cryogenic Fluid Management
3. LO ₂ /LCH ₄ Main Engine and RCS
4. Composite Primary Structure
5. Landing Hazard Avoidance and Detection
6. Radiation Effects Mitigation/Environmental Hardness
7. Cabin CO ₂ and Moisture Removal System
8. Low Cycle Life Rechargeable Battery
9. Low Mass, High Reliable, PEM Fuel Cell
10. High Pressure Oxygen System
11. Dust Mitigation
12. Sublimator-driven coldplate
13. Crew Compartment Composite Pressure Vessel Design and Validation