

Europa Lander

Mission Concept Update

3/29/2017

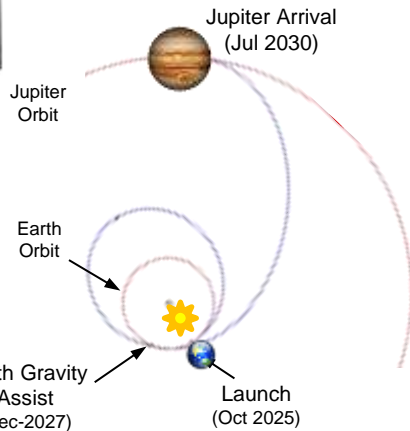


Viable Lander/Carrier Mission Concept



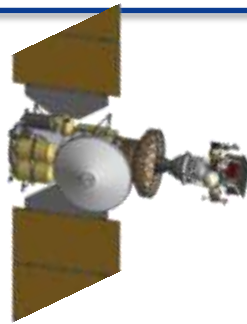
Cruise/Jovian Tour

- Jupiter orbit insertion Jul 2030
- Earliest landing on Europa: Dec 2031



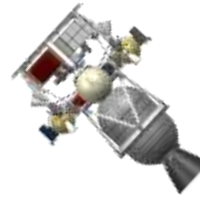
Launch

- SLS Block 1B
- No earlier than Oct / Dec 2025



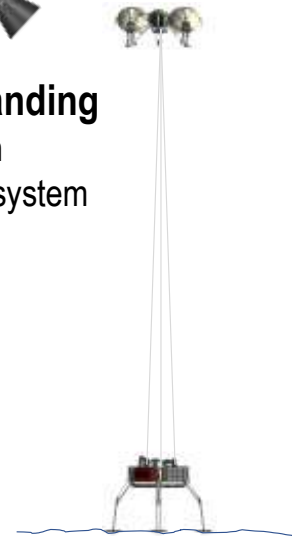
Deorbit, Decent, Landing

- Guided deorbit burn
- Sky Crane landing system
- 100m accuracy



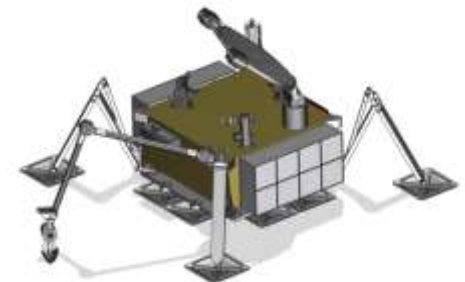
Carrier Relay Orbit

- 24 hour period
- >10 hours continuous coverage per orbit
- 2 Mrad radiation exposure



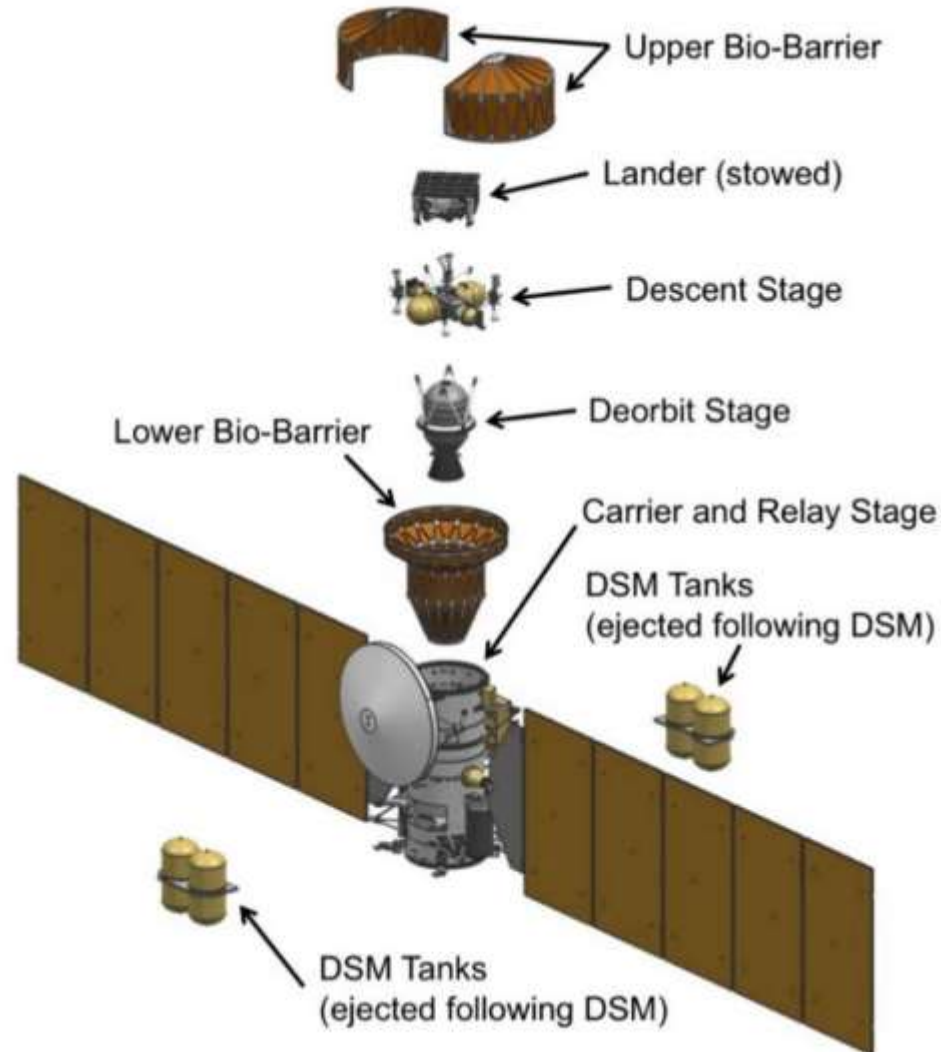
Surface Mission

- 20+ days
- 5 Samples
- Relay comm through Carrier or Clipper (backup)
- 3-4 Gbit data return
- 45 kWh battery
- 1.5 Mrad radiation exposure





Europa Lander Integrated Spacecraft Concept

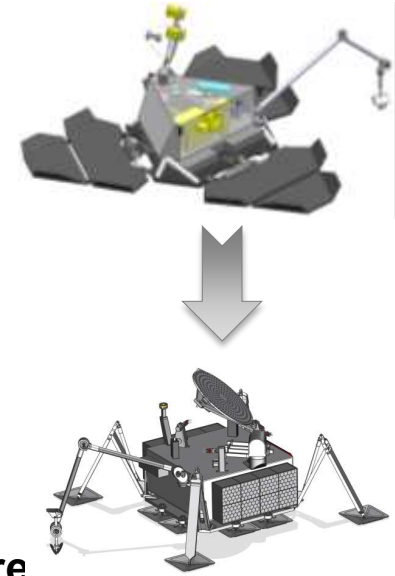


Preliminary
Launch Mass (Wet):
CRS: ~14 mT
Deorbit stage: 1.6 mT
DS + Lander: 1.1 mT
Total: ~16.6 mT

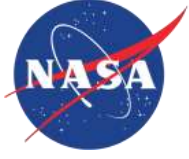


Highlights of Lander Development Concept Progress

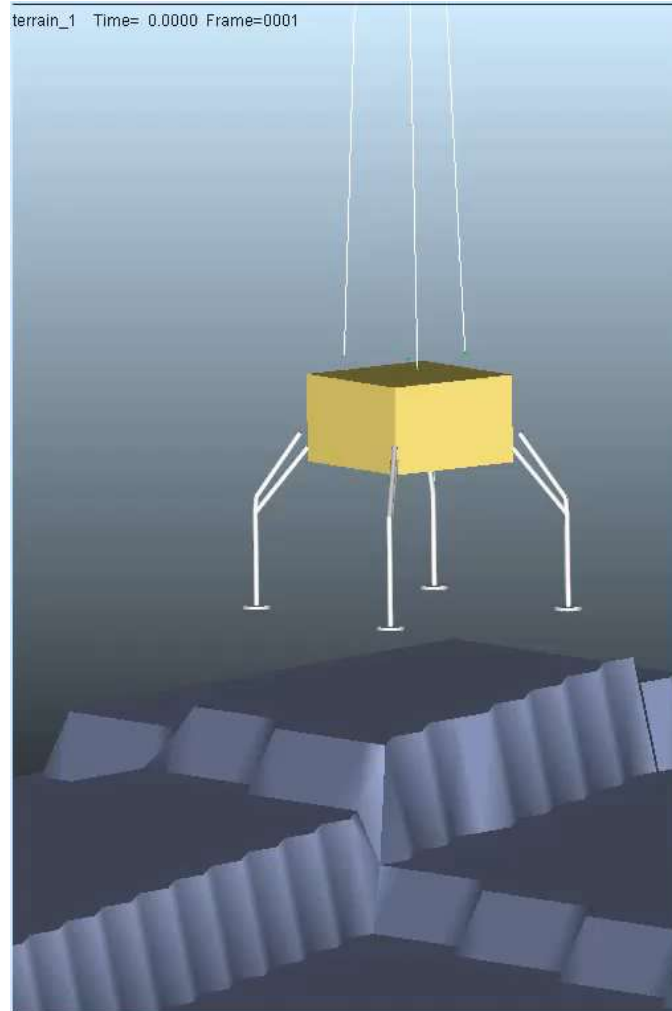
1. **Selected the adaptive stabilizer landing gear**
 - ✓ Resilient to >1.0 meter obstacles
2. **Accommodated SDT Sample Payload**
 - ✓ 5 Instruments at 42.5 kg
3. **Accommodated redundant electronics**
 - ✓ Avionics, Power Distribution and Telecom
4. **Developed the Lander Planetary Protection Architecture**
 - ✓ Added the incinerator and hydrogen peroxide purge
5. **Added Rasp/Scoop in conjunction with the Saw**
 - ✓ Phoenix heritage for reliable sample acquisition





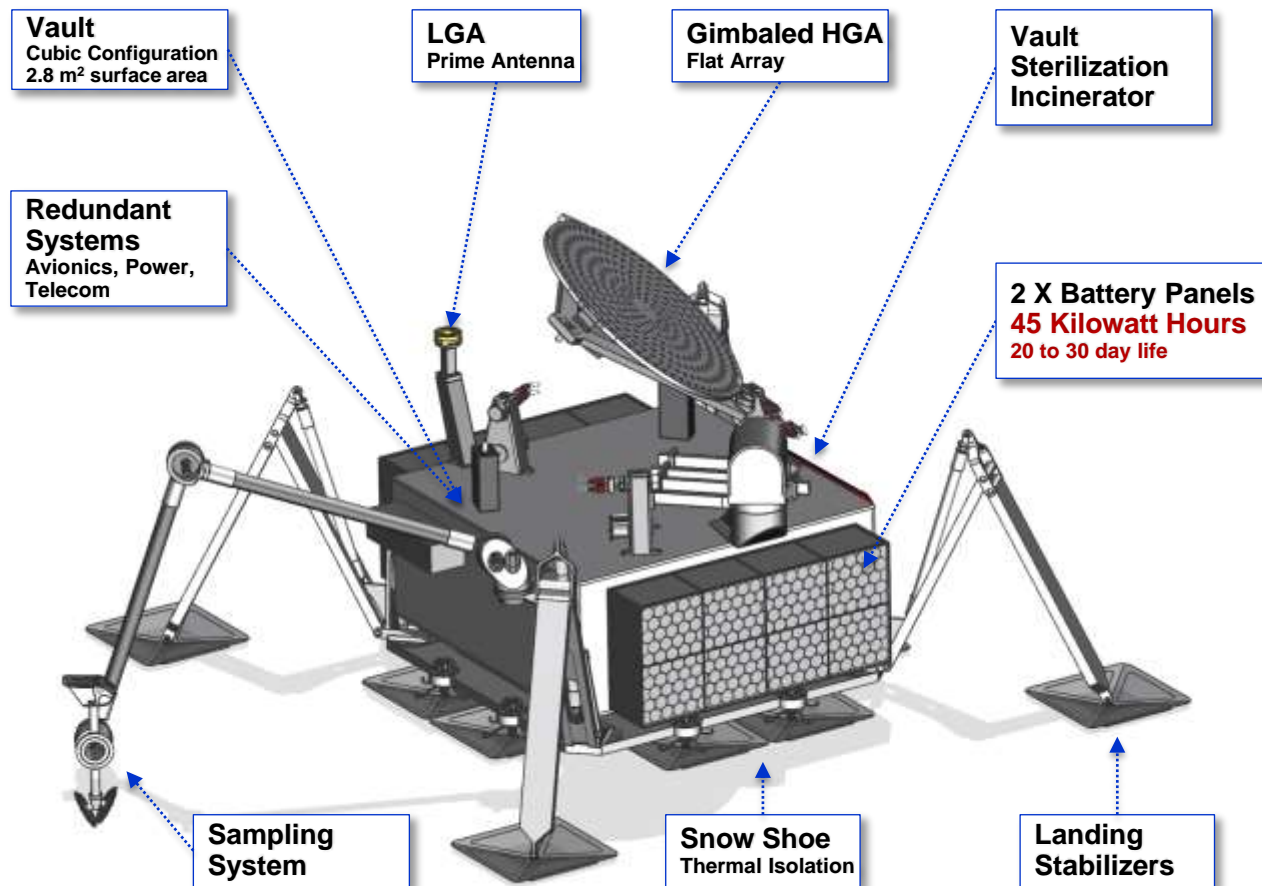


Adaptive Stabilizer Landing Simulation Succeeds in Very Challenging Terrain



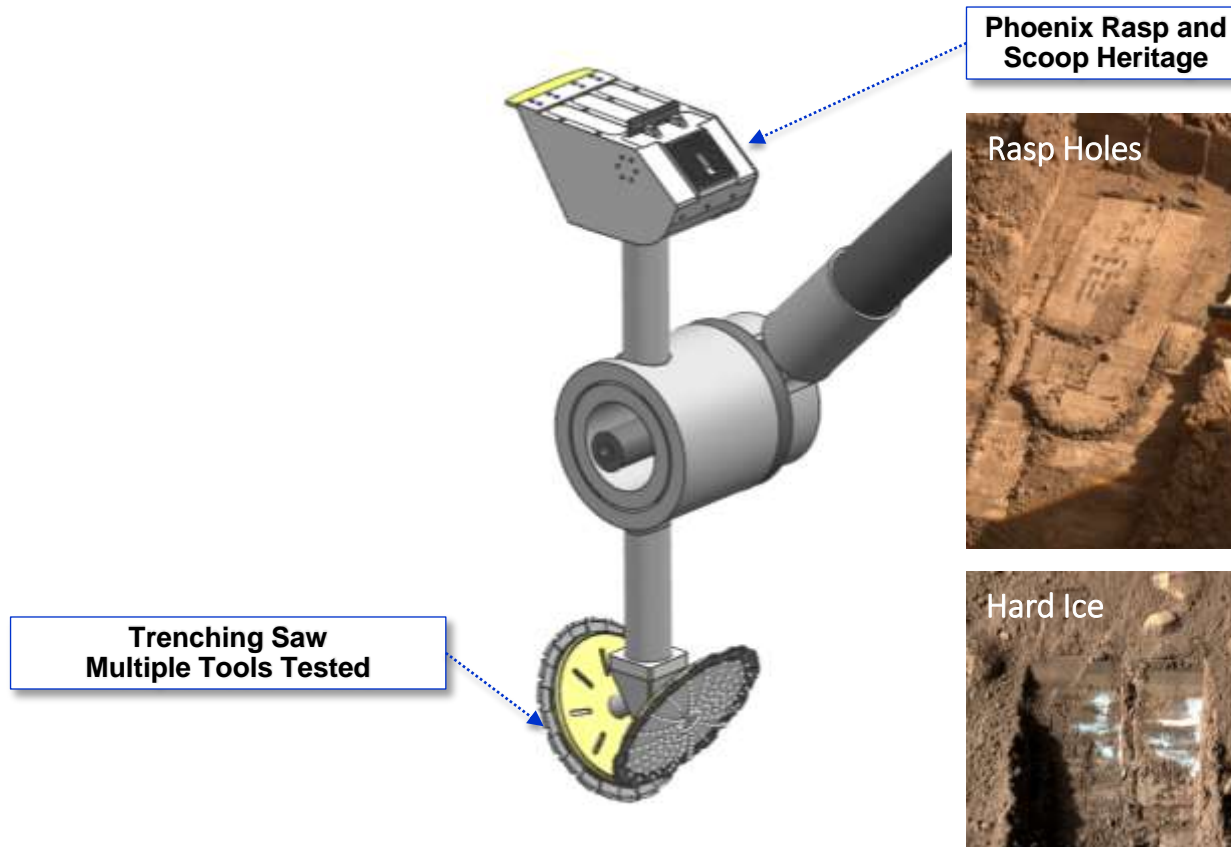


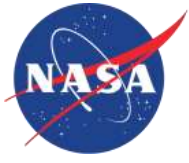
Concept Lander Surface Configuration





The Phoenix Heritage Rasp and Scoop was Added for Robust Sample Collection





Trenching Saw Had Successful Proof of Concept Tests in a Dedicated Testbed

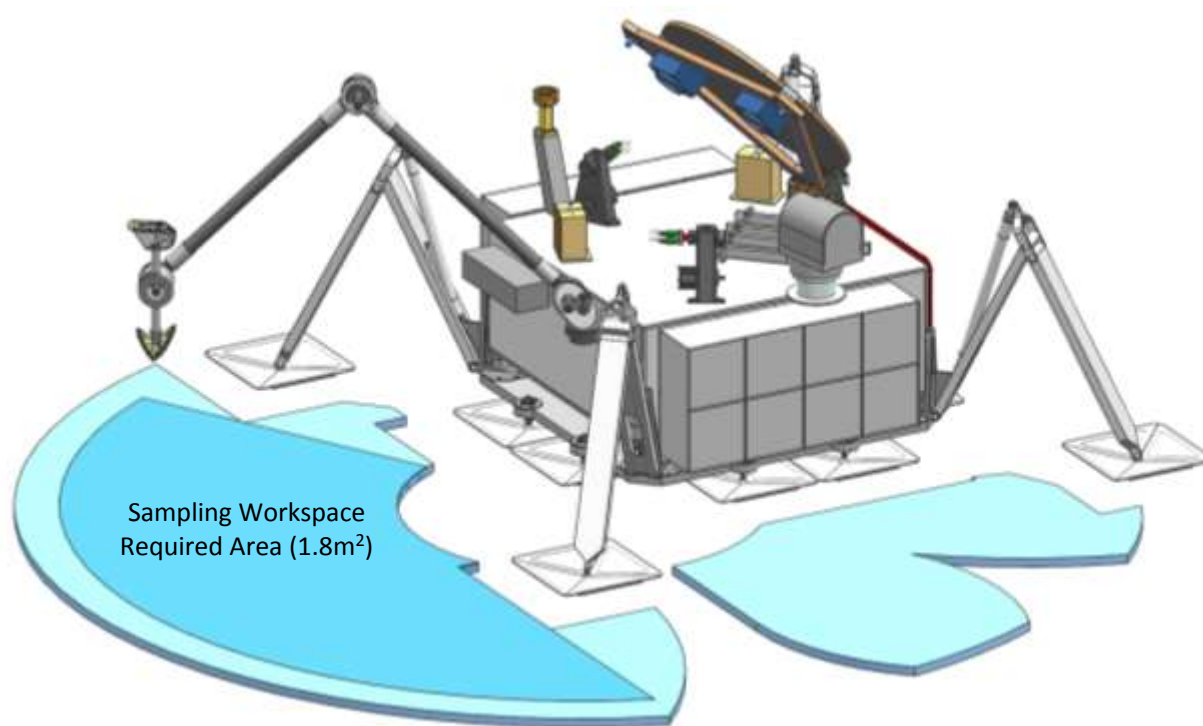
Test Progress

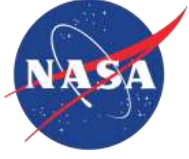
- 35 different blade types
- 25 different materials including cryogenic Ices
- Two different drive trains with a third one in work





Surfaces Workspace Exceeds the Required Area & Can Access Two Sides of Lander





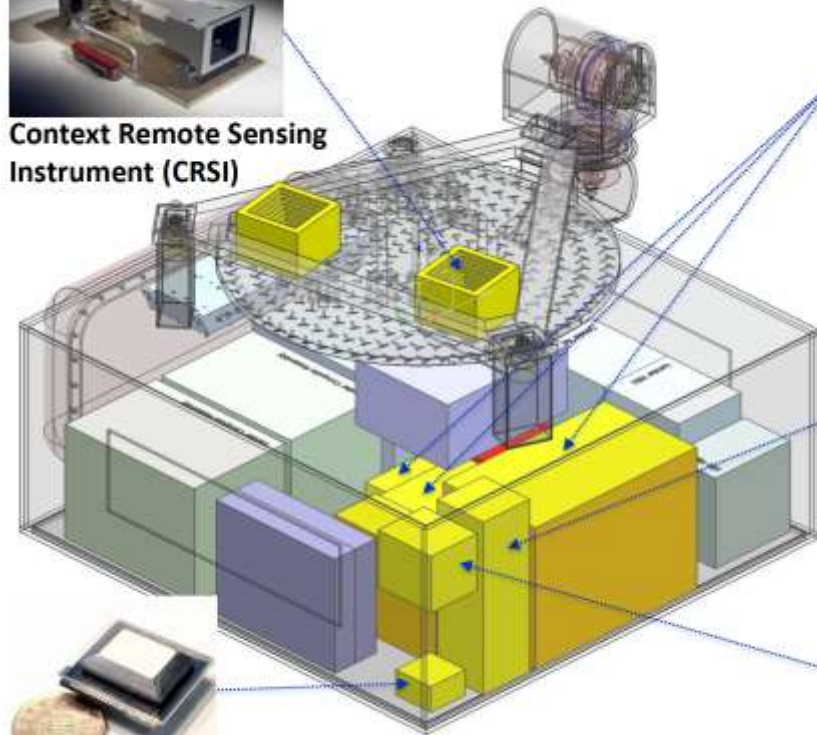
Backup



Mission Concept closes, with margin



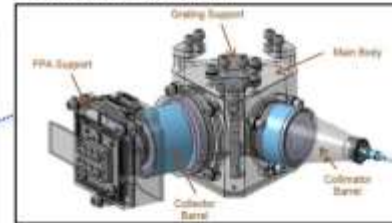
Context Remote Sensing Instrument (CRSI)



Geophysical Sounding System (GSS)



Organic Compositional Analyzer (OCA)



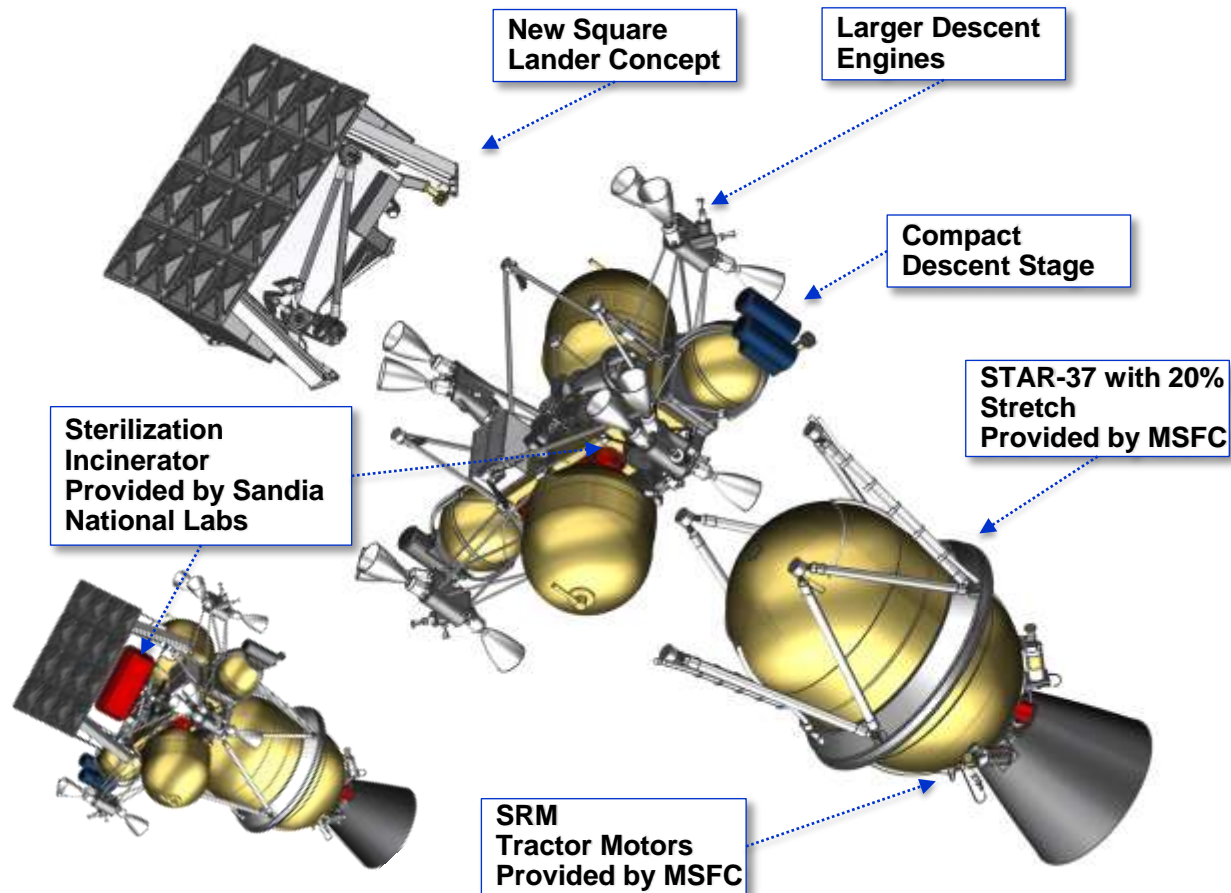
Vibrational Spectrometer (VS)



Microscope for Life Detection (MLD)



Iteration-4.0 Configuration is the Culmination of Extensive Trade Studies

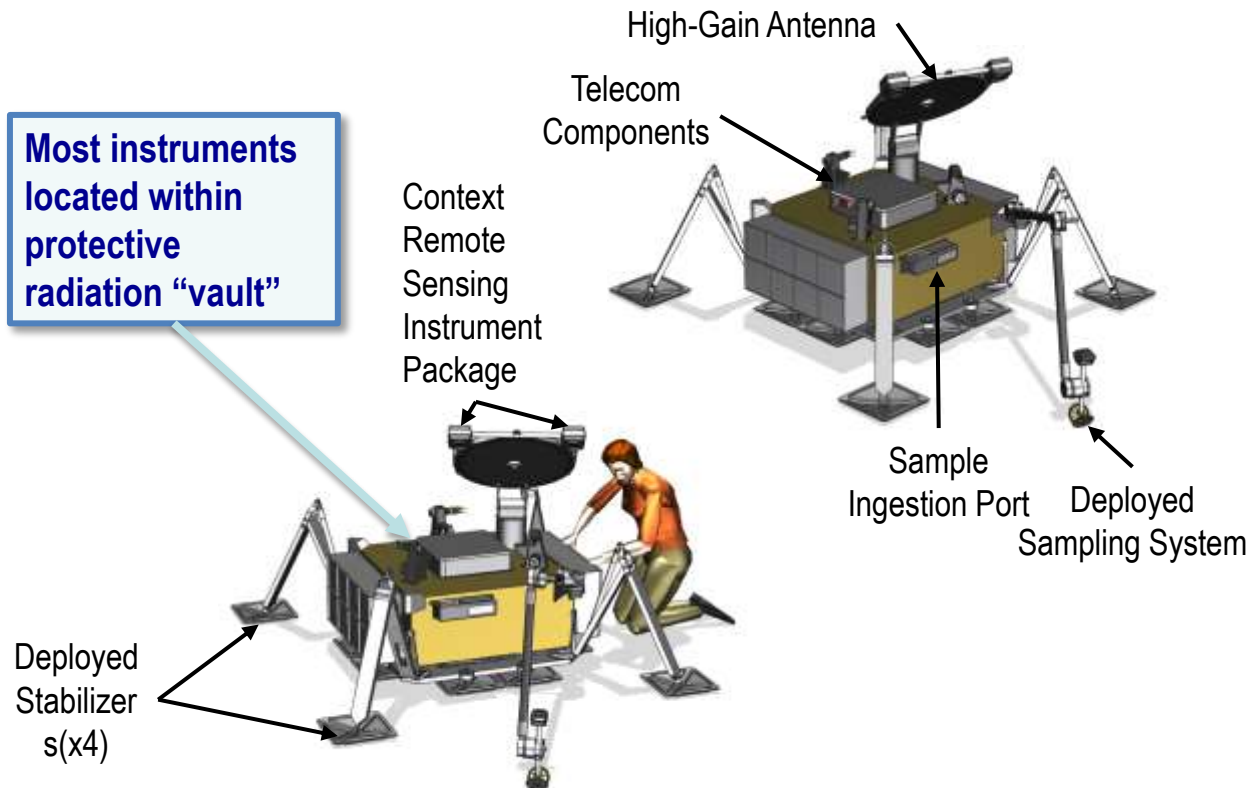


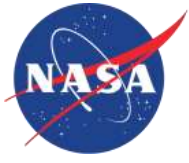


Lander Accommodates Model Instrument Payload and Supporting Equipment



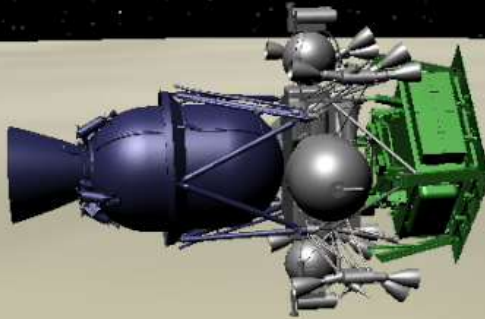
**Most instruments
located within
protective
radiation “vault”**





Initial 6-DoF GN&C Video of De-Orbit, Descent and Landing

time: 58.000 sec
altitude: 5557.770 m
V_v: -2.366 m/s
V_h: 1929.453 m/s
fuel: 237.270 kg



time: 58.000 sec
altitude: 5557.770 m
V_v: -2.366 m/s
V_h: 1929.453 m/s
fuel: 237.270 kg

Mode: ACQUIRE_DEORBIT_BURN_ATTITUDE



A Day in the Life of Concept Lander

Relay Operations

