The Nation's Vision for Exploration - An Update

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Background

Getting to the Moon

On To Mars
Nation's Vision for Space Exploration

• Announced on Jan 7, 2004 by President Bush
• Bottom line – Get humankind out of low Earth orbit to Mars and beyond
• Project Constellation formed

“A new plan to explore space and extend a human presence across our solar system”
What is Constellation?

Two new large rockets

A capsule to carry people

A means to land on the Moon and return
Why These Elements?

- Industry, Academia, Public search for ideas

- Ground rules from the White House
  - Stay inside the current NASA budget envelope
  - Continue scientific endeavors of the Agency
  - Return the Shuttle to flight
  - Finish the Space Station, then retire the Shuttle
  - Create a journey, not a destination

- “90 day study team” started in May 2005
  - Examined many options
  - Concluded
    - Use Apollo-like architecture
    - Use as much of Shuttle infrastructure as possible
    - Leverage other existing technologies, minimize need for inventions (in the short term)
    - Use the Moon as a “waypoint” prior to going to Mars
      - We can go to the Moon with existing technology... not so with Mars
♦ Background

♦ Getting to the Moon

♦ On To Mars
Going to the Moon-Current Approach

Vehicles are not to scale.

100 km
Low Lunar Orbit

LLV Performs LOI

Earth Departure Stage Expended

Direct Entry Land Landing

Low Earth Orbit

Ares 1-Orion

Ares 5-EDS, LLV

Ascent Stage Expended

Service Module Expended
Constellation Systems – Ares 5 and Ares 1 Launch Vehicles

Ares 5
360 feet

Ares 1
320 feet

70 meter DSN Antenna
(230 feet dia.)
Canberra, Australia
Orion On The Ares 1 Launcher

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Lunar Lander Vehicle (LLV)
on Ares 5
Orion and LLV on Earth Departure Stage (EDS)
Orion and LLV at the Moon
LLV on the Moon
Launch of Ascent Stage
Orion Parachuting to Earth
Orion
With Landing Attenuation System Deployed
Major Constellation Assignments

- Space Suits (Johnson Space Center)
- Ares 1 - Ares 5 - EDS (Marshall Space Flight Center)
- Lunar Lander Vehicle (Johnson Space Center)
- Lunar Ascent Vehicle (Johnson Space Center)
- Orion (Johnson Space Flight Center)
- Orion Support Module (Glenn Research Center)
JPL Activities

♦ Current key activities
  • Constellation Level 2-System Engineering
  • Lunar Architecture Team (LAT) 2-technology assessment and architectural option for the lander
  • Mars Architecture Team-system engineering support, Science integration, precursor program planning
  • Lunar Lander Project Core Team- GN&C and Flight system engineering
  • Technology program-supporting multiple projects in robotics, power systems, aero entry technology
  • Mission Operation Project-Mission operations system engineering
  • Advanced Environmental Monitoring Instruments
  • Lunar Reconnaissance Orbiter instrument (Diviner)

♦ Mission Proposals
  • Lunar Sample return
  • Lunar Gravity field mapper

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Background

Getting to the Moon

On To Mars
On to Mars
Important Technical Problems To Be Solved

- Counter measures for human physiological changes
  - Calcium loss from bones
  - Atrophy in muscles
  - Immune system changes
  - Radiation damage

To mention a few

- Landing 25 metric tons safely

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On to Mars
Important Technical Problems To Be Solved

- Living off the land – using resources from Mars, don’t ship from Earth

- Operating 20 minutes (to 30 days) from contact with Earth

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On to Mars
Important Technical Problems To Be Solved

- Operating on your own
  - The ambulance is a one to three year ride (unless it has to be dispatched from Earth). Then its two to four years.

- Understanding how robots and humans can leverage each other
On To Mars
Important Program Problems To Be Solved

- A long term program
  - 10 to 15 elections
  - 4 to 8 presidents and at least that many NASA administrators

- Science and engineering skills
  - Declining enrollment in needed specialties
  - Regearing NASA and industry as skilled people retire
On to Mars
How It Might Be Done

- 6 launches of the Cargo Vehicle place six 100 + metric ton payloads in low Earth orbit
- Payloads are assembled into a Mars Expedition Vehicle
- 6 month trip to Mars
- Expedition enters into an orbit around Mars
- Lander descends to a “camp” pre-positioned with equipment including system to utilize local resources
  - Water ice
- 600 day stay on Mars
- Return to low Mars orbit, rendezvous with orbiting assets
- 6 month return to Earth

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Why?

"Humankind needs expanding frontiers. We are a curious, questioning outward-going (in every sense), contentious, competitive bunch. We don't like confinement – even when the boundaries of our confinement are as wide as the world that gave us birth.

Man will not be contained.

Let him soar"

– Tom Clancy / General Chuck Horner
“Every Man a Tiger”
End of File