Achieving the National Exploration Vision
Propulsion Perspective

Statement to the Aldridge Commission

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NASA Vision Roadmap

**Propulsion**
- Existing / Derived
  - New
  - U.S., Foreign

**CEV**
- Lunar Orbit
- Lunar Land (Nuclear Power)
- Beyond Moon (Nuclear Prop / Power)

**Explore the Solar System and Beyond**
- Unmanned → Manned
- Observatories
- Robotic Orbiters, Landers (Nuclear Prop / Power)
- Complete ISS → Bio Astronautic Research Focus
- Retire
- Funds the Vision

**Shuttle Return to Flight**
- 25-30 Flts.

**Figure 1**
Exploration Vision Propulsion Challenges

Mission Success
Crew Safety

Availability
Affordable Cost

Payload Capacity

Figure 2
Non-Recurring Cost, $B (2001 dollars)

Development Cycle Time, years

Cost Reduced

FACTOR OF 4 to 6

F-1
56 Engines
1564 Tests

SSME
18 Engines
615 Tests

J-2
38 Engines
1730 Tests


Cycle Time Reduced

30 to 55%

Figure 3
Rocketdyne Propulsion Workforce

Figure 4

Propulsion Development Capability AT RISK


Propulsion Workforce x 1000

Cold War
Apollo
Shuttle
EELV

?
Engines Launched in 2003 (Global)

Total: 247

Russia (66%)

Proton 37%
Soyuz-U 27%
Soyuz-ST 4%
Atlas III/V 3%
GSLV 1%
Molniya 8%
Rockot 8%
Kosmos 6%
Zenit 3SL 6%
Khimash (Russia) 1%
P&W/Energomash (Russia) 1%
P&W (U.S.) 5%
Rocketdyne (U.S.) 5%
Aerojet (U.S.) 8%
P&W/Energomash (Russia) 1%

U.S. Total 18%

Figure 5