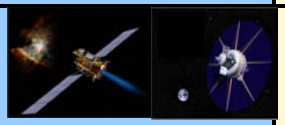
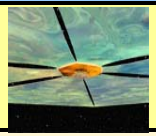
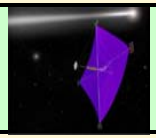
In-Space Propulsion Technologies Prioritized

Process

- Requirements/ Goals Established by NASA Enterprises
- Technology options identified
- Systems concepts developed
- Systems Concepts Compared
- Technologies Prioritized

In-Space Propulsion Technology	High Priority	Medium Priority	Low Priority	High Payoff/ High Risk
Advanced Chemical				
Aerocapture				
Solar Electric Propulsion (SEP				
Nuclear Electric Propulsion (NEP				
Solar Sails				
Solar Thermal				
Nuclear Thermal Propulsion (Bimodal)				
Plasma Sails				
Momentum Exchange Tethers (MXER)				

Code S Priority

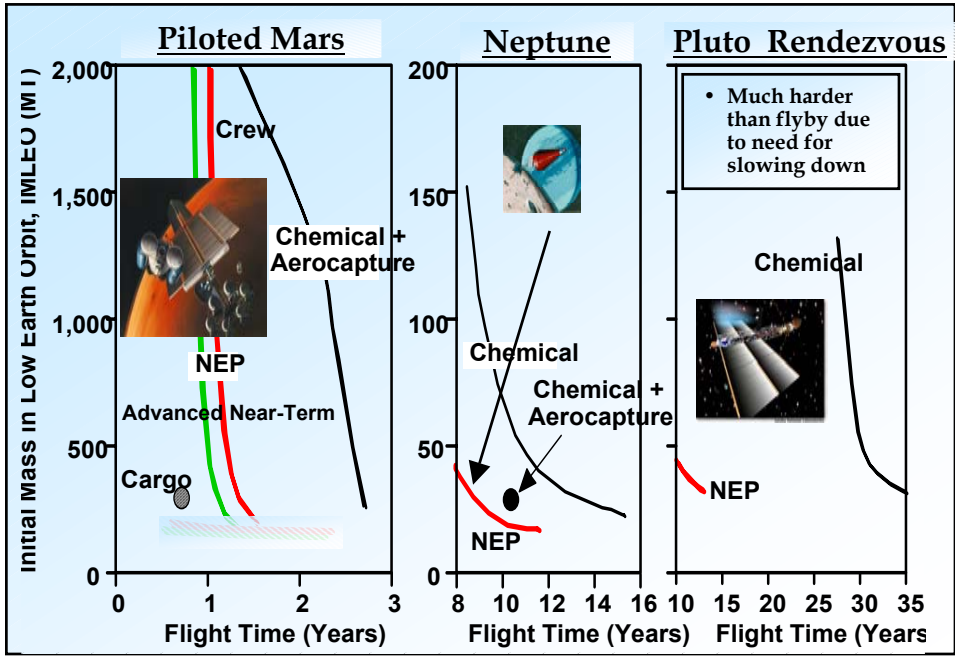
Code M Priority

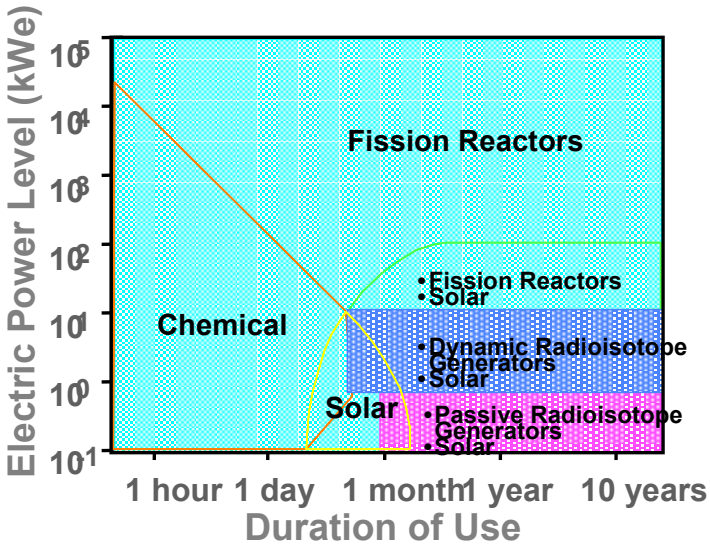
Code M and S

Nuclear Power and Propulsion

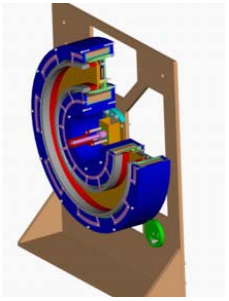
Why Nuclear?

- NEP identified as high-priority in space propulsion technology for human and robotic exploration
  - Enables very high delta-V missions
  - Offers abundant power at destination
- Evolutionary approach to fission propulsion proposed (3 phases)
  - 10-500 kW NEP and surface
  - Up to 100 MW NEP, solid-core NTR
  - Up 1000 MW NEP, gas-core NTR
- Enables non-Keplerian orbits that can avoid hazardous regions (e.g. ring particles)
- Enables complex, long duration missions

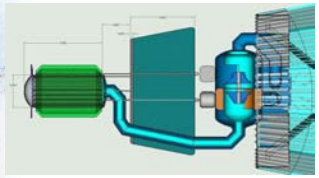


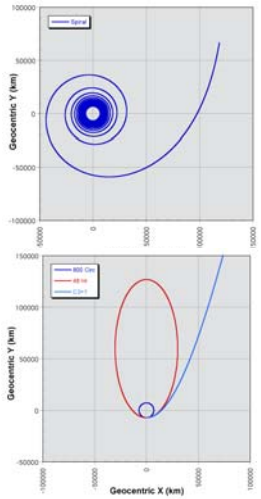


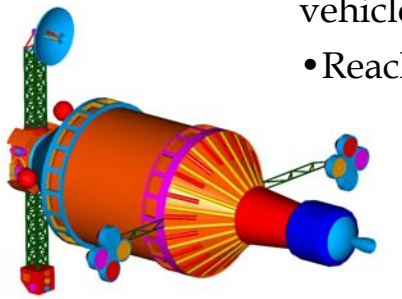
Nuclear Power and Propulsion

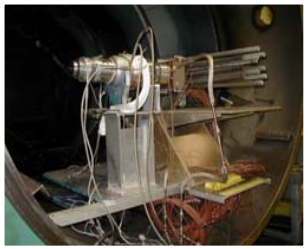


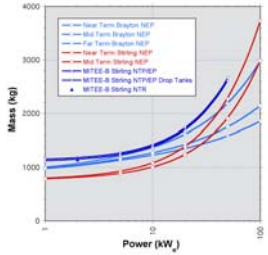
- Refurbished 2 kWe Brayton testbed and began high power Brayton system design studies with industry
- Conducted Heat Pipe reactor-to-Stirling power conversion integrated test
- Conducted Stirling engine-to-Hall thruster integrated test
- Fabricated and tested plasma injector for compact toroid high power plasma thruster
- Completed design and initial fabrication stages of 50kWe Hall thruster
- Conducted mission/trajectory design and analysis for high and low thrust nuclear propulsion systems
- Prepared conceptual designs of NEP and NEP/NTR vehicles for human and robotic science missions
- Reached 19,000+ hours on DS-1 ion engine ground test







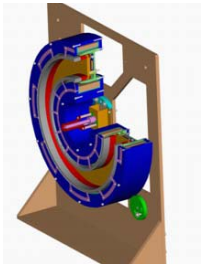




Nuclear Power and Propulsion

HP Reactor simulator

50 kW Hall



Ion thruster

Compact toroid Plasma thruster

2 kW Brayton testbed

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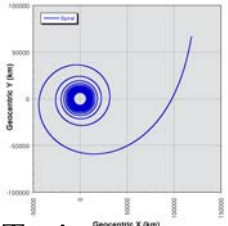
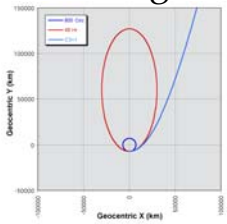
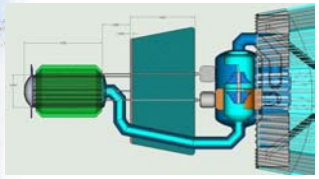
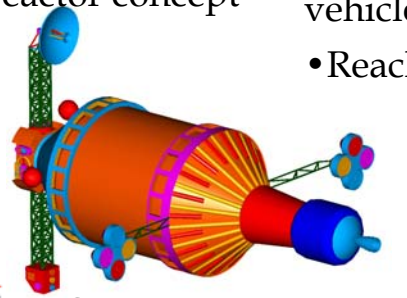


Trajectory modeling

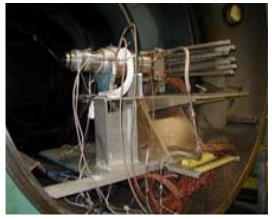




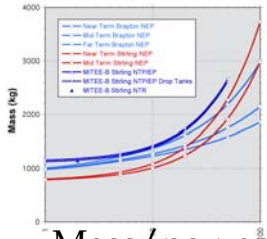
Gas cooled reactor concept



Science mission vehicle concept



HP reactor/ Stirling test



Mass/power trade study

Hall/Stirling test