NASA LEWIS RESEARCH CENTER

NEP SYSTEMS MODEL

NUCLEAR PROPULSION TECHNICAL INTERCHANGE MEETING

PLUMBROOK STATION

NASA LEWIS RESEARCH CENTER

OCTOBER 22, 1992

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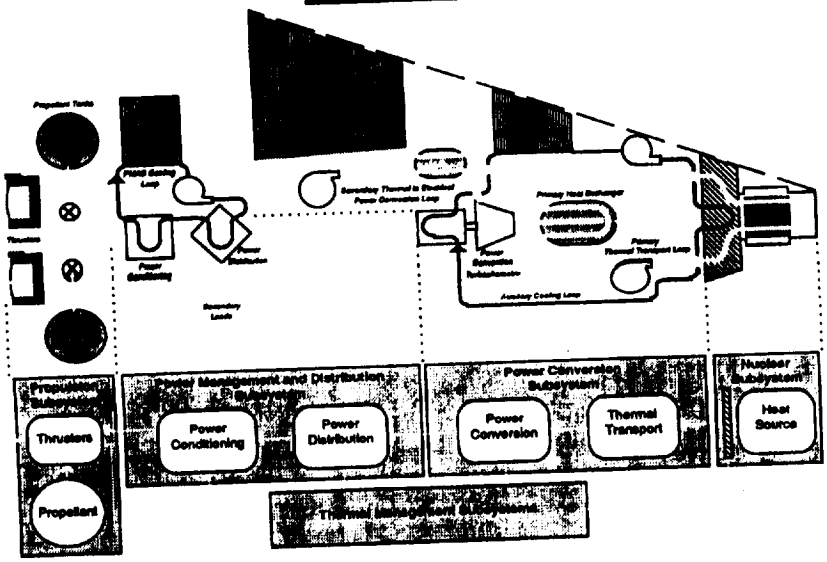
THE NUCLEAR ELECTRIC PROPULSION SYSTEM



Nuclear Electric Propulsion System Schematic
Example High Power Dynamic System for Piloted Missions

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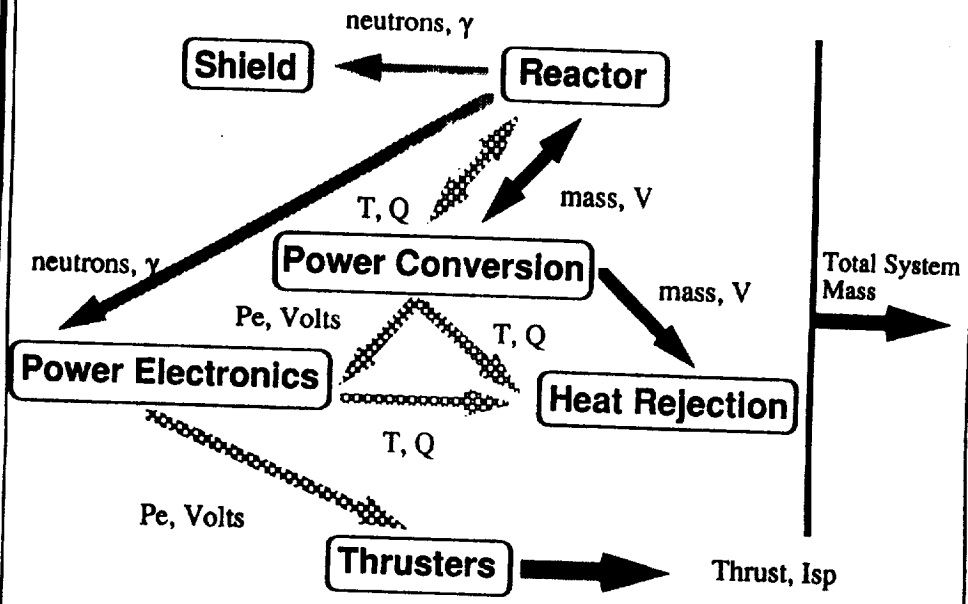
THE NEP SYSTEM ANALYSIS CHALLENGE



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GOALS FOR NUCLEAR ELECTRIC PROPULSION SYSTEM ANALYSIS

- **Design**
  - Develop an effective means of system integration, optimization and design
  - Perform subsystem level trades and sensitivity studies
  - Establish system design for planetary exploration
- **Studies**
  - Develop an effective means of performing integrated system trade studies over a range of technology options
  - Identify most advantageous technologies for next generation NEP systems

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NUCLEAR PROPULSION OFFICE APPROACH TO NEP SYSTEM ANALYSIS

- **NPO's initial purpose was analysis and design of MWe NEP systems for SEI applications**
  - MWe NEP subsystem models not well developed
  - Very little system integration was taking place in NEP studies
  - NPO chose to fund development of broad based component models that
    - **Update MWe subsystem designs**
    - **Allow for integrated system analysis**
- **Current emphasis is on kWe systems**
  - 20 - 100 kWe SP-100 power system definition
  - kWe ion thruster modelling
  - Integrated NEP system, vehicle definition

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NEP SUBSYSTEM MODEL DEVELOPMENT (1992)

- **In House**
  - Improve existing K-Rankine code
  - Develop thruster systems model
    - **Ion**
    - **MPD**
- **Power Conversion - Rocketdyne**
  - K - Rankine
  - Brayton
- **Power Management and Distribution - Rocketdyne**
- **Heat Rejection - Rocketdyne**
- **Reactors - Oak Ridge National Laboratory**
  - Liquid Metal Cooled Fuel Pin
  - NERVA - Derived
  - Liquid Metal Cooled Cermet

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