Numerical Propulsion System Simulation for Space Transportation
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New project to
Develop Advanced System Simulations for 3rd Generation Engine Design and Analysis

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**Milestones / Activities**

**FY01 MAJOR Milestones**
- Incremental Release Rocket System Simulation (GRC)
- Rotor-Stator Pump CFD Analysis Initial Capability (MSFC)

**FY02 MAJOR Milestones**
- Production RBCC Rocket System Simulation (GRC)
- Initial Cavitating Pump Element Design Code (MSFC)

**Prioritized Activities**
- Development of Rocket System Modules for Simulation FY01
- Development of RBCC System Modules for Simulation FY02

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**FY01 Acquisition Plan**
- Contracting with appropriate support organizations

**Facility Requirements**
- COSMO Supercomputing Facility at ARC
- SHARK and AEROSHARK Computing Facilities at GRC

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**Numerical Propulsion System Simulation**
Implementation / Metrics

- Current State of the Art
  - Current System Simulations are mature, difficult to modify, and poorly documented.
  - Multidisciplinary couplings are one way and fabricated for specific applications.
  - Probabilistic life prediction techniques for space applications are in their early application.
  - Many parts of the full system, variable fidelity simulation have been demonstrated individually or technology is available from aeronautical applications.

- Benefits of Technology (Cost, Safety, Performance, etc)
  - An anticipated 20% reduction in time to design with improvements in performance and risk reduction.

- Risks/Technical Challenges with Mitigation Plans:
  - All GRC software implementation will be V&V’d against data or other V&V’d software.
  - GRC Software development will proceed as occurred with similar development efforts in Aeronautical simulations.
  - Similar Aeronautical Systems are at TRL 8
  - Where appropriate, parallel efforts will be encouraged/tracked in high risk areas until success is assured.

- Participants/University
  - NASA Centers: GRC, MSFC, LaRC, ARC (Subtask in outyears)
  - Industry: TBD Partners
  - Universities: OAI, TBD
  - HBCU/HMCU/SDB’s: TBD

- Public Briefings Scheduled for FY01
  - Annual NPSS Industry Review in October, 2001

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