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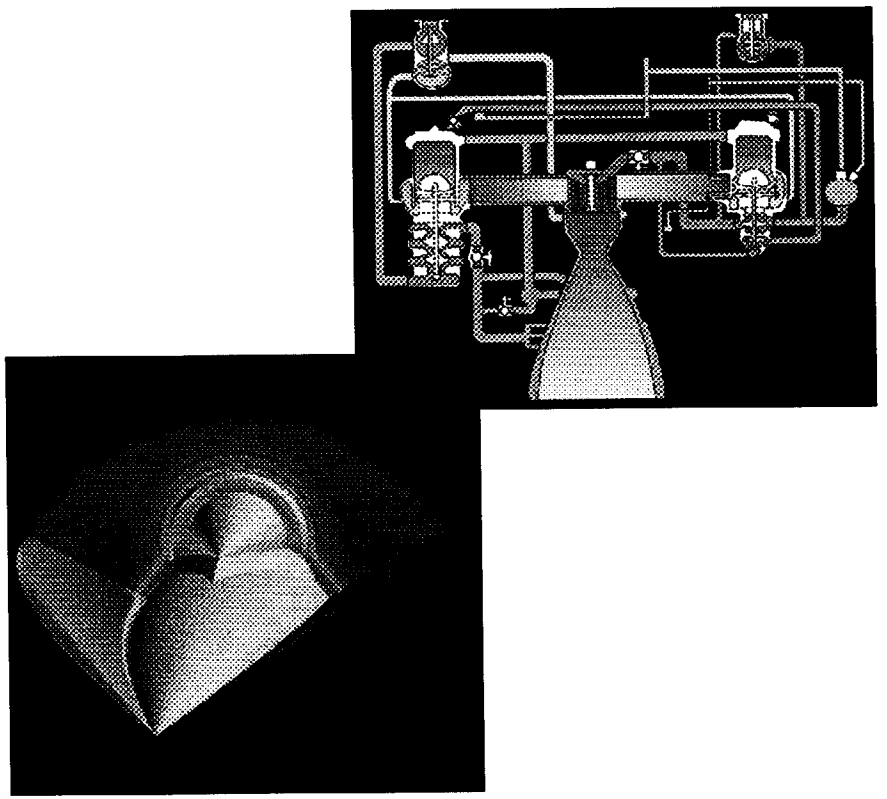
Numerical Propulsion System Simulation for Space Transportation

Karl Owen, GRC, 216-433-5895

New project to Develop Advanced System Simulations for 3rd Generation Engine Design and Analysis



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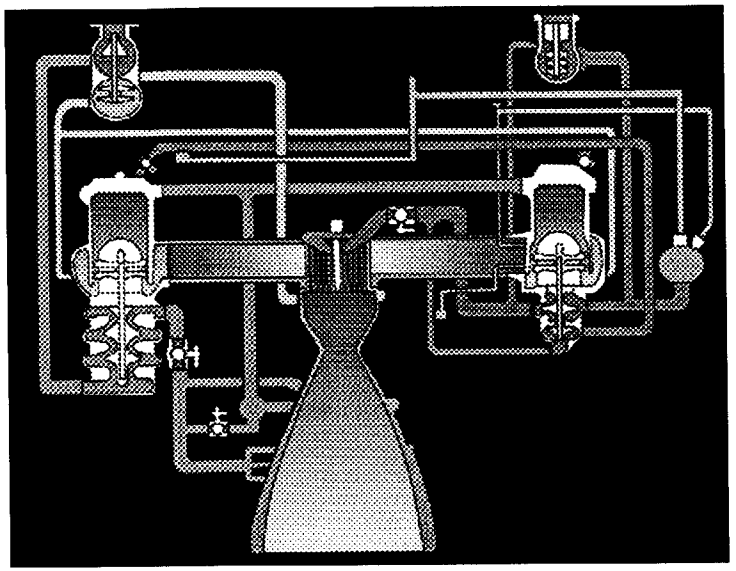


Milestones / Activities

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

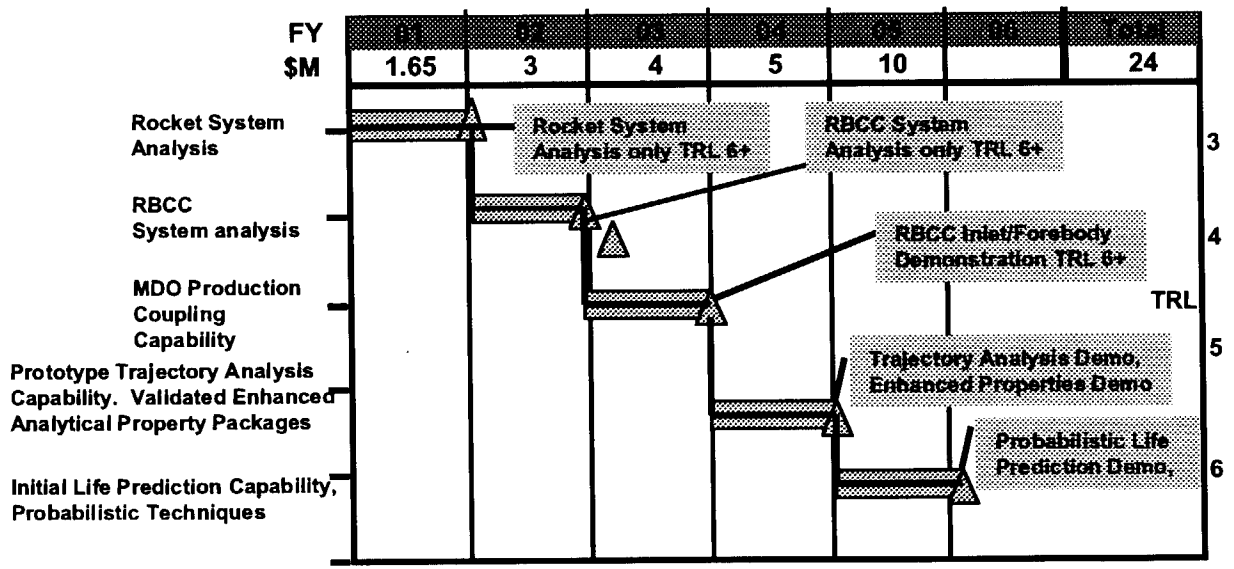
- Development of Rocket System Modules for Simulation FY01
- Development of RBCC System Modules for Simulation FY02

FY01 Acquisition Plan

- Contracting with appropriate support organizations

Facility Requirements

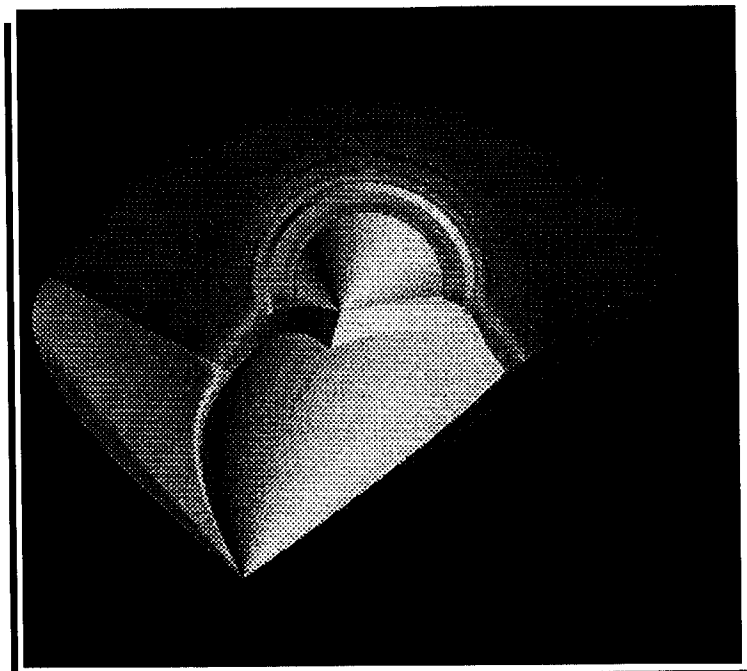
- COSMO Supercomputing Facility at ARC
- SHARK and AEROSHARK Computing Facilities at GRC



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 it 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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Numerical Propulsion System Simulation