CFD ACTIVITY AT AEROJET RELATED TO SEALS AND FLUID FILM BEARING

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This presentation package covers the CFD activity at Aerojet related to seals and fluid film bearing. The presentation addresses the following topics:

1. Aerovisc Numeric and Capabilities
2. Recent Seal Application
3. Future Code Development

PRESENTATION PREVIEW

- AEROVISC NUMERICS AND CAPABILITIES

- RECENT SEAL APPLICATION

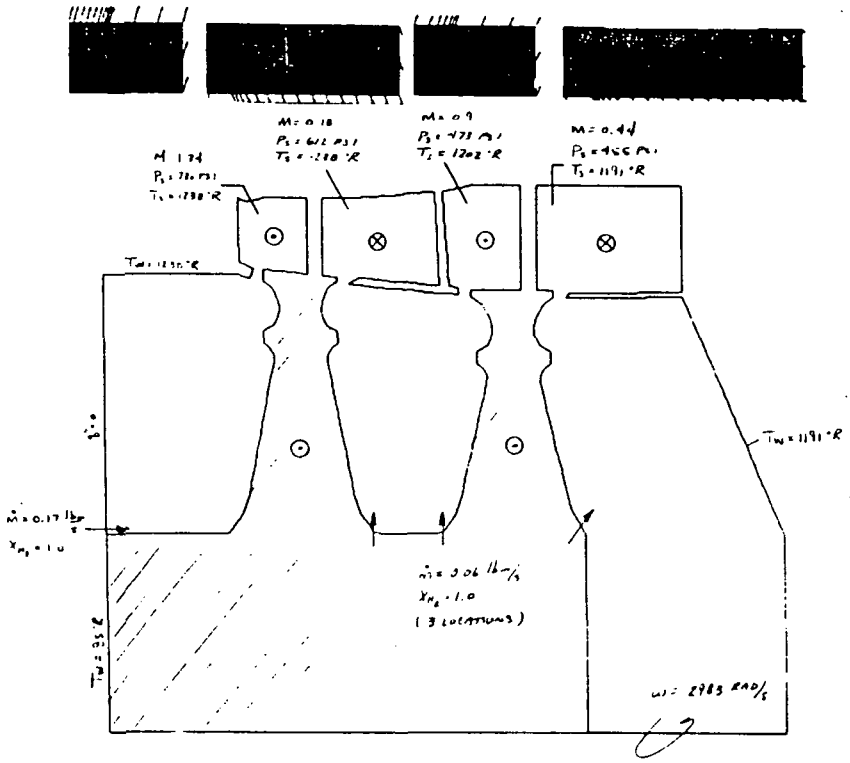
- FUTURE CODE DEVELOPMENT

AEROVISC Numerics

- Formulation
  - Reynolds Stress Averaged Navier-Stokes Equations in Cartesian, Strongly Conservative, Primitive Variable Form
  - k-e and ARS Turbulence Models With Log-Law Wall Functions
- Discretization
  - "Flux" Element Based Finite Volume Method
  - General Non-Orthogonal Boundary-Fitted Structured Grid
  - Choice of Advection Schemes
    - Upward Difference (Most Robust, Least Accurate)
    - Mass Weighted Skew (Enhanced Accuracy)
    - Linear Profile Skew (Most Accurate)
  - Second-Order-Accuracy With Physical Advection Correction Term
  - Rhie-Type Pressure Redistribution for Incompressible Flows
- Algebraic Solver
  - Choice of Vectorized Gauss-Siedel or Incomplete Cholesky Base Solver
  - Additive Correction Multigrid (Large Grids)
  - Block Correction (High Aspect Ratio Grids)

RELEVANT CODE CAPABILITIES

- INCOMPRESSIBLE FLOW
- SUBSONIC, TRANSONIC, AND SUPERSONIC FLOW
- NON-ISOTHERMAL AND ISOTHERMAL FLOW
- LAMINAR, TURBULENT, OR INVISCID FLOW
- CORIOLIS AND CENTRIFUGAL TERMS FOR TURBOMACHINERY APPLICATIONS
- FIXED, MOVING OR ROTATING TURBULENT WALLS
- CONJUGATE HEAT TRANSFER OR SPECIFIED WALL TEMPERATURE/FLUX
- VARIABLE FLUID AND SOLID PROPERTIES
- MULTI-COMPONENT FLOW (N ADDITIONAL SCALAR TRANSPORT EQUATIONS)
- MULTIPLE BLOCKED REGIONS



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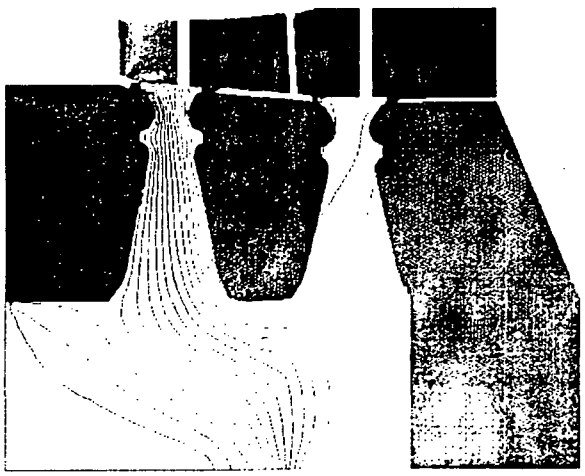

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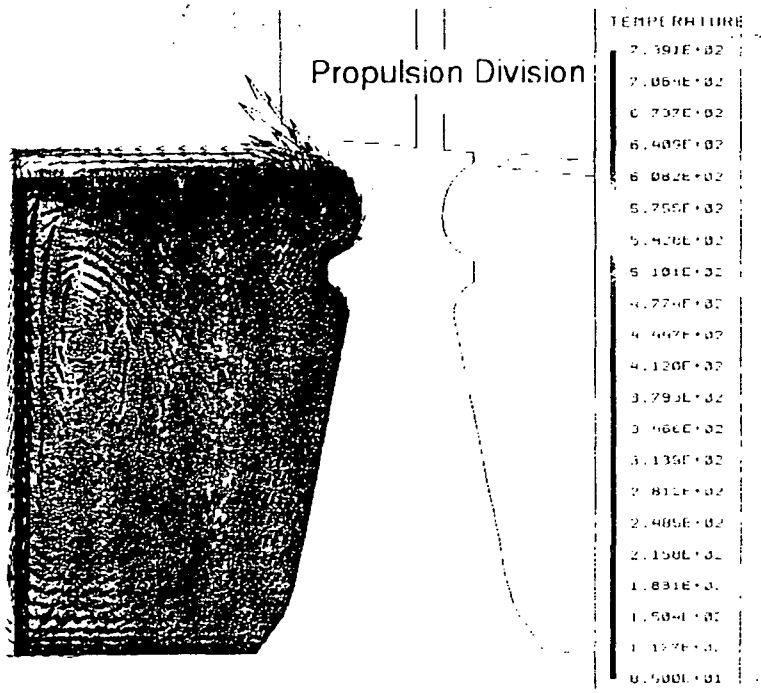
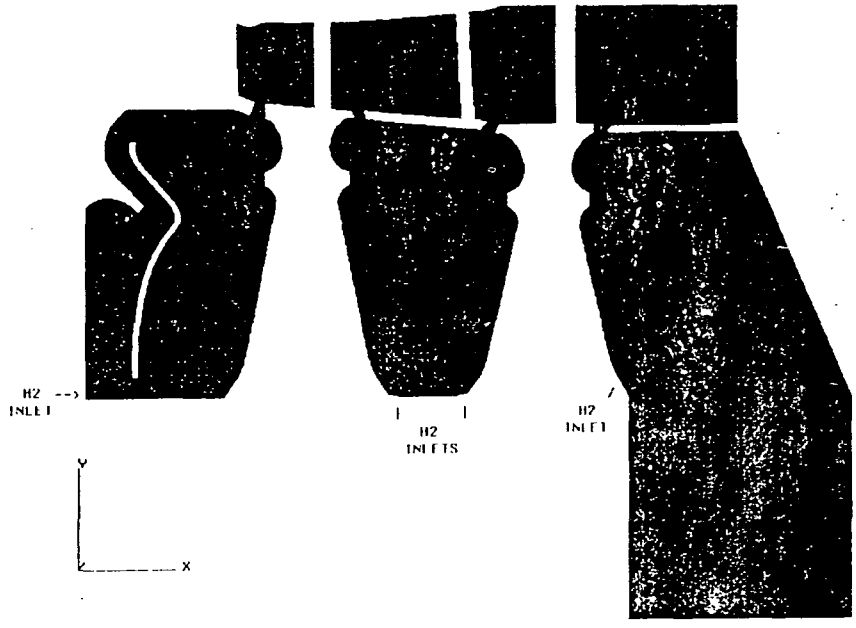
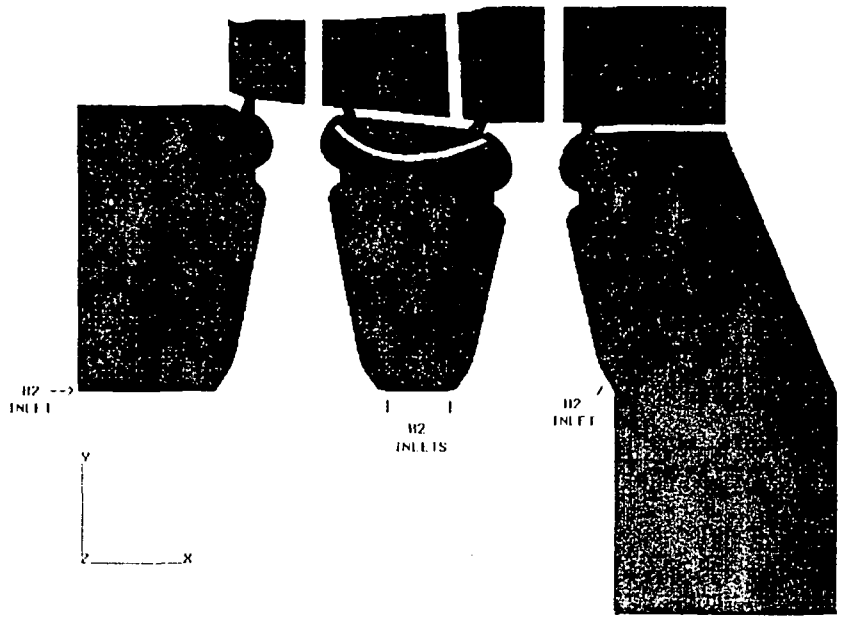




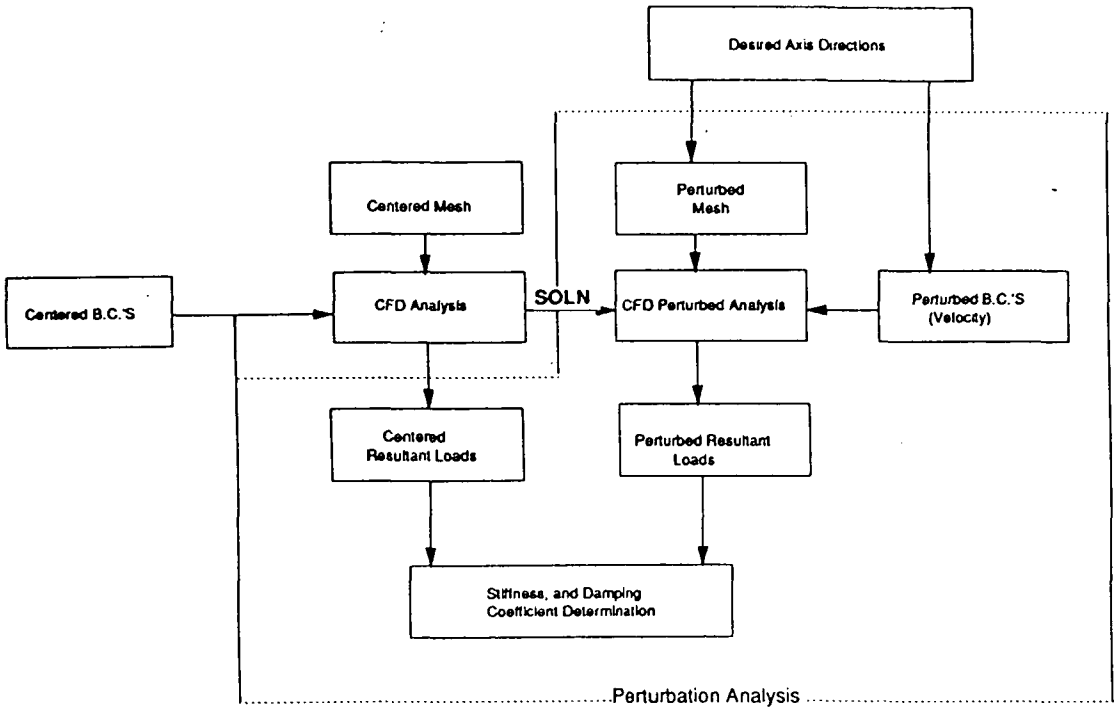


FUTURE CODE DEVELOPMENT

- GRID EMBEDDING/ATTACHING
  - GRID REFINEMENT IN AND NEAR SEALS
  - IMPROVED SOLUTION ACCURACY

- MULTI-LAYER TURBULENCE MODEL

- AUTOMATED PROCEDURE TO PREDICT FLUID SEAL DYNAMIC COEFFICIENTS



Schematic of Fluid Film Bearing Analysis Methodology