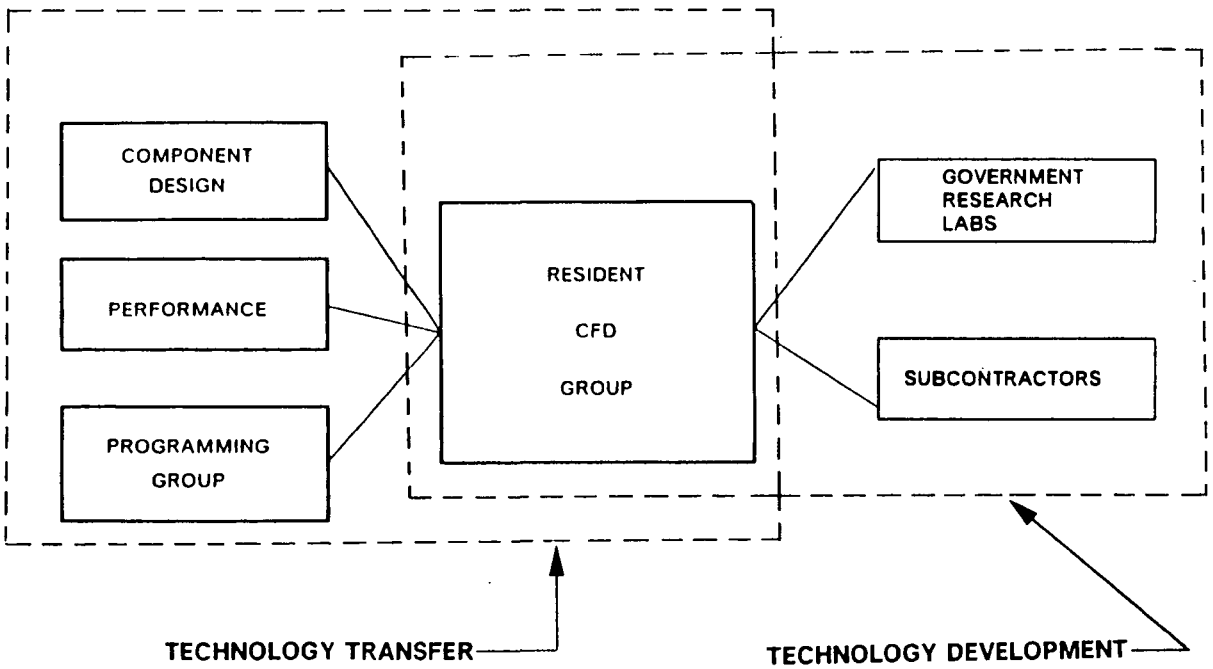
N92-15099

PRATT AND WHITNEY ACTIVITIES

Saadat A. Syed

An example of CFD application in the seal area is described. This effort consisted of optimizing specific seals in SSME-ATD and resulted in design of a seal tested at Pratt and Whitney which demonstrated 30% lower leakage than standard design at the same clearance. This example shows the potential of identifying seal geometry parameters which reduce internal flow leakages detrimental to component and turbopump efficiencies. This information can then be used to develop an analytical design procedure for controlling leakage in any given application or environment.

ORGANIZATION



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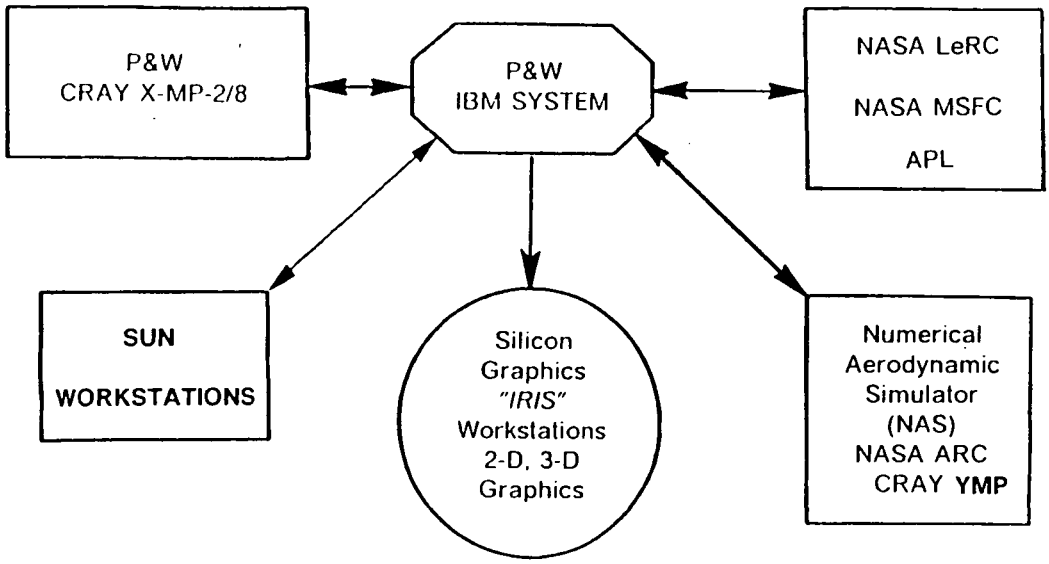
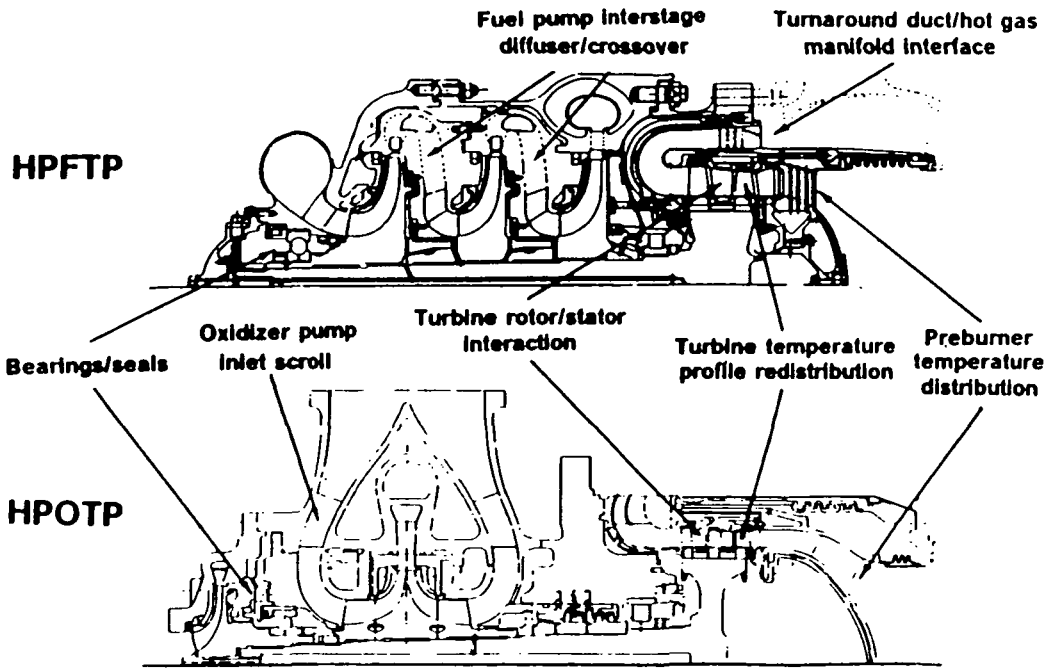
COMPUTATIONAL FLUID DYNAMICS

Significant Computing Power Available



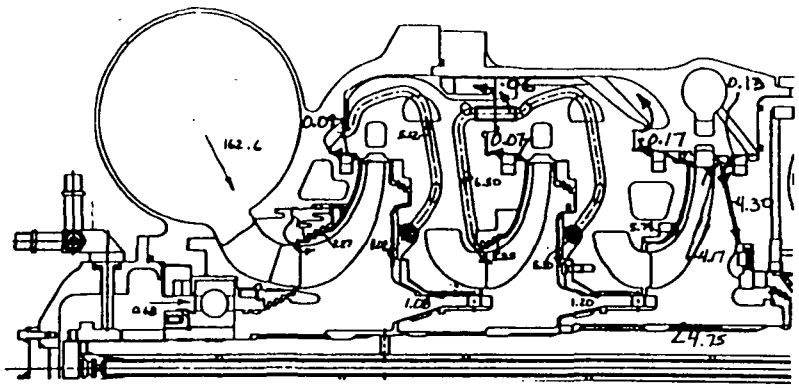
CFD ANALYSES OF TURBOPUMPS

Seven Areas Of Analysis Identified As Important For Successful Turbopump Design



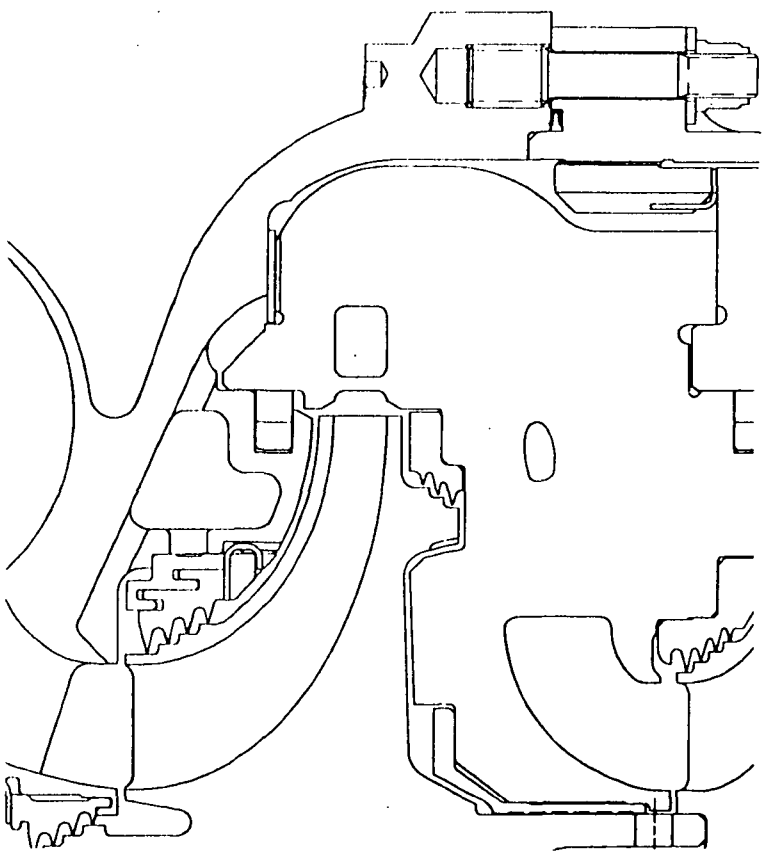
ATD HPFTP INTERNAL FLOW MGMT

Pump Internal Flows



ATD - HPFTP

Seal Detail



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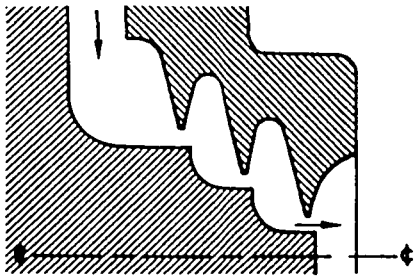
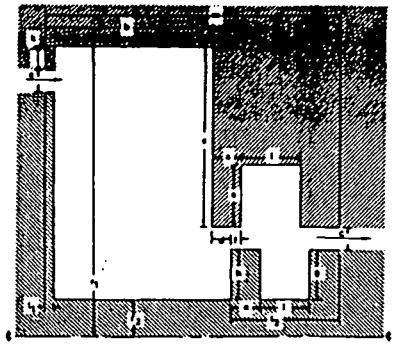
SSME-ATD FUEL PUMP CAVITY

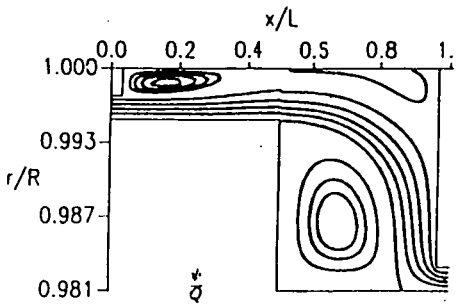
Minimize Leakage



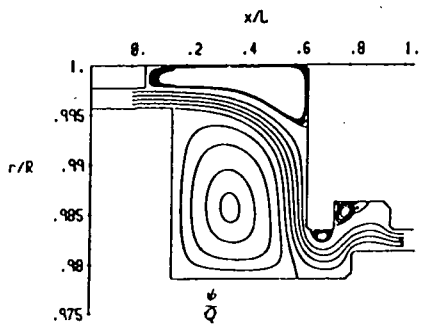
Overall original BI Seal configuration.



Design dimensions for the BI Seal configurations.



Streamline pattern within the idealized original cavity.

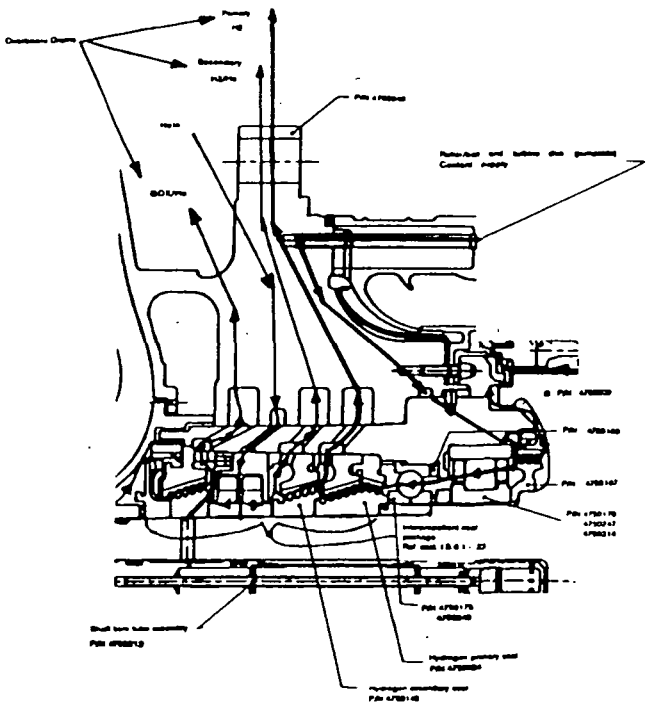


Streamline pattern within the Seal 8 cavity.

ATD HPOTP INTERNAL FLOW MGMT

Bearing And Turbine Coolant Flows

Roller Bearing Coolant Flow



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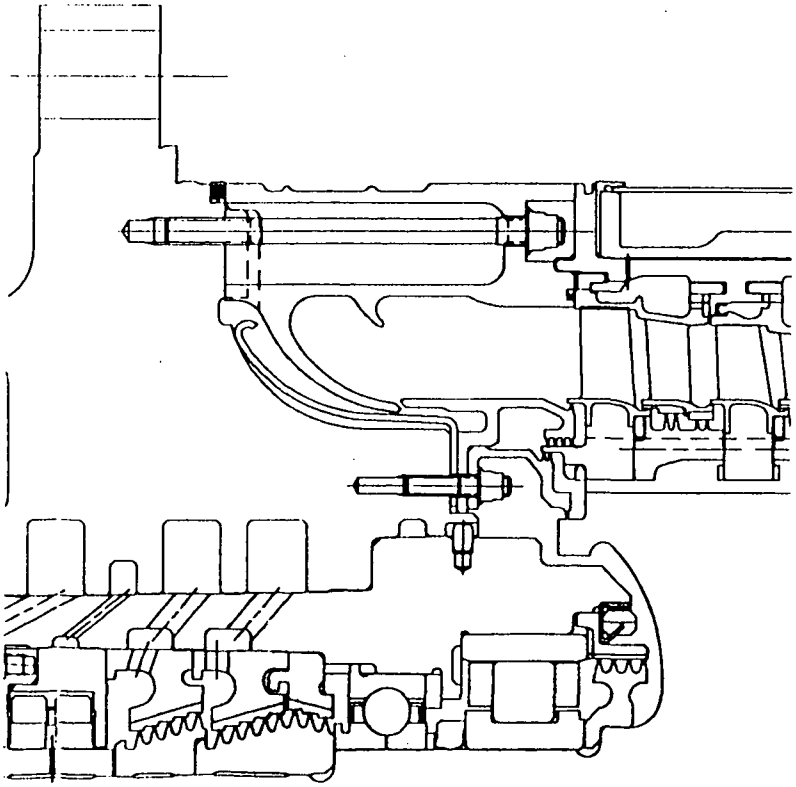
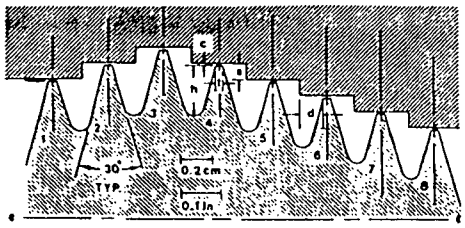
ATD HPOTP

Seal And Bearing Details

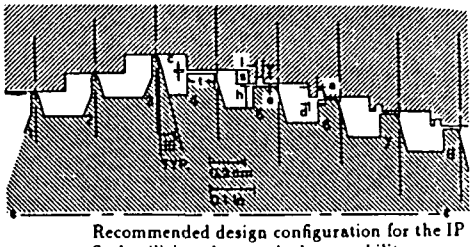


SSME-ATD LOX PUMP CAVITY

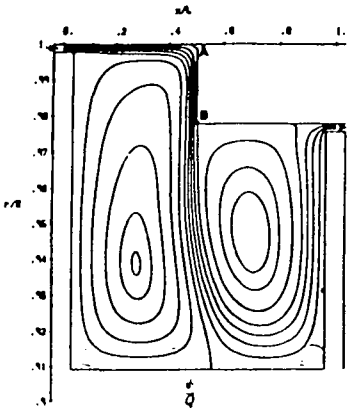
Controlled Leakage



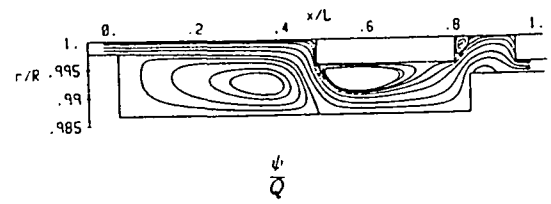
Overall original Interpropellent (IP) Seal design.



Recommended design configuration for the IP Seal utilizing the new leakage stability concept.



Streamline pattern within an idealised original IP Seal cavity.



Streamline pattern within Seal 75 cavity.

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