N92-15087

SEALS RELATED RESEARCH AT LEWIS RESEARCH CENTER

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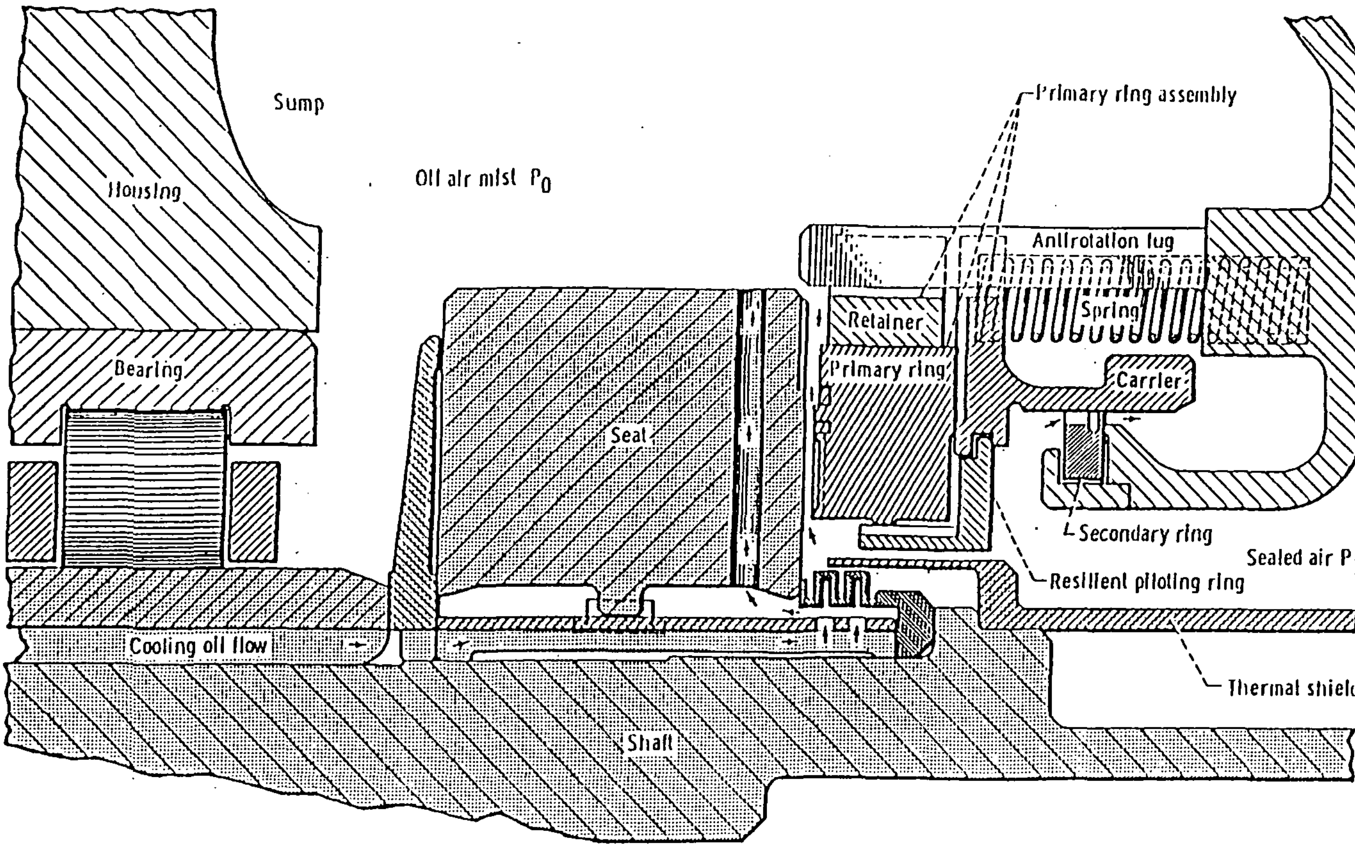
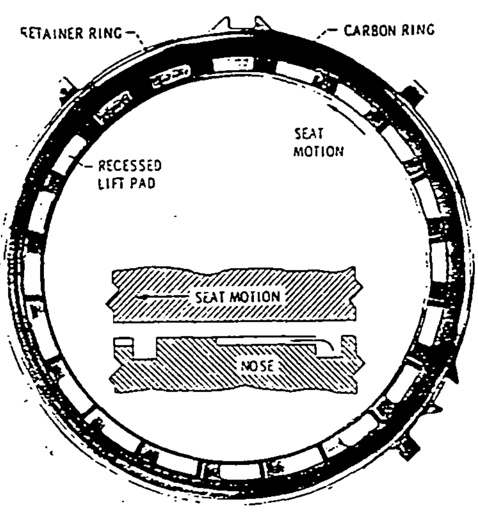
Cleveland, Ohio

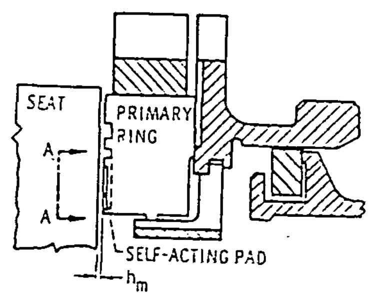
Lewis Research Center has a strong history supporting seals, and seal dynamics, research design, design, fabrication and test. Some efforts include spiral groove, self energized configurations, Rayleigh lift pads, conical, labyrinth, bore, honeycomb, face, tip, support for two-phase work, stepped configurations for SSME, near critical expansion, visualization, dynamic analyses, and materials.

Some researchers on these topics include: Larry Ludwig and Bob Johnson's various seal designs and application; John Zuk's cavity analysis and seals codes; Tom Strom's face and spiral groove seals; Dave Fleming's various configurations including conical seals and dynamic stability predictions; Bob Bill's abradable and ceramic configurations; Bill Hughes' two-phase flow analyses; Hal Sliney's materials work; Gordon Alen, Bill Loomis, El Dirusso and Bill Hady's test data comparisons and analyses; Isaaic Etsion's analyses of a variety of configurations; Allen Lubeck's face and shaft seal analyses; Hendricks' shuttle seal and multiple aperture configuration research; Glen McDonald and Hendricks' ceramic shroud seal; and the Texas A&M program to cite some of LeRC's efforts.

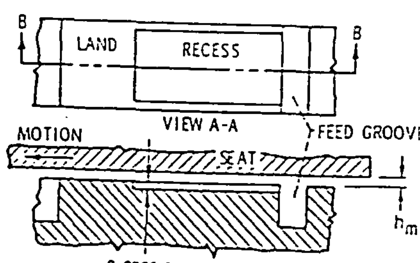
Some current efforts include: Bruce Steinetz and Paul Sirocky's self sealing linear segmented ceramic configurations; George Bobula, Bob Bill and Hendricks' T700 brush seal engine test; flow and duration characteristics of brush seals and other configurations with Margaret Proctor and Julie Schlumberger; cryogenic hydrogen brush seal tests at Rocketdyne with Joe Scharrer; Teledyne brush seal tester with USAF; and support for contracts and grants.





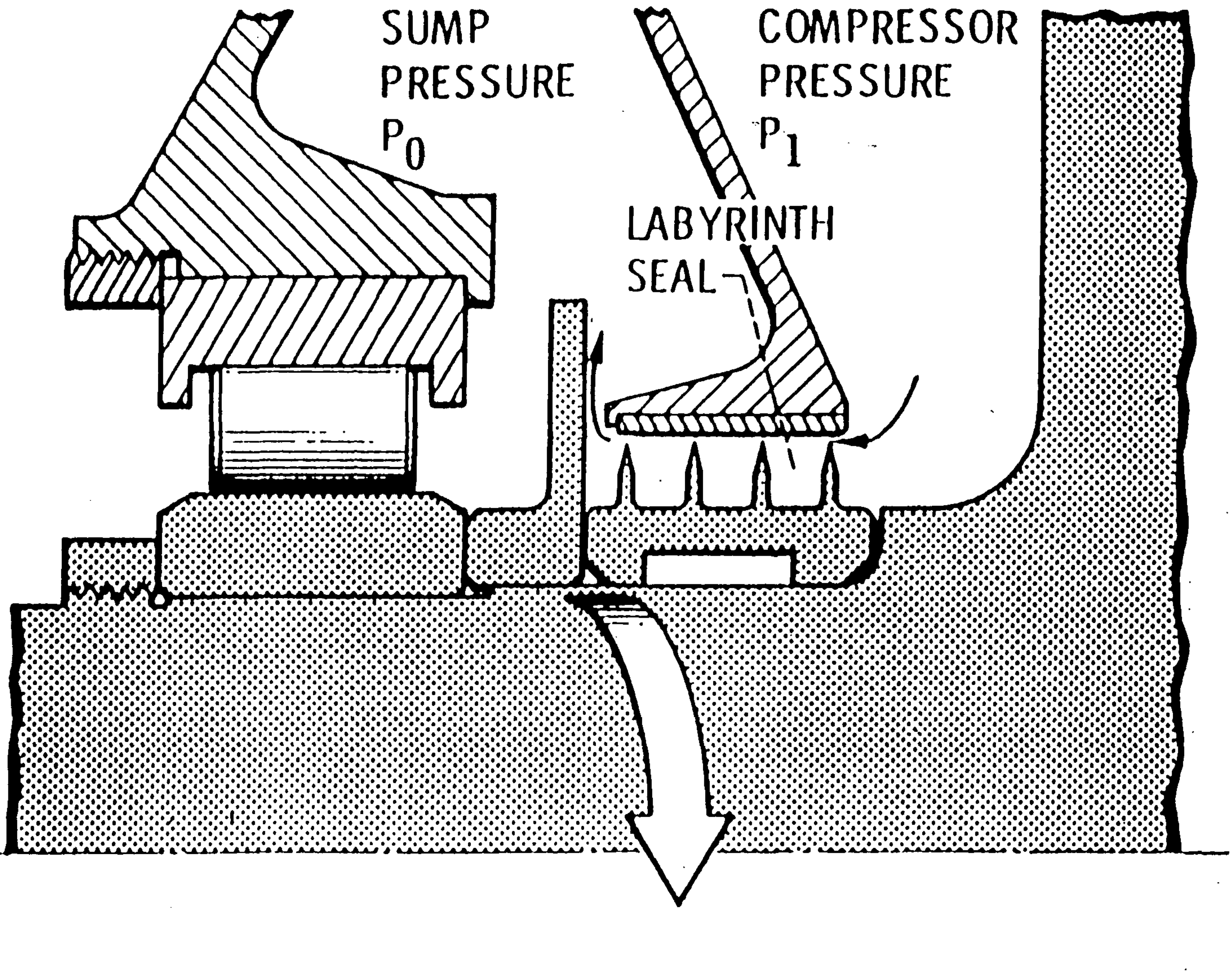


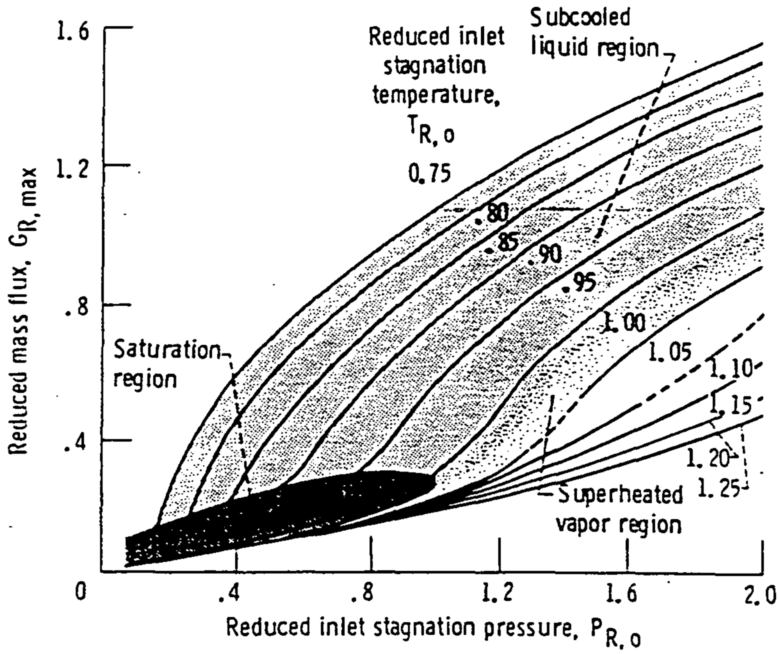
SELF-ACTING PAD LOCATION.



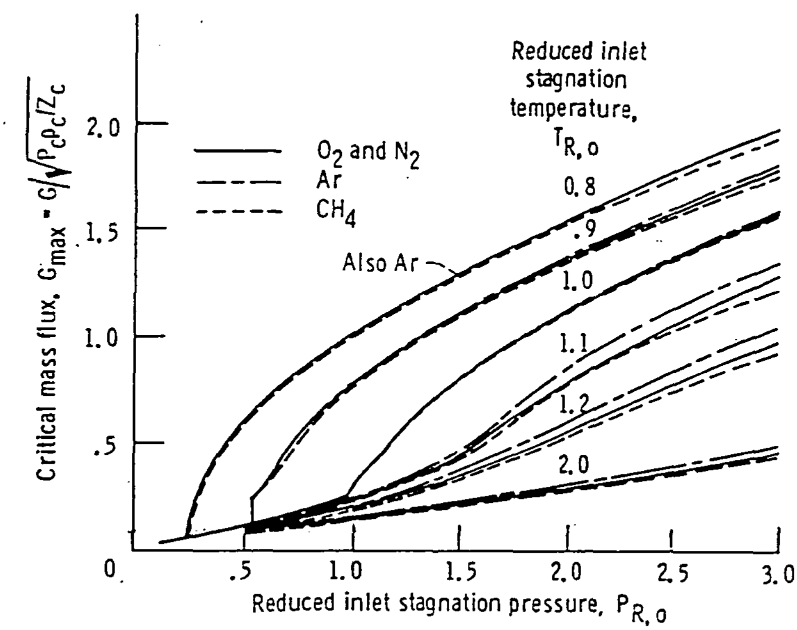
VIEW B-B

LABYRINTH SEAL

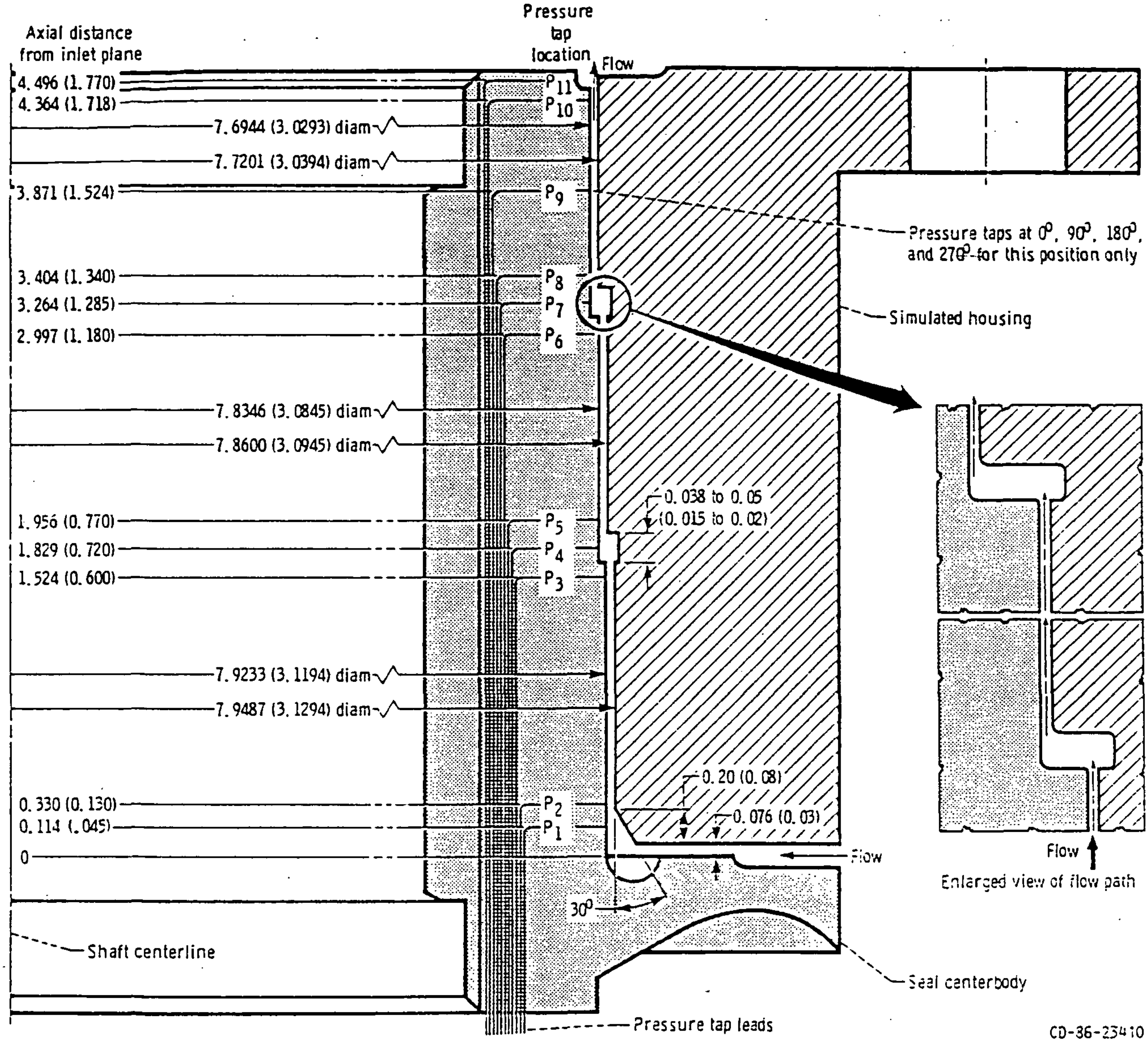




Reduced choked mass flux based on homogeneous isentropic equilibrium model.

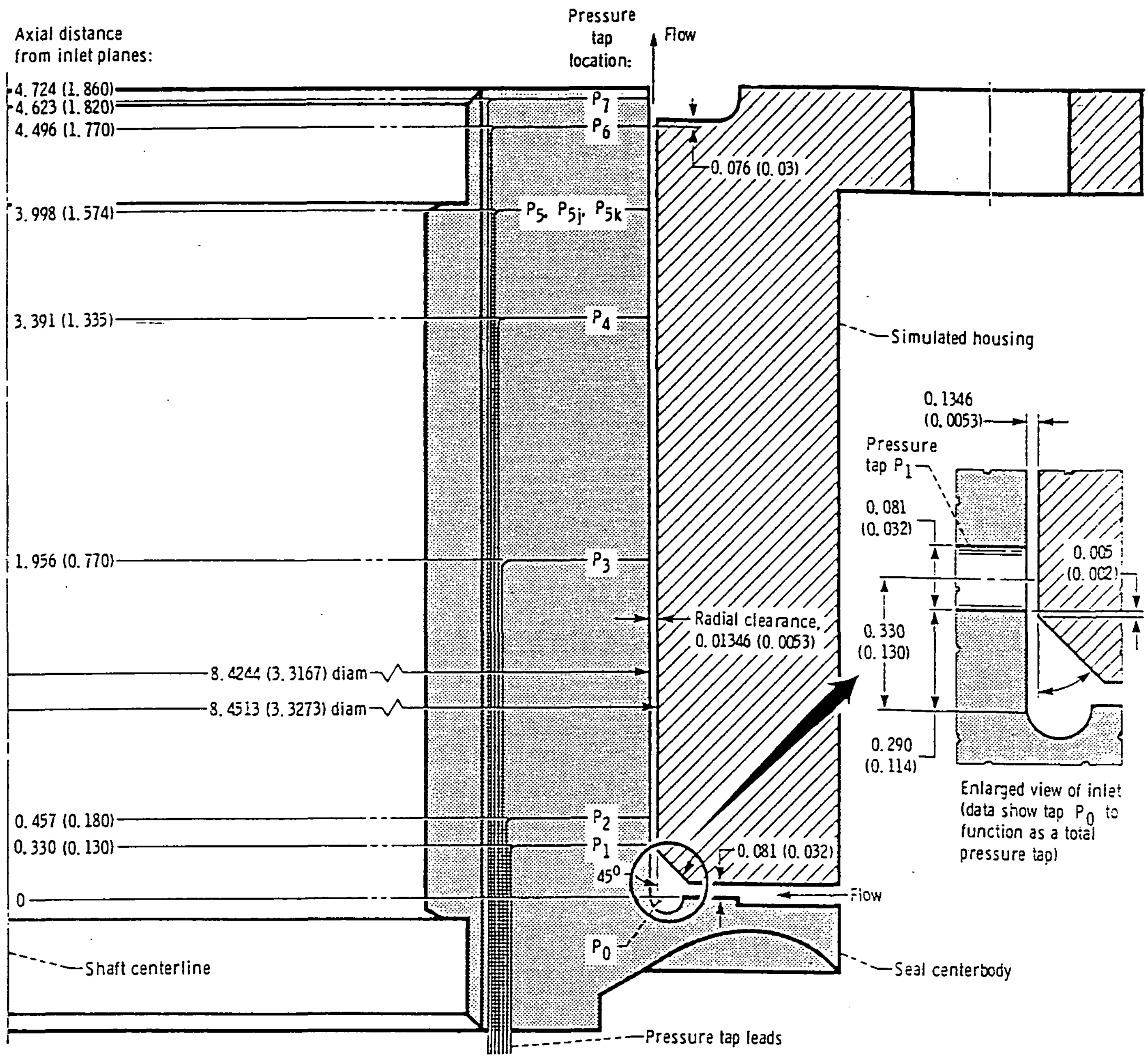


Critical mass fluxes of oxygen, nitrogen, argon, and methane computed by isentropic equilibrium expansion using corresponding-states principles.

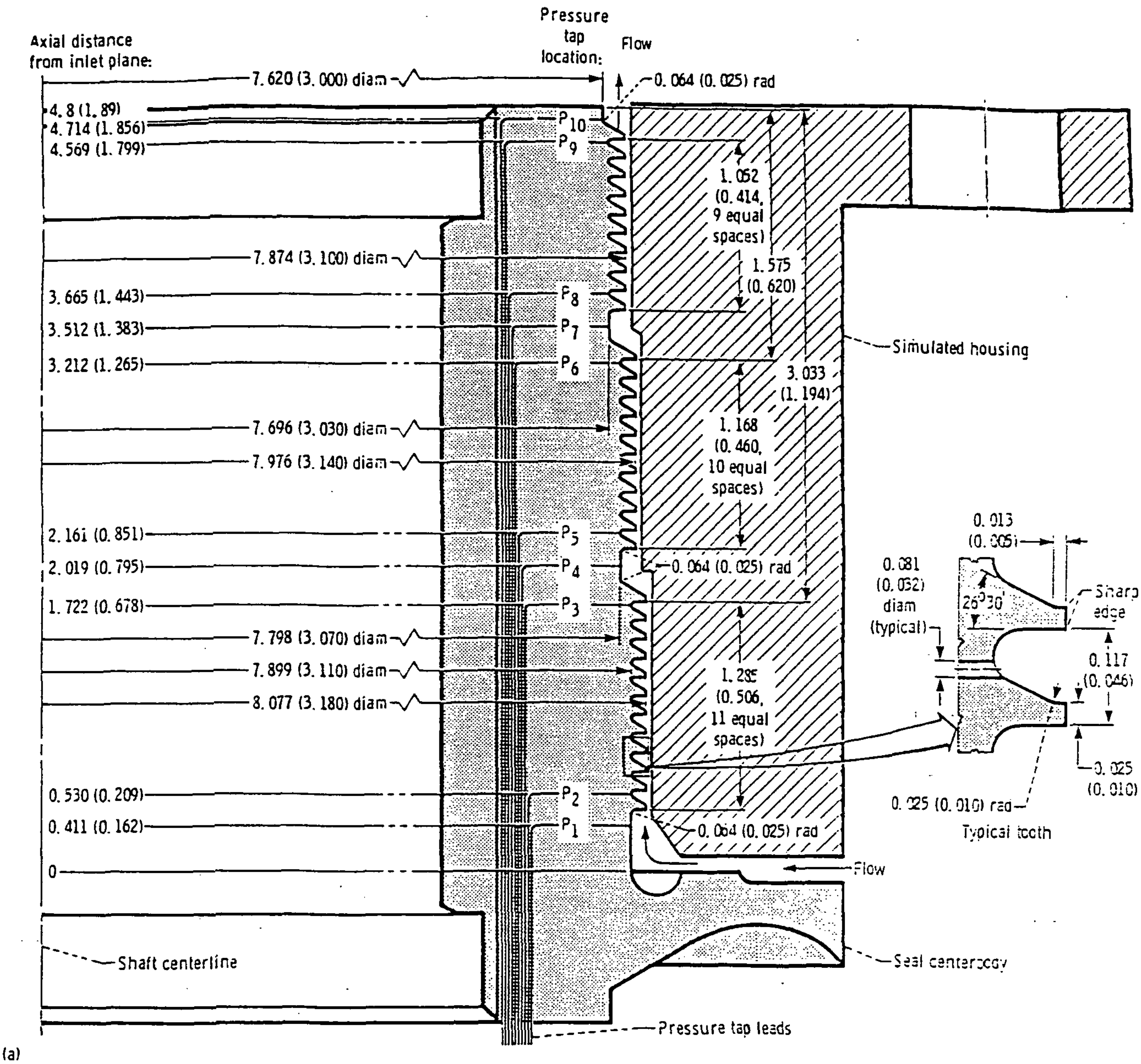


(a) Pressure taps.
(b) Step geometry.

Schematic of three-step flow path and pressure tap locations. (Linear dimensions are in centimeters (inches).)

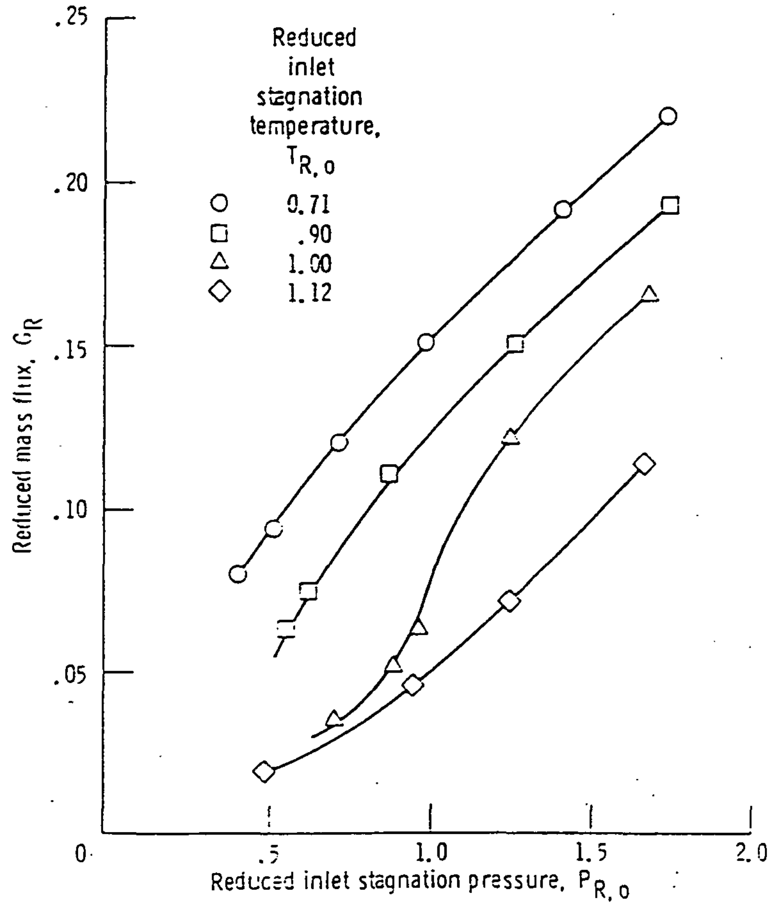


Overview of pressure taps and geometry for straight cylindrical seal. (Linear dimensions are in centimeters (inches).)

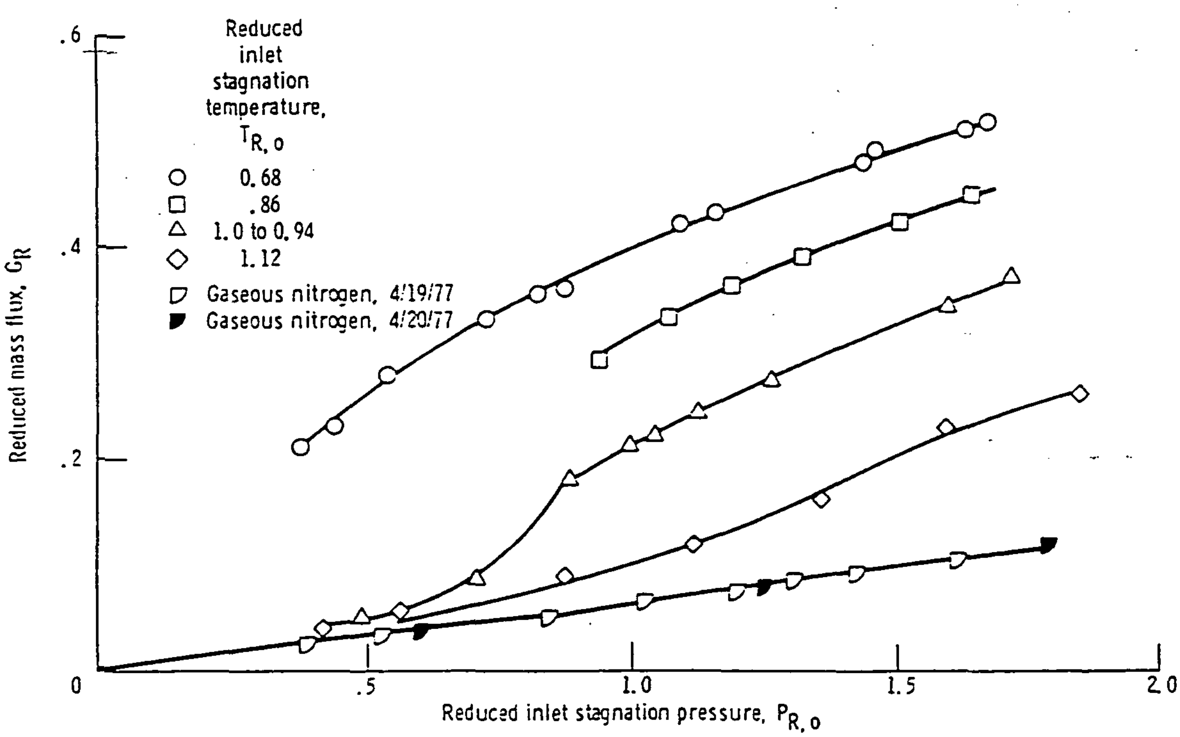


(a) Pressure taps.

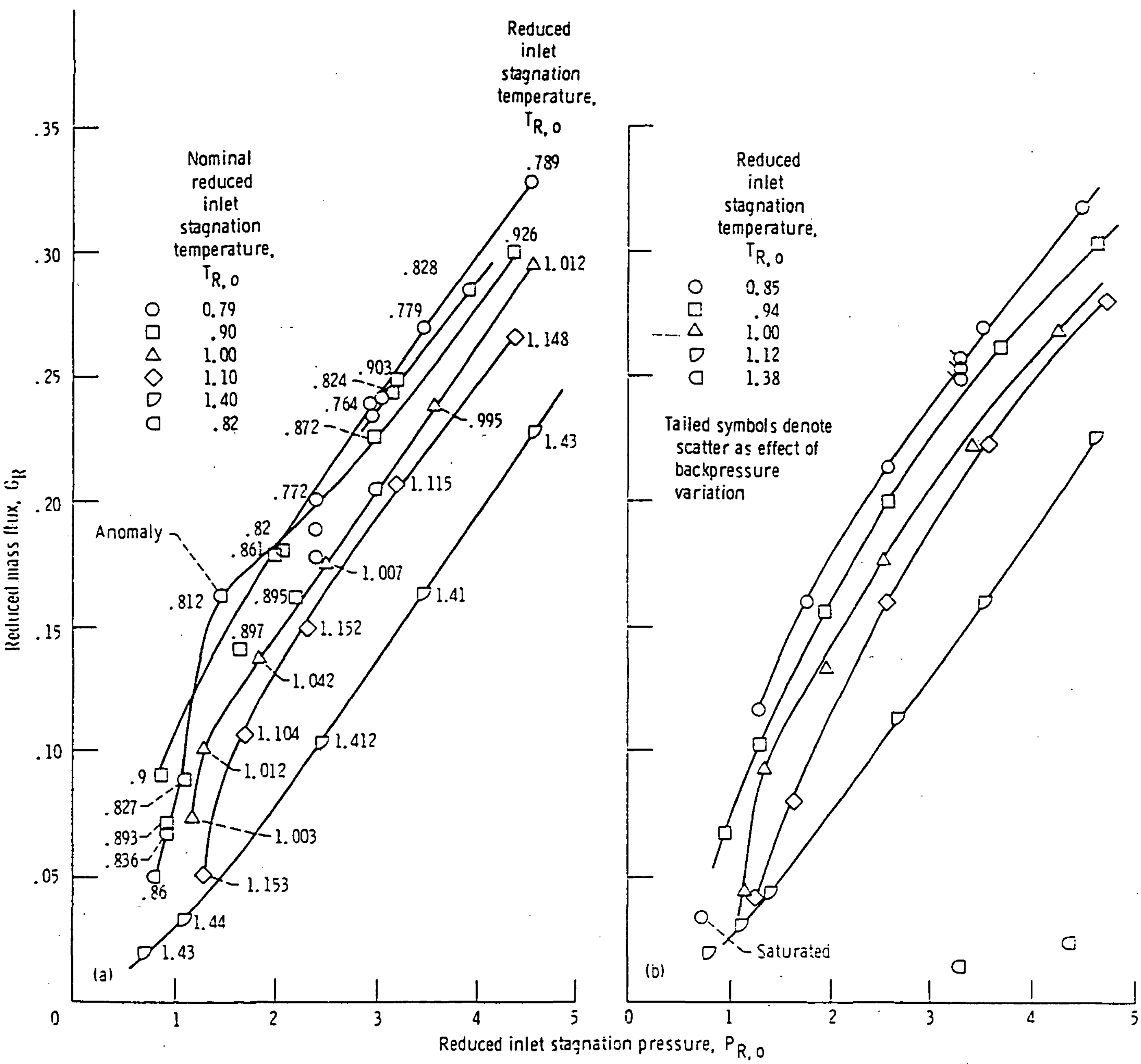
Overview of pressure taps and geometry for three-step labyrinth seal. (Linear dimensions are in centimeters (inches), and surface finish on all machined surfaces is 32.)



Reduced mass flux of fluid nitrogen through three-step labyrinth seal in concentric position, as function of reduced inlet stagnation pressure.



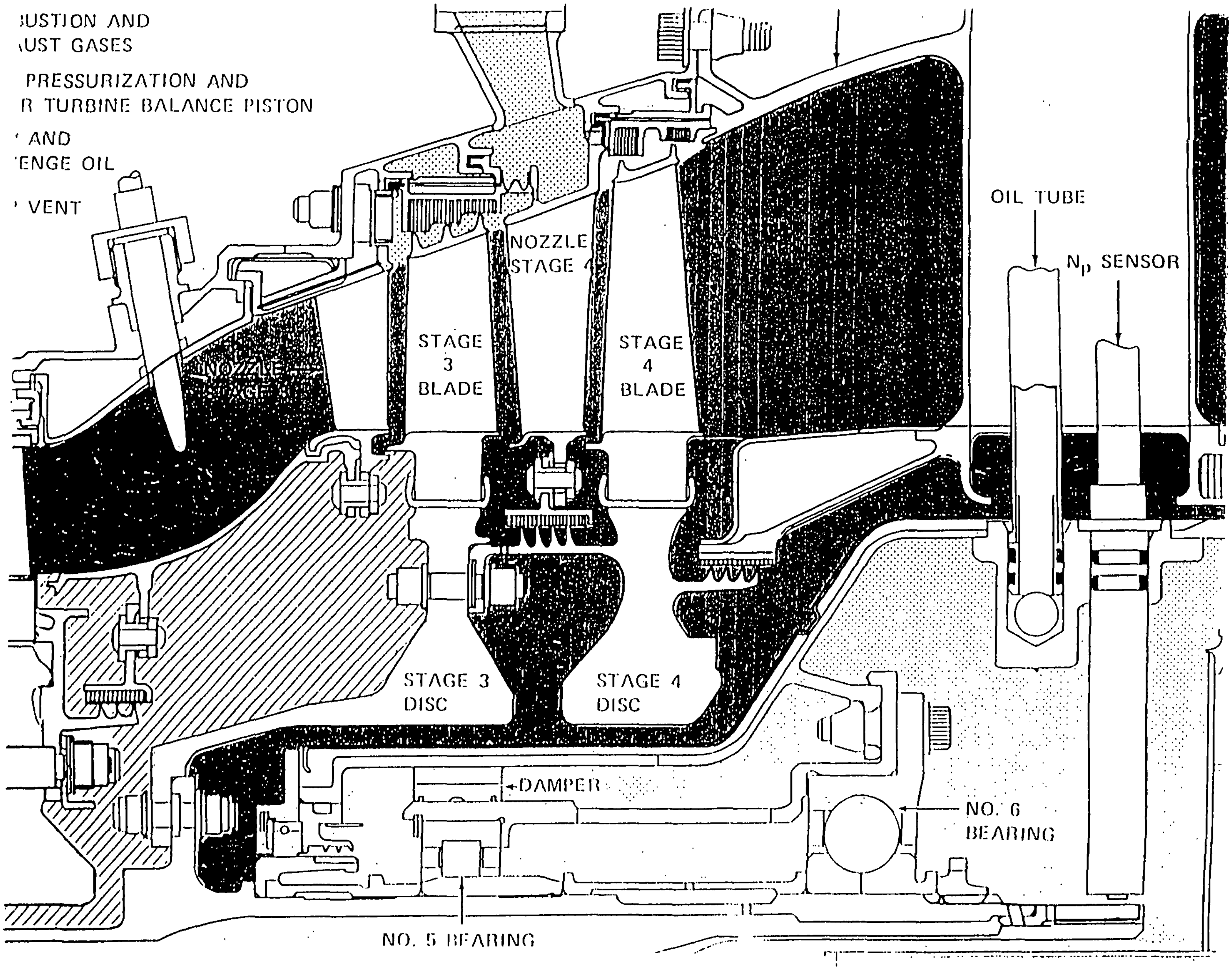
Reduced mass flux of fluid nitrogen through three-step cylindrical seal in fully eccentric position, as function of reduced inlet stagnation pressure.



(a) Fluid hydrogen with an anomaly.

(b) Fluid hydrogen with backpressure control.

Reduced mass flux of fluid hydrogen through three-step labyrinth seal in concentric position, as function of reduced inlet stagnation pressure.



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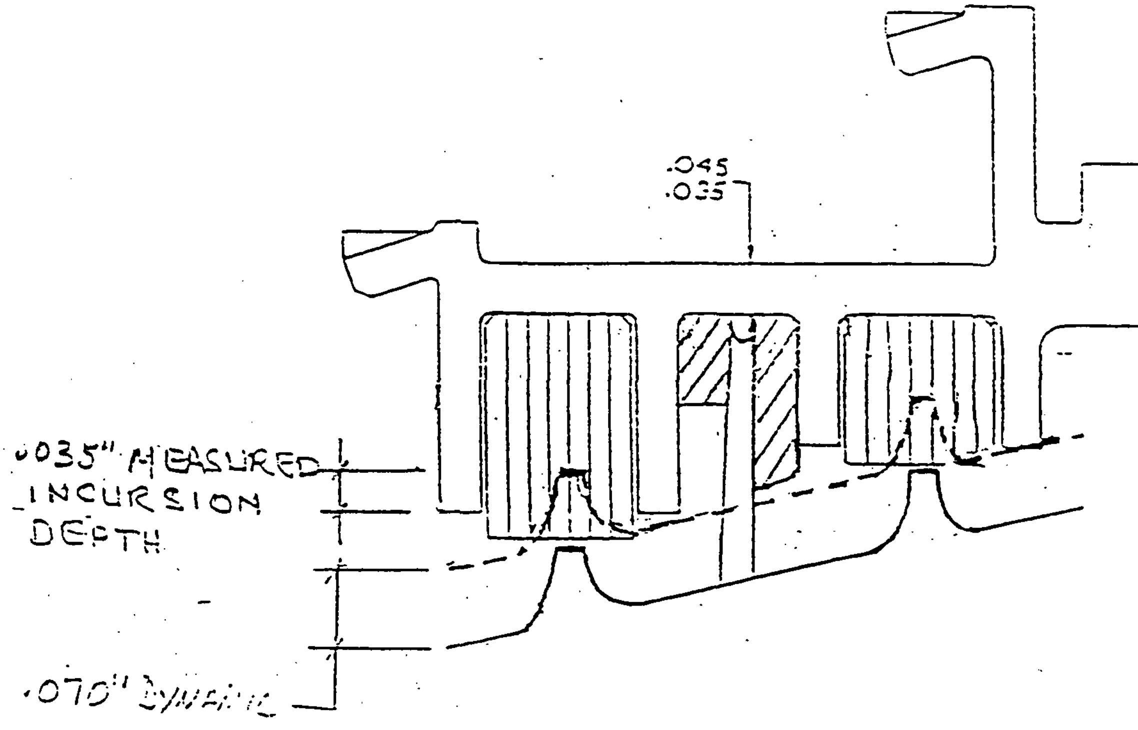
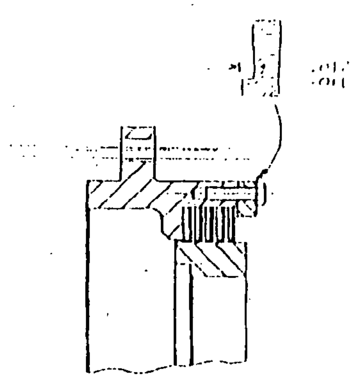
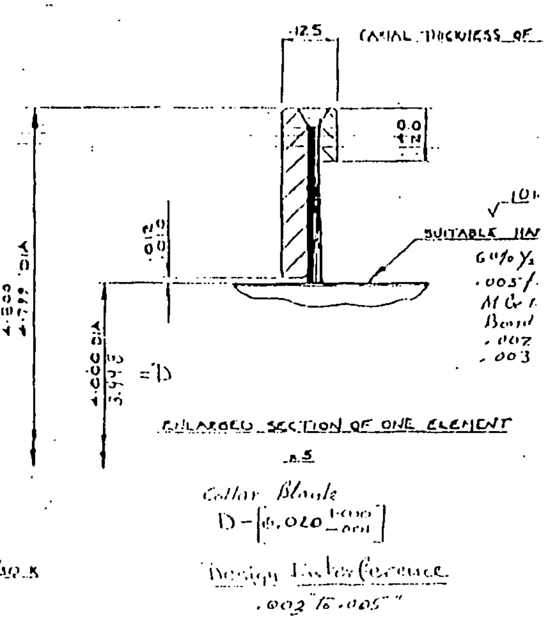
BEARING
NO. 5 BEARING







NOTES

MATERIALS SIDEPLATES HASTELLOY X

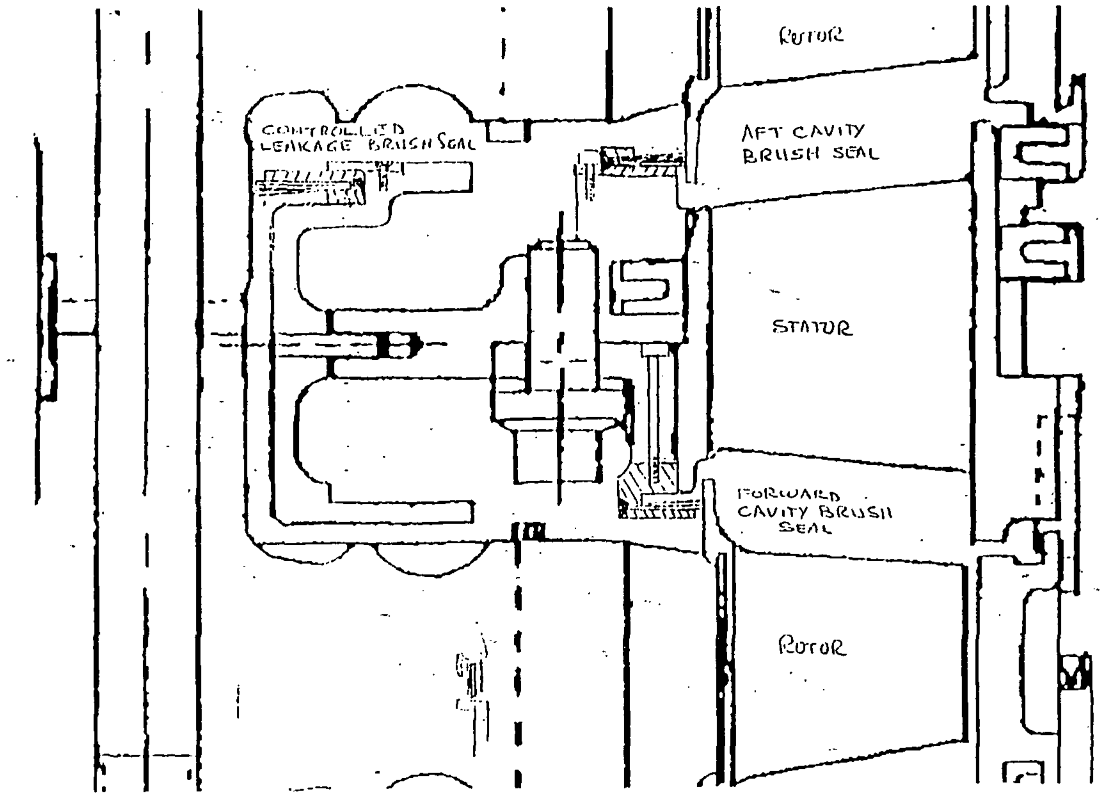
BRISTLES HAYNES 25 .0028" ∅

OPERATING CONDITIONS

LIQUID HYDROGEN TEMPERATURE 20 K/30 K

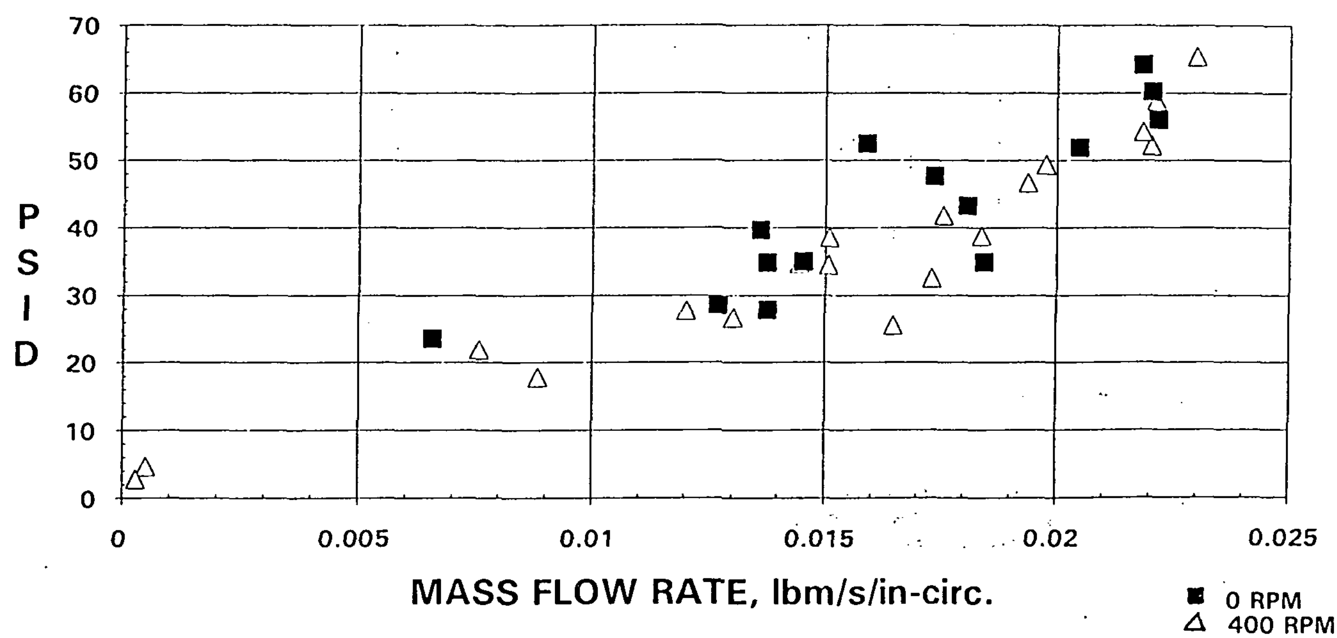
UPSTREAM PRESSURE 500 P.S.I.

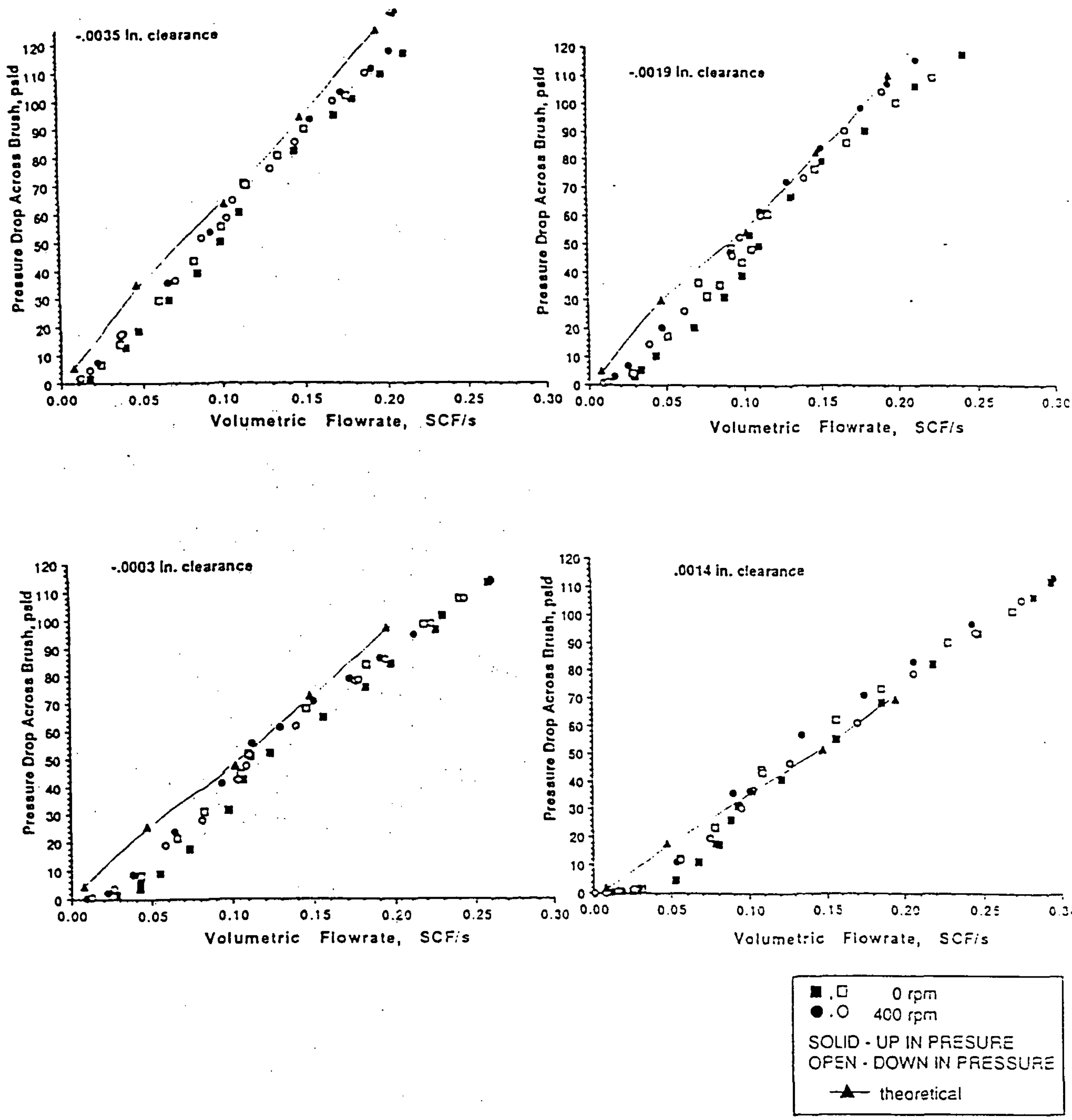
DOWNSTREAM PRESSURE 50 P.S.I.



PRESSURE DROP ACROSS BRUSH VERSUS MASS FLOW RATE

(IN LIQUID NITROGEN)





COMPARISON OF DATA AT 0 AND 400 RPM WITHOUT FLOW STRAIGHTENER