

# High-Temperature Turbine Seals

## High-Temperature, High-Speed Turbine Seal Test Rig



- Designed to test air-to-air shaft seals at speeds and temperatures envisioned for next-generation commercial and military turbine engines, this one-of-a-kind test rig is more capable than any known test rig in existence at either engine manufacturers or seal vendors.
- Seal leakage performance and power loss are measured as a function of inlet air temperature, shaft speed, and pressure drop across the seal.

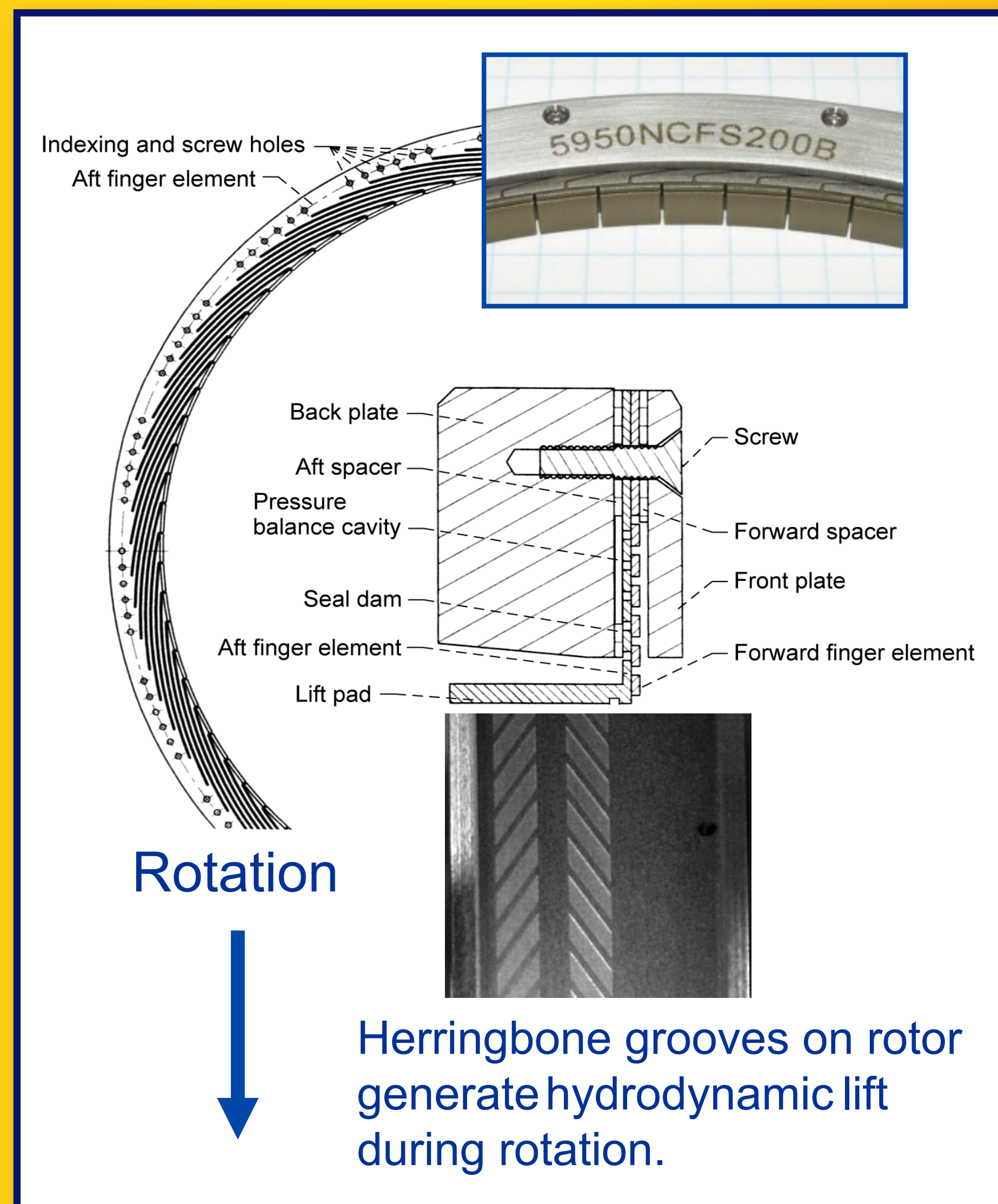
Pressure: 0 to 250 psig  
 Temperature: Ambient to 1500 °F  
 Surface speed, max.: 0 to 1500 ft/s  
 Seal inner diameter: 8.5 in. and near sizes

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## Baseline Noncontacting Finger Seal

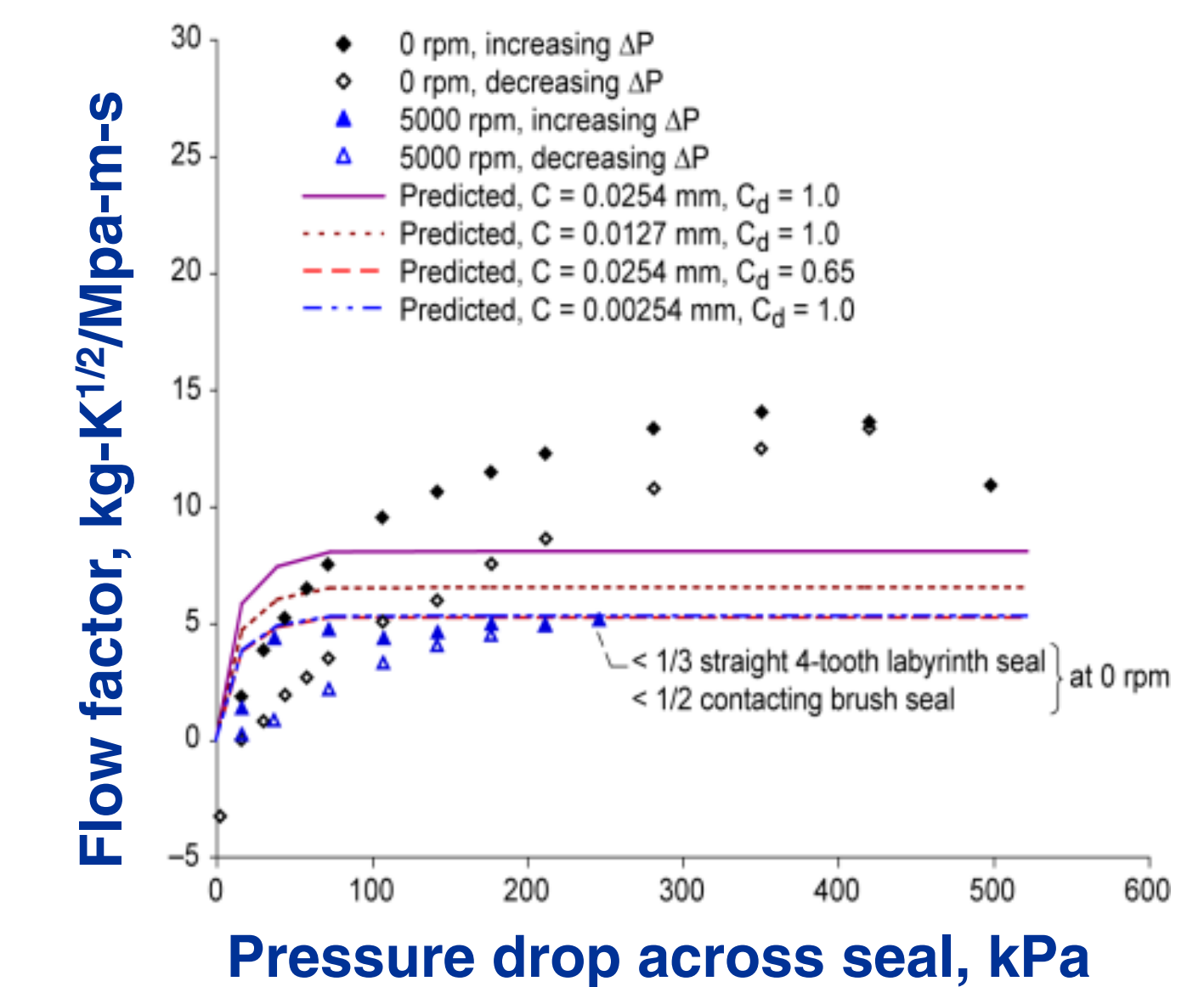
Advanced seals can yield a 2 to 3 percent reduction in specific fuel consumption, which reduces fuel burn and are applicable to N, N+1, and N+2 aircraft platforms.

- Conducted initial performance tests at 5000 rpm and demonstrated seal lift-off.
- Predictions are in good agreement with measured leakage when flow is choked.

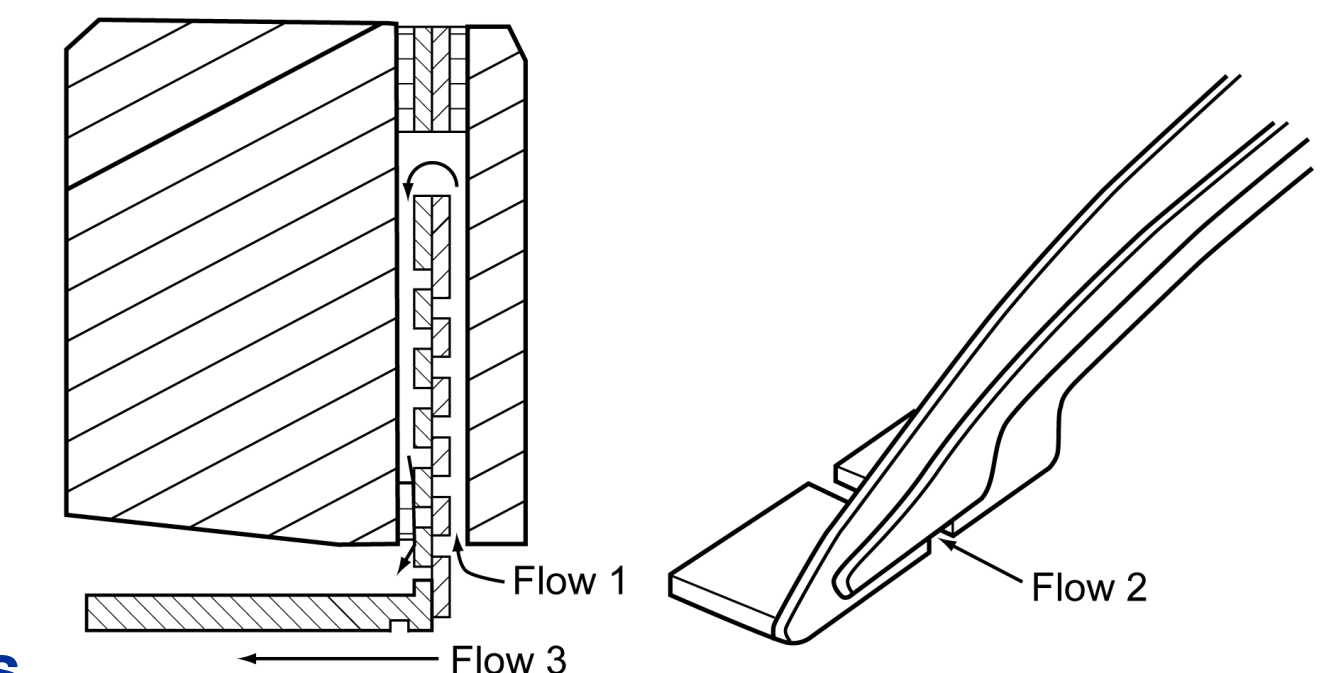


- Noncontacting finger seals are one type of compliant noncontacting seal, which holds promise to achieve low leakage rates and long life capability in subsonic gas turbine engines.
- U.S. Patent 6,811,154 B2

## Second Spin Test at 300 K, 5000 rpm



## Leakage Flow Model



### Assumptions

- Isentropic flow.
- Seal leakage area is sum of areas of each flow path.
- Geometry is fixed.
- Lift pads remain concentric to rotor.
- Finger elements held tightly to each other and seal dam so there is no leakage between contacting areas.
- Pressure in balance cavity equals seal inlet pressure.