National Aeronautics and Space Administration

MAINTENANCE CHALLENGES IN AGING TEST FACILITIES

NASA's Propulsion Systems Laboratory

TETWoG 109

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HX5 Sierra/NASA GRC

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Topics

I. A Brief History of the Propulsion Systems Laboratory (PSL)

II. Maintenance Challenges in Aging Test Facilities

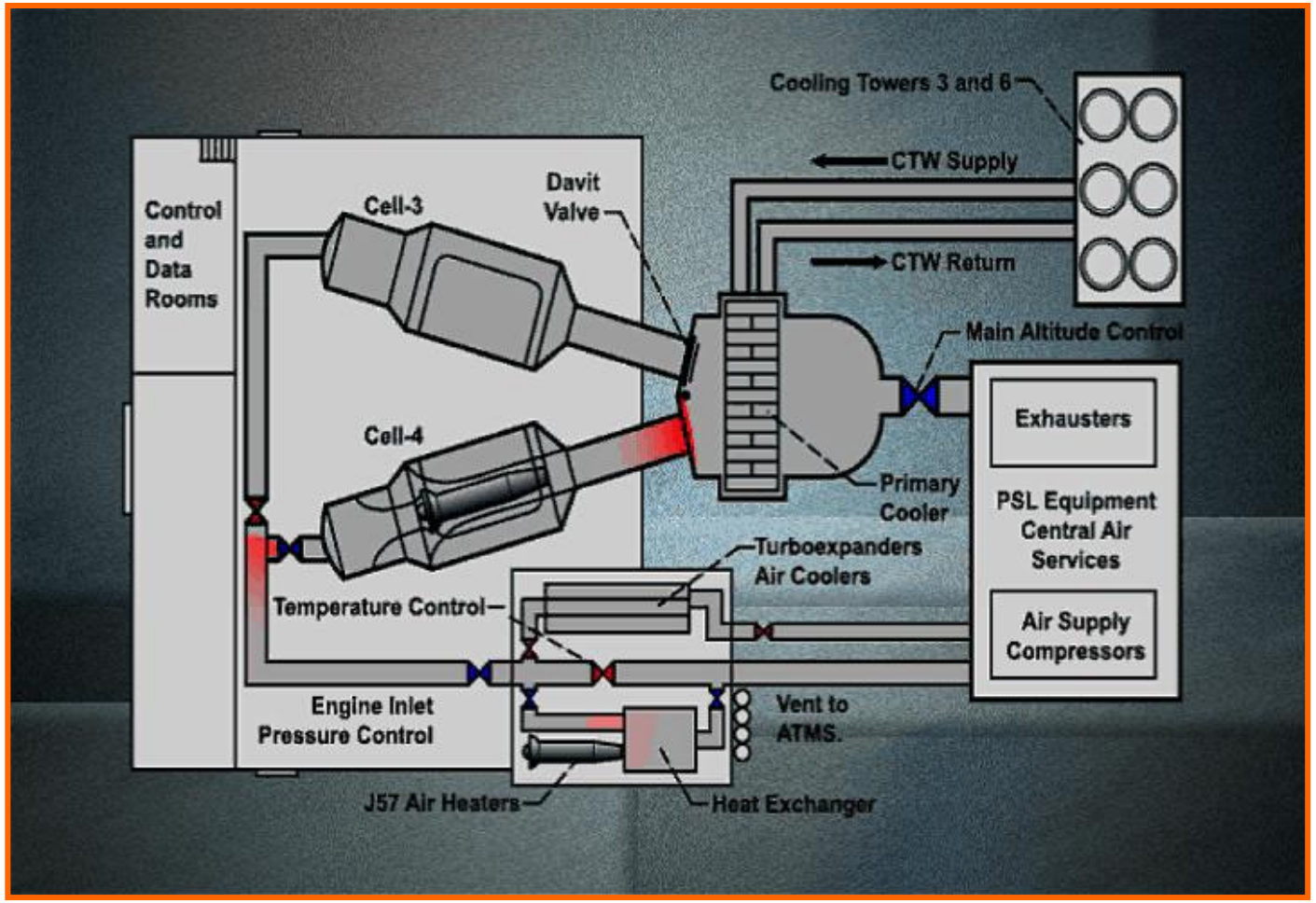
III. PSL Cooling Tower Water Examples

NASA Glenn Research Center

Aerial View of NASA GRC at Lewis Field

PSL-3 and PSL-4

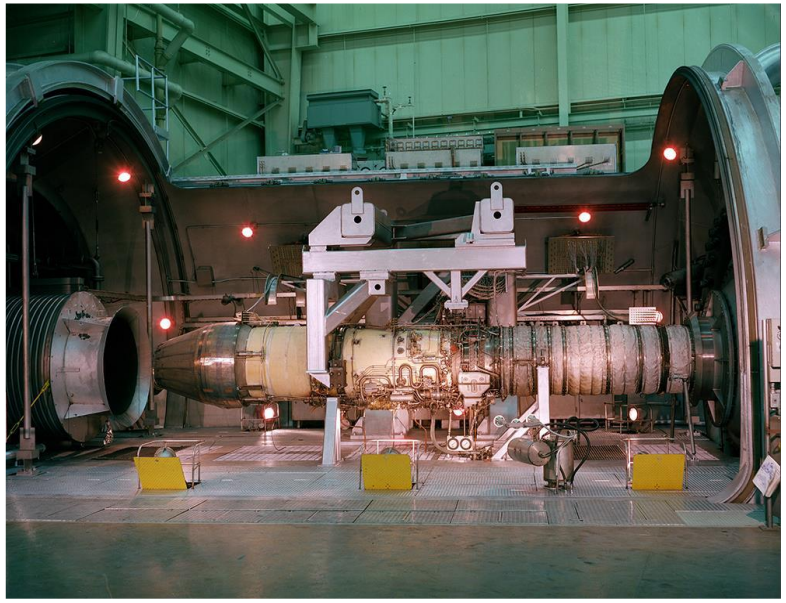
- Overview



PSL History

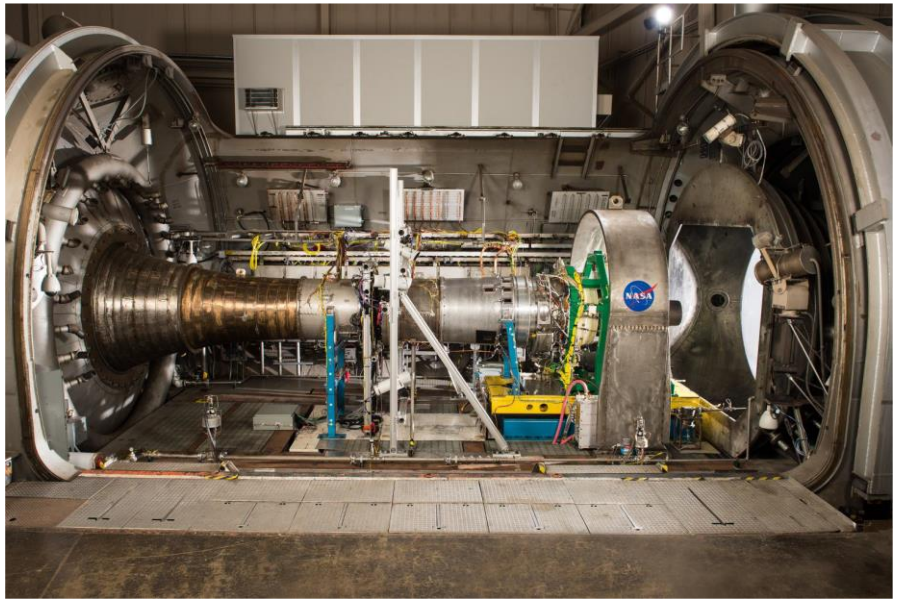
- PSL construction was completed in 1972.
- First engine test completed in 1973.
- 450# heated air capability at Mach 4 temps added in late 1990s.
- Engine icing capability added in 2011.
- PSL 1 and 2 operated for 27 years from 1952 until 1979.
- PSL 3 and 4 are in their 52nd year of operation.
- No planned date for construction of PSL 5 and 6.

PSL History



1973: Pratt & Whitney F100

1998: General Electric J85



2015: Honeywell ALF502

Maintenance Challenges

- Mechanical Challenges
  - Corrosion resistance
  - Heater maintenance
  - Support equipment obsolescence (Large valves, etc.)

- Electrical Challenges
  - Power requirements growing
  - Upgrades to facility infrastructure

- Quality Challenges
  - Thrust measurement
  - Instrumentation upgrades
  - Transfer of knowledge

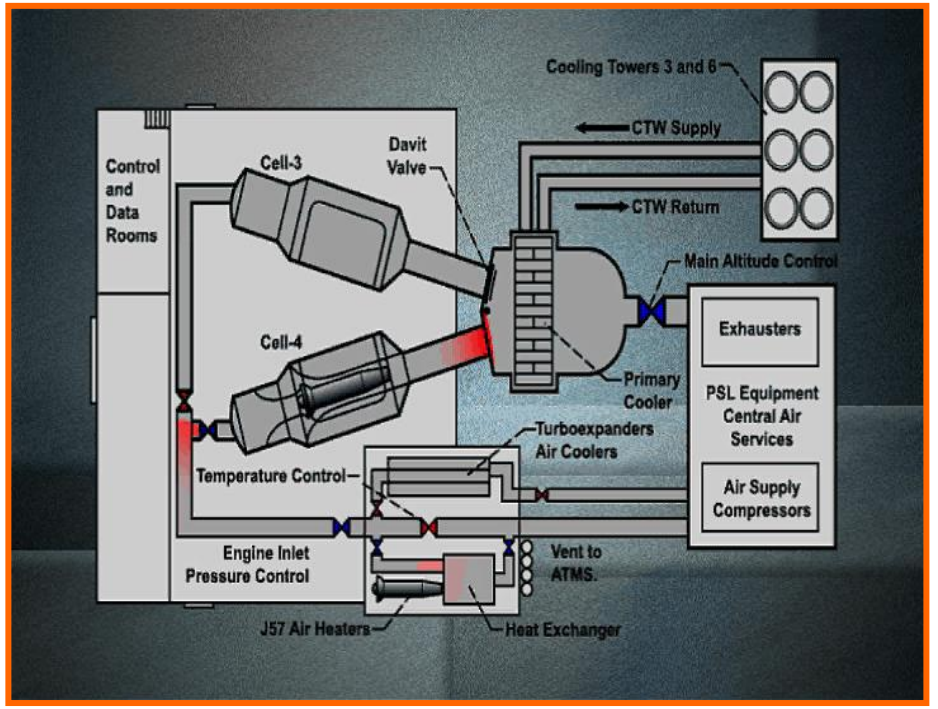
PSL Cooling Tower Water

- Main challenges:
  - Run-to-failure strategy
  - Rust buildup and clogging
  - Leaks due to wear

Example 1

- Issue:
  - 18’ valve used to protect unused test cell from hot engine exhaust experiences water spray clogging.
- Result:
  - Clogged sprays result in additional maintenance for the facility technicians. Approximately 200 additional man hours per year of extra work.
- Solution:
  - Install a y-strainer in the supply line for the water sprays to prevent clogging.

PSL Cooling Tower Water



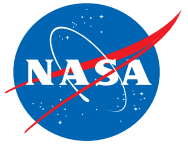
PSL Cooling Tower Water

- Main challenges:
  - Run-to-failure strategy
  - Rust buildup and clogging
  - Leaks due to wear

Example 2

- Issue:
  - PSL primary cooler water jacket spraying water on to facility pumps needed for operation.
- Result:
  - Early spotting of leak through maintenance inspections prevented damage to PSL pumps.
- Solution:
  - Leak was repaired by qualified welders and is no longer leaking.

PSL Cooling Tower Water



Questions?