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*Office of Aviation Safety*

# **Pinnacle Airlines Flight 3701 Jefferson City, Missouri**

Core Lock Phenomenon  
Carol Horgan



# Compromised In-Flight Restart Capability

- Severe shutdown conditions
- Inadequate air flow → cores stopped
- Faster-cooling stationary parts contacted stopped rotors
- Core rotors “locked”
- Locked rotors did not respond during assisted start attempts

# Core Lock

- Long-term Bombardier production problem
- Interference contact at an HPT air seal
- Called “core lock”
- Believed corrected by rework procedure
- Not considered a safety of flight issue

# Double Engine Failure Checklist

- 240 kts intended as minimum core rotation airspeed
- No core lock if the rotor retains enough energy to cut into seal material
- Maintaining core rotation as operational mitigation
- No data validating checklist for flameout from high power at high altitude

# CRJ-100, -200, -440 Operational Mitigation for Core Lock

- Determine minimum core rotation  
airspeed
- Demonstrate all methods of in-flight  
restart

# Other Air Carrier Engines May Be Affected

- Common design
- Common operation
- Exposure to common hazards
- Recommendation adopted

# Crew Awareness

- Core rotation essential to restart
- Loss of in-flight restart capability may result
- Performance penalties tied to maintaining minimum airspeed for core rotation

# New Aircraft Certification

- Demonstration of in-flight engine restart capability a certification requirement
- Current certification tests will not identify core lock
- Demonstration of zero core speed, hot shutdown in-flight restart capability recommended



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