Safety Management Summit
SMS - Brazil 2019

Facts & Fixes

Fuel Nozzle Leaks

Controlled flight into terrain

Smoke in the cockpit

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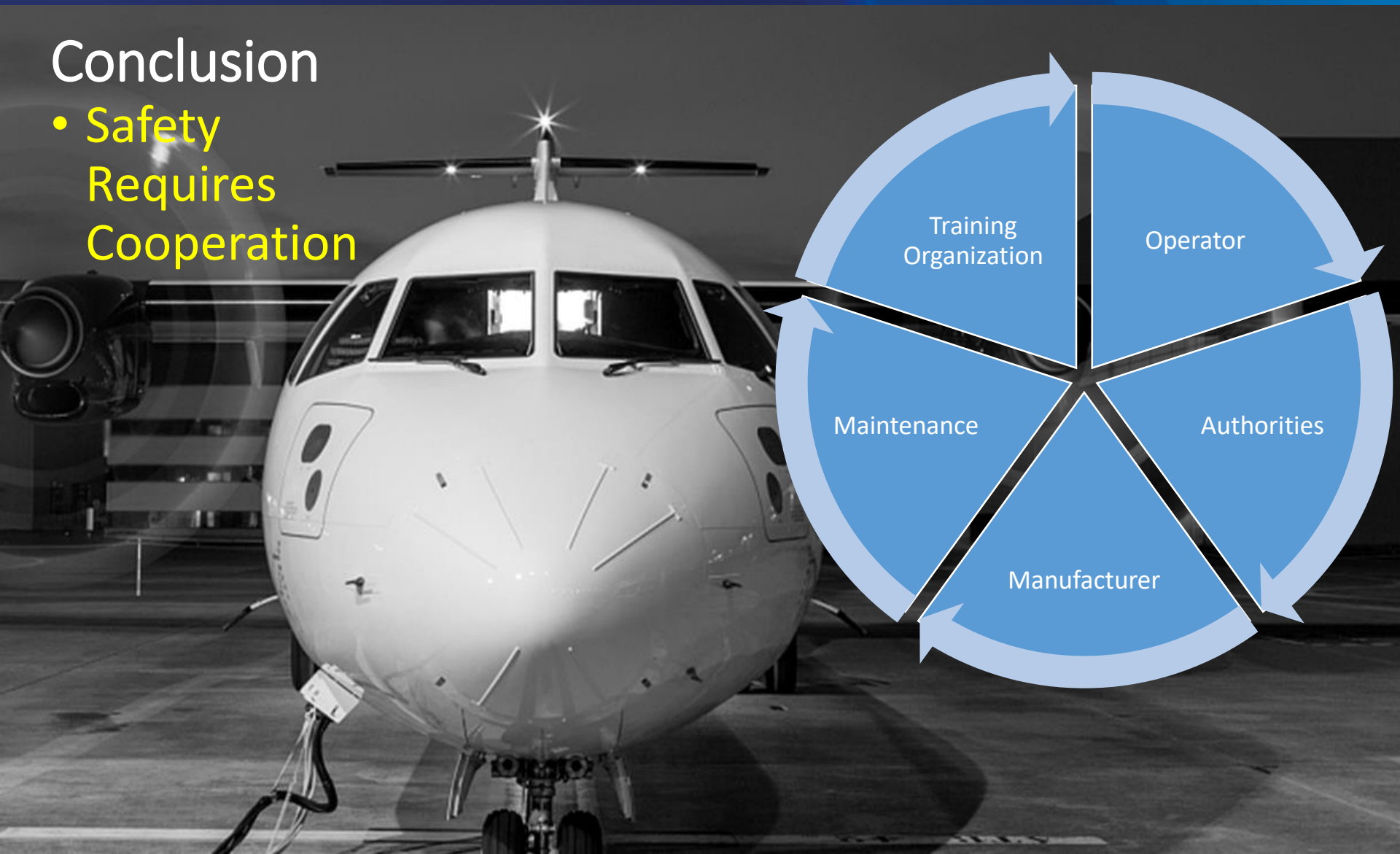
Conclusion

- Safety Requires Cooperation

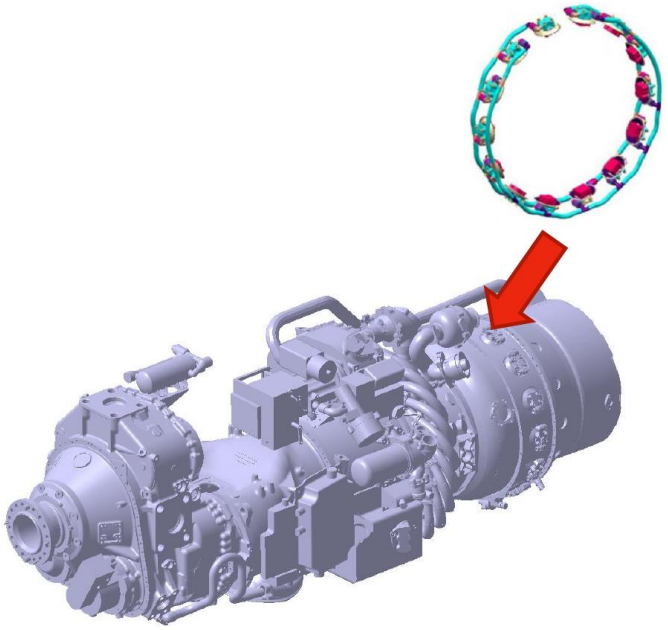


Fact #1 – Fuel Nozzle Leak

- Reported events

- Reported **Fuel Nozzle Leaks**: 3 in 2009, 5 in 2010, 7 in 2011
  - All of them led to Engine Fire Warning
  - Some of them were actual Engine Fire

- Investigation showed:
  - Maintenance issue (**wrong torque** applied)

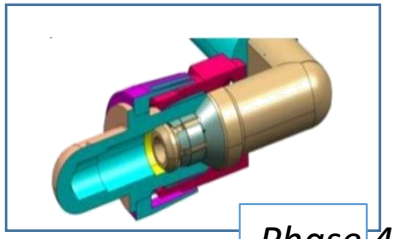


Fix #1 – Fuel Nozzle Leak

- Design modifications & Support

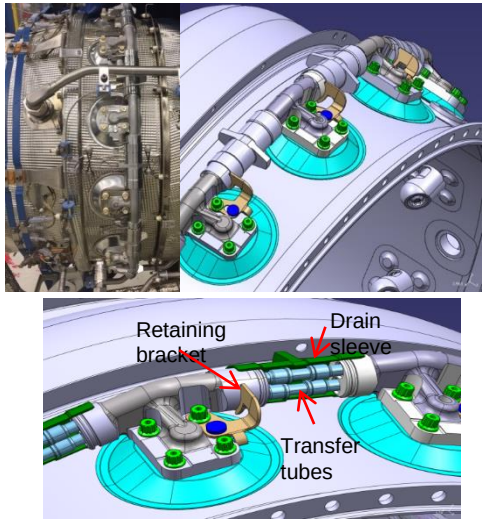
- Modification of the design
  - 2014: Phase 4
    - Modified fuel nozzle adapters installation
    - Metal conical gasket on new or modified fuel nozzle adapters
  - 2017: New Design
    - Fuel Nozzle change during Overhaul / Hot Section Inspection visits

- Maintenance & Operational visits with PWC
  - On the Job training for fuel nozzle installation



Phase 4

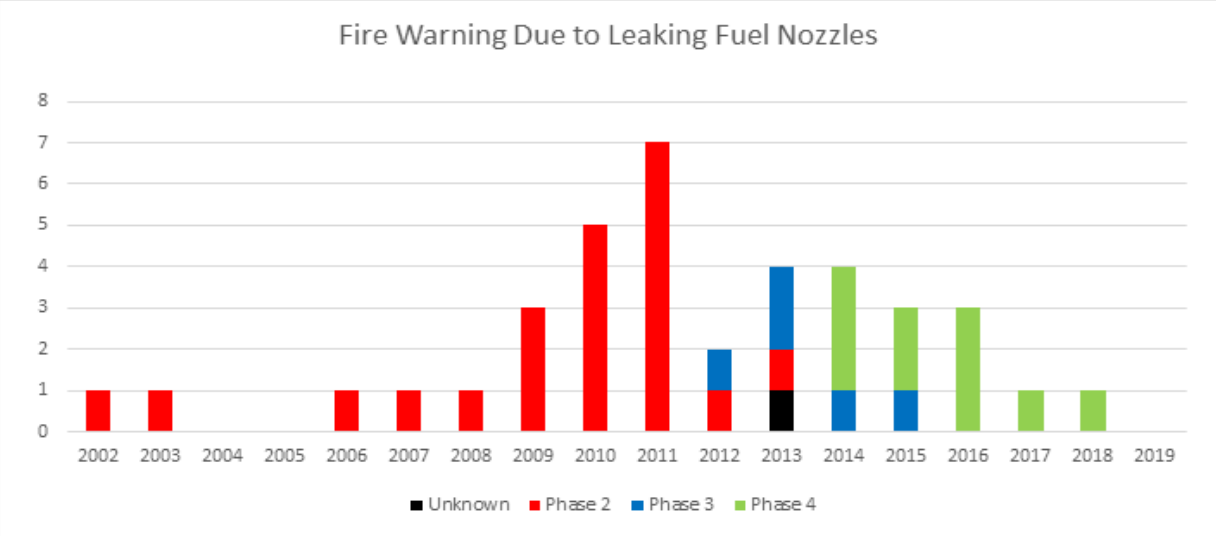
New Design



Fix #1 – Fuel Nozzle Leak

- Conclusion

- Phase 2: 22 events
- Phase 3: 5 events
- Phase 4: 10 events



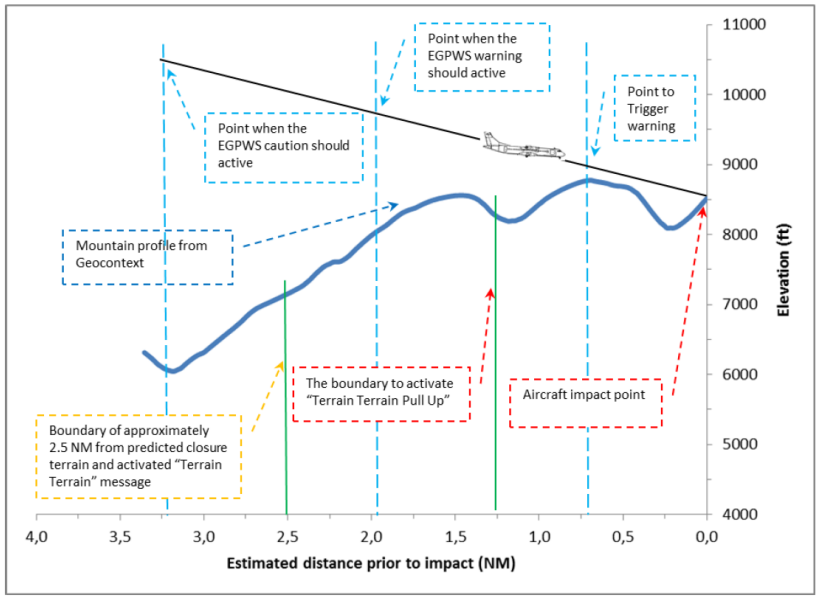
Number of events per year and per phase

- New Design:
  - No leak reported with this design
  - Times x 7 between removal
  - Whole fleet retrofitted by May 2021

Fact #2 – Controlled flight into terrain

- Reported events

- The pilot made first contact with Aerodrome Flight Information Services (AFIS), reporting cruising at 11500 feet
- The AFIS controller acknowledged the message and instructed the pilot to report when overhead the airport
- the pilot had extended the flap and landing gear in preparation for landing
- Aircraft impacted the terrain at elevation approximately 8,300 feet

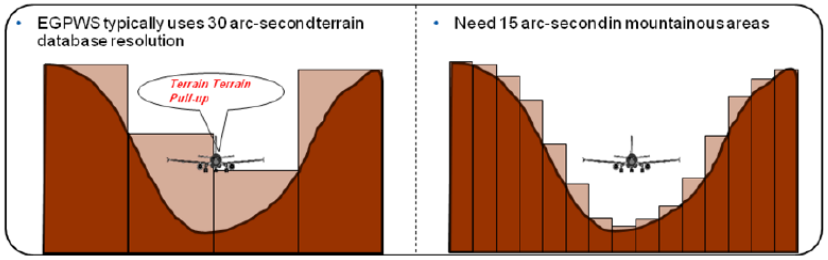


Fact #2 – Controlled flight into terrain

- Findings
  - The deviation from the visual approach guidance in visual flight rules without considering the weather and terrain condition, with no or limited visual reference to the terrain resulted in the aircraft flew to terrain.

  - The absence of EGPWS warning to alert the crew of the immediate hazardous situation led to the crew did not aware of the situation.

    EGPWS was not provided with the high-resolution terrain data



    Some pilots had experiences that the EGPWS warning became active in a condition not appropriate. These experiences led to the pilot behavior of pulling the EGPWS circuit breaker to eliminate nuisance of EGPWS warning that considered unnecessary

Fix #2 – Controlled flight into terrain

- Conclusion
  - Training for pilots with highlight of Situational Awareness, visual guidance and the Basic Visual Weather Minima for Approach.
  - Approach guidance to be reviewed to ensure contain correct information and easy to fly to minimize the pilot workload.
  - EGWS training for maintenance engineer and flight crew
  - Coordinate with the manufacturer to provide specific airports with EGPWS high resolution terrain database.
  - Consider the application of Performance Based Navigation (PBN) approach to fly in area with ground-based navigation system implementation is limited.

Fact #3 – Smoke in cockpit

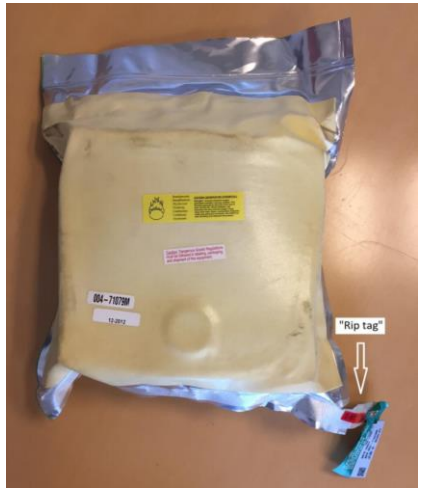
- 1min after takeoff, eng 1 failure, smoke in the cockpit and in the cabin
- Cockpit crew donned their oxygen masks, secured eng1, declared emergency, landed 4 min after takeoff, evacuated safely
- 1 cabin crew put on her smoke hood, the other **could not**

Note

In case of use of oxygen mask it is recommended to put the RAD/INT selector(on Audio Control panel) to neutral position and to use the control wheels PTT selector forward, to avoid permanent breathing noise.

Fact #3 – Smoke in cockpit

- Findings
  - 19kg needed to tear open the PBE* bag
  - PBE actual opening not required in training
  - No one in cabin heard Passenger Address from pilot



*PBE: Protecting Breathing Equipment

Fix #3 – Smoke in cockpit

- Conclusion

Figure 9
Align Scissors with Edge of Bag

- Flight Crew Training (cockpit & cabin):
  actual opening of the bag + talk in oxygen Mask

- Modification of the PBE bag

Conclusion

- Safety Requires Cooperation