

Fire on left engine during start-up

⁽¹⁾Unless otherwise specified, the times in this report are expressed in Universal Time Coordinated (UTC). 10 hours should be subtracted for local time in Tahiti.

Aircraft	ATR 72-212A registered F-OIQO
Date and time	18 November 2011 at 17 h 20 ⁽¹⁾
Operator	Air Tahiti
Place	Moorea airport (French Polynesia)
Type of flight	Scheduled public transport of passengers
Flight crew	Captain (PF) Copilot (PNF)
Consequences and damage	Left engine slightly damaged

HISTORY OF FLIGHT

During start-up of the left engine, the crew noticed that the inter-turbine temperature (ITT) was not increasing at a nominal rate and stabilised between 300 and 400°C. Engine RPM stabilised between 30 and 40%. The Captain was then thinking of abandoning the start-up sequence when the engine fire alarm came on. He applied the engine ground fire procedure and fired extinguisher n°1 without success. Firing the second extinguisher put out the fire.

Evacuation of the passengers took place without incident.

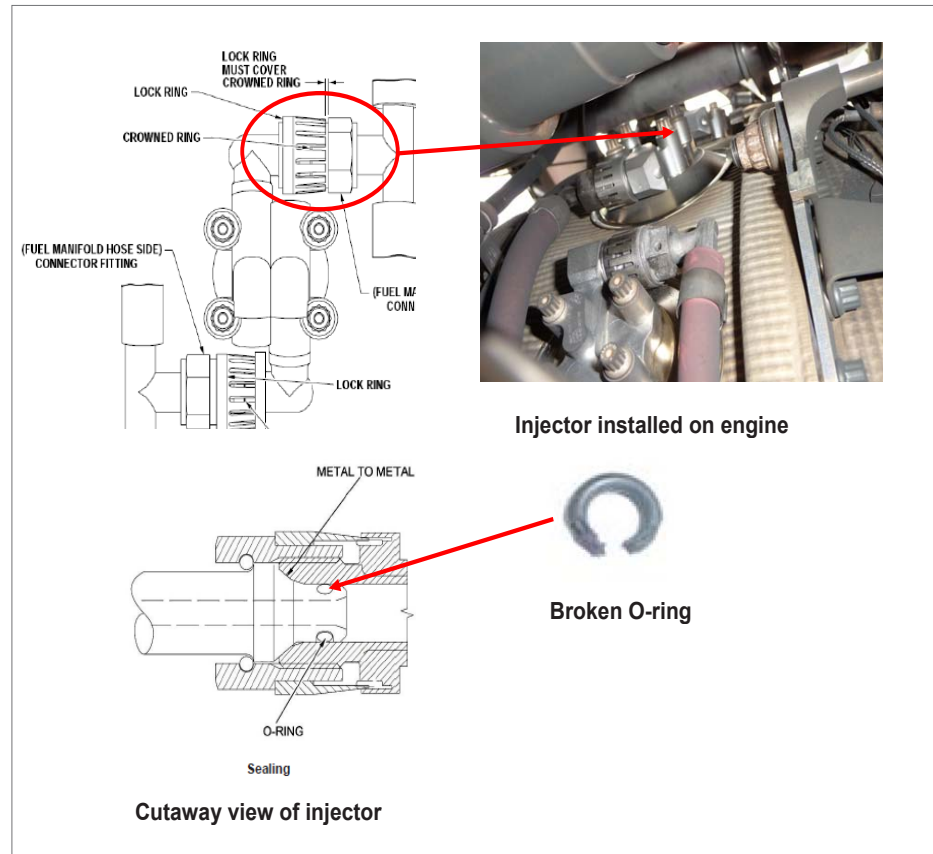
Additional Information

Inspection of the engine showed traces of soot and some burns, mainly around the ITT sensor manifold. The lower engine cover had 2 delaminated areas with black marks. The engine was cleaned, the manifold and the cover changed. An engine ground run was performed and the aeroplane was returned to service the following day.

Examination of the engine showed that the cause of the fire was a fuel leak at the level of the manifold at injector n°14. Removal of the manifold showed that one of the two O-rings was cut (see photo and cutaway on following page).

The injection system

The combustion chamber on a Pratt & Whitney PW120 series engine is an annular chamber fed by 14 injectors.



Sealing between the injector and the manifold is ensured by tightening, metal against metal, to a torque level defined by the manufacturer. The two O-rings create an additional safety when this tightening is not correct. Any damage to them can lead to a leak.

The maintenance manual specifies changing the injector nozzle manifold every 1,000 flying hours. Once the operation is finished, sealing of the injectors is checked by a leakage check (wet ventilation), then by a ground run at 80% performed for 10 minutes. The presence of the O-rings can mask incorrect tightening during this leakage check.

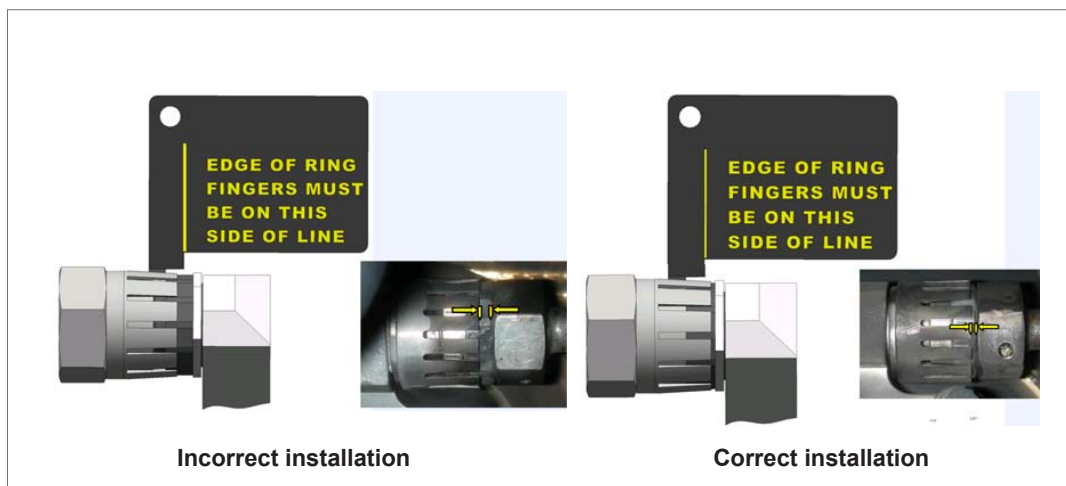
Similar Events

Between January 2003 and August 2010, Pratt and Whitney Canada identified 25 cases of fuel leaks involving the injectors, of which 10 led to engine fires.

The leaks mainly appeared on the injectors located at the top and at the bottom (injectors 14 and 7) of the chamber. These are more difficult to access when the engine is installed in the nacelle and the maintenance mechanic can have difficulties in applying the correct tightening torque.

In order to reduce the number of events, the manufacturer took a series of steps:

- publications and revisions of service information letters aimed at operators, in order to improve awareness of the risks run following an error in tightening the injectors,
- introduction of an indicator that makes it possible to check the correct level of tightening: (revision of the engine maintenance manual in June and August 2009).



- conferences on the correct maintenance procedures to follow;
- additional inspections and leak checks.

Air Tahiti knew of these actions and applied them in the context of its maintenance programme.

Following a study undertaken with two operators from July 2011, Pratt and Whitney Canada published, in February 2012, service bulletin SB 21803 R4. This bulletin is intended:

- to remove the O-ring ;
- to allow a leakage check on the metal to metal contact;
- to clarify the installation of the injectors and the procedures for checking for any leaks;
- to add a new procedure for leakage checks with nitrogen.

Pratt and Whitney Canada recommends that operators apply this service bulletin when the engine is disassembled in order to get access to the work area specified in the service bulletin.

CONCLUSION

The incident was the result of an inadequate maintenance operation. Incorrect tightening left a leak at the level of the metal to metal contact and led to a fuel leak at the level of the n°14 injector when the O-ring was damaged.

The presence of the O-ring to ensure sealing contributed to the incident by masking the failure in the tightening of the injector. Since February 2012, the manufacturer has modified its maintenance documentation in order to prevent this type of incident.