RNSA

Rannsóknarnefnd samgönguslysa

LOKAÐ MEÐ BÓKUN

Case nr.: **19-072F016**

Date: **27. May 2019**

Location: **During holding over Patterson, near Keflavik Airport**

Description: **Not able to restart left engine after inflight shutdown**

During flight instructor's[1] training exercise, an engine shutdown and restart of the left engine of airplane TF-KFE (Diamond DA-42) was to be performed. The purpose was to fulfill Icetra requirements, under 5.5 Engine shutdown and restart on Icetra form LF210.

The left engine was shut down at 21:12, when the airplane was in holding pattern over Patterson at 1500 ft altitude (MSL), close to Keflavik Airport (BIKF).

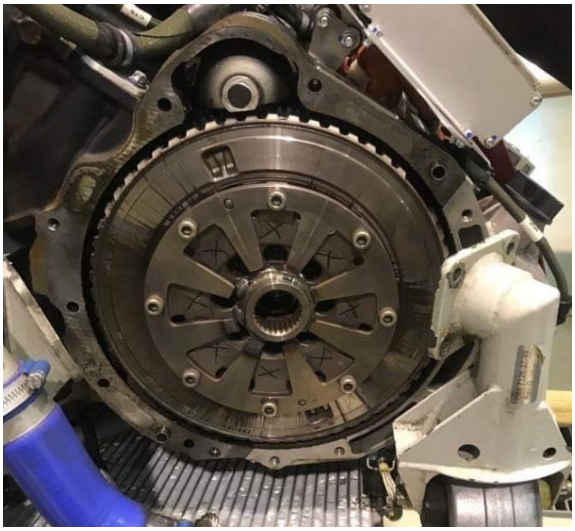
After the engine shut down, the PF[2] attempted to restart the engine, following the procedure on the emergency check list. According to the flight crew the airspeed was between 85 and 90 knots during the restart and the restart was attempted using the starter motor. The restart of the left engine was unsuccessful. The flight crew declared PAN-PAN-PAN and landed successfully with one engine (right) operational on RWY 01 at BIKF

[1] Training for Class Rating Instructor (CRI)

[2] Pilot Flying

Airport. After the airplane had vacated the RWY, at taxi Sierra, taxiing the airplane was difficult.

The flight crew notified ATC, exited the airplane and pushed the airplane to the flight school‘s tarmac.



Subsequent maintenance action revealed that the two-mass flywheel on the left engine had fractured around the hub section. This was the second hub section fracture the flight school had endured on this kind of two-mass flywheel, but the other occurred on a Diamond DA-40 airplane in January 2019 during a ground running after maintenance.

The manufacturer inspected the two-mass flywheel under the supervision of the IIC[3] from the ITSB and the ACCREP of the manufacturer’s State.

Detailed inspection revealed that the two-mass flywheel failure mode occurred due to overstressing at the point of highest bending moment, resulting in hair cracks. Stress crack corrosion benefited the notch effect, which led to

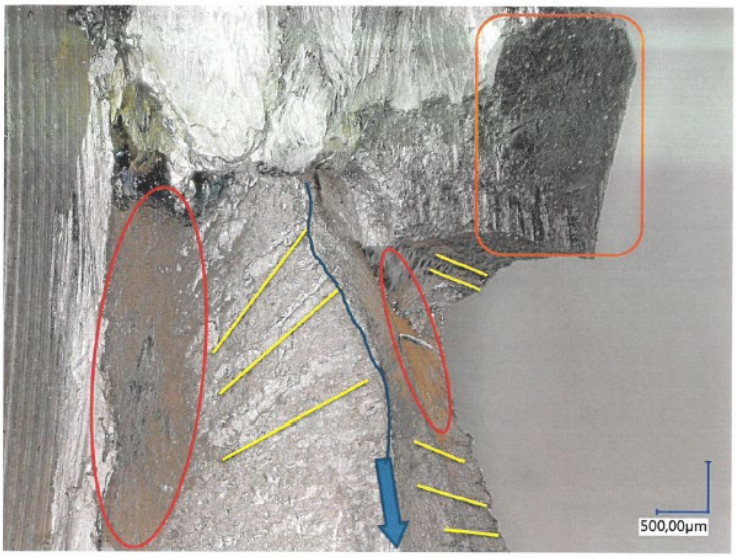


fig 1.2:4 schematic overview of the initial crack

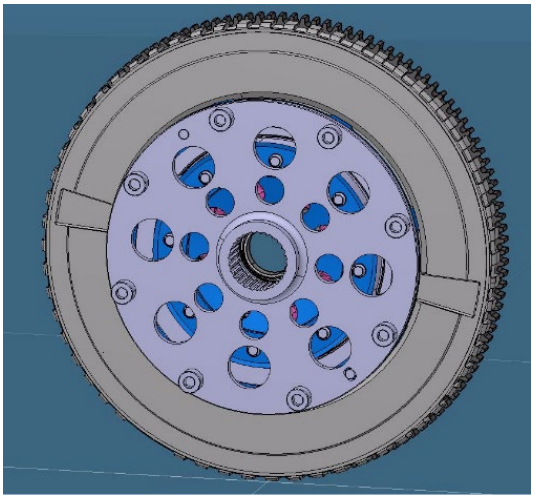
- Orange shows zones fast fracture
- Red shows zones of crack corrosion
- Yellow shows rest lines
- Blue shows the direction of force
- After narrowing the cross section threw corrosion, characteristic rest lines of fatigue failure show the advance of the damage until the critical cross section was reached and the fast crack appeared.

[3] Investigator-In-Charge

further expand of the cracks. [4] The crack damage grew until a critical cross section was reached, resulting in failure of the two-mass flywheel.

The investigation revealed that the engine manufacturer had issued an upgrade to the two-mass flywheel. This upgrade was initially intended to a correct failure mode[5] that had occurred to the engine's timing chain, the spring load system between the two wheel parts of the two-mass flywheel. During the upgrade, simultaneous work by the manufacturer, after an incident where cracking in a hub area on another airplane had also been located, had indicated a weak region around the hub area. The manufacturer had therefore performed the following actions proactively:

- Changed the design of the hub area of the two-mass flywheel
- Set up a program for the replacement of the wheel with the new hub for new engines, spare parts and during engine overhaul
- Wind milling as a restart method has been moved from the normal operation instructions to "emergency procedures" in the engine operation manual



After this incident, the flight school changed its procedures so that requirement 5.5 Engine shutdown and restart on Icetra form LF210 are complied with during flight simulator training, instead of performing an actual inflight engine shutdown.

As the failure mode is known and has been corrected, as well as migrating actions have been introduced, the Icelandic Transportation Safety Board (ITSB) decided not to write a formal report regarding this serious incident and closed the case during a board meeting on 27. December 2019.

[4] Austro Engine report document E4.07.07-Occ_E4-19-015_r0

[5] MSB E4 017-2 and EASA AD 2017-0103