Australian Government

Australian Transport Safety Bureau

AO-2017-032

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Web update

The occurrence

On 17 March 2017, a Saab 340B aircraft, registered VH-NRX (NRX) was being operated as RXA768 on a routine passenger flight from Albury, New South Wales (NSW) to Sydney, NSW. On board the aircraft were 16 passengers and 3 crew.

About 55 nautical miles south-west of Sydney airport, the crew noticed uncommanded engine indications and began the necessary checklists. While undertaking the checklist items, the crew experienced minor vibrations from the right engine. These vibrations worsened as the checklist progressed and became visually evident to the First Officer. As a result the crew commenced the engine shutdown procedure. During the engine shutdown procedure, the propeller separated from the aircraft. The crew made a Pan-Pan[1] call to air traffic control, and completed the engine shutdown procedure. The aircraft landed without incident at Sydney airport.

Figure 1: The aircraft, VH-NRX, at Sydney airport after the incident

Source: Grahame Hutchison

An inspection of the aircraft by the ATSB at Sydney airport identified that the propeller shaft had fractured, leading to the separation of the propeller.

On 21 March 2017, the NSW Police Aviation Support Branch (PolAir) undertook a search operation for the separated propeller. The propeller was located in an area under dense forest about 8NM south-west of Sydney airport.

[1] A Pan-Pan call is used to declare an urgent situation on-board the aircraft that is not immediately life threatening, but requires assistance from the ground.

Figure 2: The propeller that had separated from VH-NRX as found by PolAir about 8NM south-west of Sydney airport.

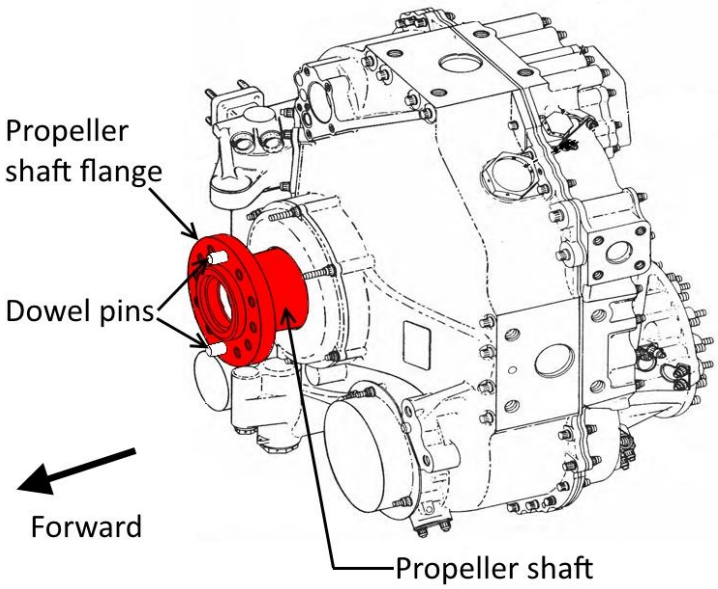
Source: ATSB

The propeller was found with the flange section of propeller shaft secured to the propeller assembly and a fracture through the propeller shaft. ATSB subsequently removed the remaining propeller shaft and integral flange section (Figure 4**Error! Reference source not found.**) for examination at its facilities in Canberra.

Propeller shaft examination

The recovered part of the propeller shaft is highlighted in Figure 3. The propeller was found properly secured to the forward-facing flange by bolts and the dowel pins pictured. The examination was conducted with representatives present from the Civil Aviation Safety Authority (CASA), SAAB, GE Aviation (engine manufacturer) and Regional Express (REX). Initial observations revealed cracking that appeared to run between the main shaft and the flange region. The part was sectioned in order to expose the crack's fracture surface.

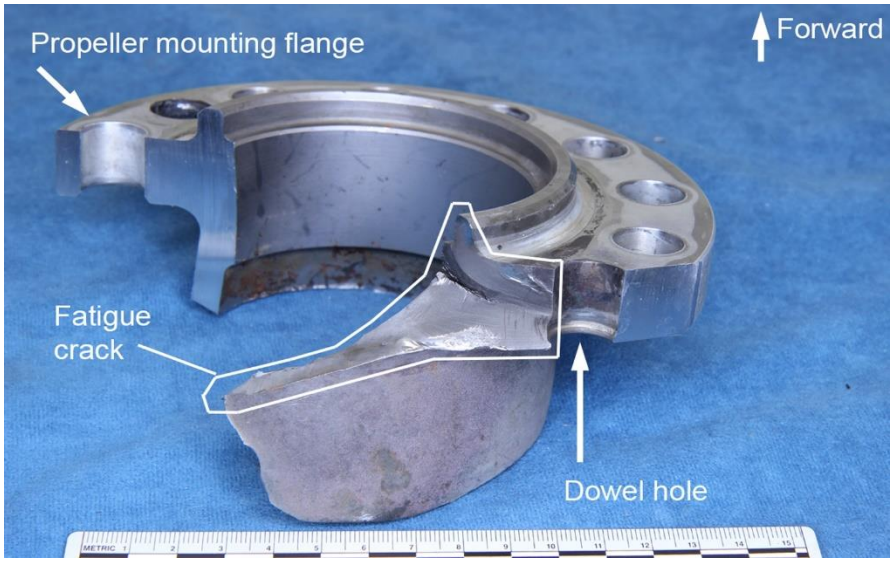
Figure 3: Propeller gearbox schematic highlighting the recovered section of the propeller shaft



Source: GE Aviation, modified by ATSB

The crack was found to be a fatigue fracture that had initiated within the propeller mounting flange, and then transitioned into the shaft section (see Figure 4). The crack originated at the bore of a dowel pin near the forward face of the propeller hub flange. The dowel pin bore was corroded in parts (shown in **Figure 5**), and corrosion pitting was found near the fracture. Further work is ongoing to ascertain whether the corrosion or other factors contributed to the fracture initiation.

Figure 4: Section of the propeller shaft showing the fatigue crack originating at the dowel hole and progressing into the shaft itself



Source: ATSB

This is the first known critical failure of this type initiating within the propeller hub flange of a GE Aviation CT7-9B engine. The same propeller gearbox (PGB) is fitted to multiple variants of the CT7 engine (5A2, 7A1, 9B, 9C, and 9C3) on SAAB 340 and EADS CASA[2] CN-235 aircraft. There is currently no maintenance requirements specified in existing maintenance manuals for routine

[2] In this instance, CASA refers to the aircraft manufacturer EADS CASA and **not** the Australia Civil Aviation Safety Authority.

inspection within the dowel pin bores. Any corrosion or cracking within the bore may go undetected until it progresses to the surface of the flange. Other than a visual inspection of the flange during propeller removal, inspection for surface defects (via magnetic particle inspection or dye penetrant inspection) only occurs when the PGB is disassembled for maintenance at a workshop specifically approved by the engine manufacturer.

Figure 5: Corrosion observed within the bore of the dowel pin hole

Source: ATSB

Safety advisory notice

AO-2017-032-SAN-001:

The ATSB advises that those responsible for the operation and maintenance of SAAB 340 and EADS CASA CN-235 aircraft fitted with the GE Aviation CT7 engine type variants 5A2, 7A1, 9B, 9C, and 9C3 should note the facts presented in this preliminary report with a view to addressing any risks to their own operation.

Proactive safety action taken by GE Aviation

GE Aviation is actively involved in supporting the Australian Transport Safety Bureau in this investigation. The propeller flange and all required hardware has been transported to GE Aviation laboratories in Cincinnati for further metallurgical analysis. GE Aviation is inspecting additional PGBs from the fleet and recommends that all operators follow existing maintenance and inspection procedures. As the investigation progresses GE Aviation will release additional maintenance and inspection recommendations if they become necessary.

Proactive safety action taken by Regional Express

Regional Express has quarantined all propeller gearboxes with propeller shafts of the same series as that installed in VH-NRX.

Further investigation

The investigation is continuing and the ATSB will focus on:

- maintenance procedures associated with the PGB shaft
- factors that may have contributed to the fatigue fracture at the propeller mounting flange, possibly including:
  - design and manufacturing of the dowel pins, bores, and overall assembly

- corrosion protection on the surface of the part
- opportunities for crack detection.

Should any critical safety issues emerge during the course of the investigation, the ATSB will immediately bring those issues to the attention of the relevant authorities or organisation. This will allow those authorities and organisations to consider safety action to address the safety issues. Details of such safety issues and any safety action in response will be published on the ATSB website at www.atsb.gov.au .

The information contained in this web update is released in accordance with section 25 of the Transport Safety Investigation Act 2003 and is derived from the initial investigation of the occurrence. Readers are cautioned that new evidence will become available as the investigation progresses that will enhance the ATSB's understanding of the accident as outlined in this web update. As such, no analysis or findings are included in this update.