National Transportation Safety Board
Office of Aviation Safety
Washington, DC 20594

ERA22LA145

POWERPLANTS

Group Chair's Factual Report

August 25, 2022

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A. ACCIDENT

Location:	Abingdon, Virginia, USA
Date:	March 6, 2022
Time:	2359 Eastern Standard Time (EST) 0359 Coordinated Universal Time (UTC)
Helicopter:	Eurocopter Deutschland GMBH MBB-BK 117 C-2, Registration N29VA

B. POWERPLANTS GROUP

Group Chair	Stephen J. Yee National Transportation Safety Board Washington, D.C., USA
Accredited Representative	Erell Verleyen Bureau d'Enquêtes et d'Analyses Paris, France
Technical Advisor (France)	Bryan Larimore Safran Helicopter Engines, USA Grand Prairie, Texas, USA

C. EVENT SUMMARY

On March 6, 2022, at 2359 EST, a Eurocopter Deutschland GMBH, MBB-BK 117-C-2 helicopter, N29VA, was substantially damaged when it was involved in an accident at the Virginia Highlands Airport (VJI), Abingdon, Virginia, USA. The pilot sustained serious injuries and the two flight paramedics were not injured. The helicopter was operated by the Virginia Department of State Police as a public state aircraft.

The accident helicopter was powered by two Safran Helicopter Engines (formerly Turbomeca) model Arriel 1E2 turboshaft engines. Both engines were securely installed in the accident helicopter and showed no evidence of uncontainment or external fire. The gas generators and power turbines of both engines rotated freely by hand with no abnormal noises. Corresponding rotations of their respective transmission drive shafts were observed.

Operational leak check, oil pressure, vibration, and torque transmitter tests did not show any significant findings.

D. DETAILS OF THE INVESTIGATION

1.0 Engine Description

The accident helicopter was powered by two Safran Helicopter Engines (formerly Turbomeca) model Arriel 1E2 engines. The Arriel 1E2 engine is a turboshaft engine consisting of an axial air intake, an axial compressor, and a centrifugal compressor driven by a two-stage turbine, a combustion chamber, and a single stage power turbine (free turbine) driving a reduction gearbox located at the rear. An accessory drive gearbox, driven by the gas generator, is located at the front. The mounts and starter-generator are not part of the engine type definition.

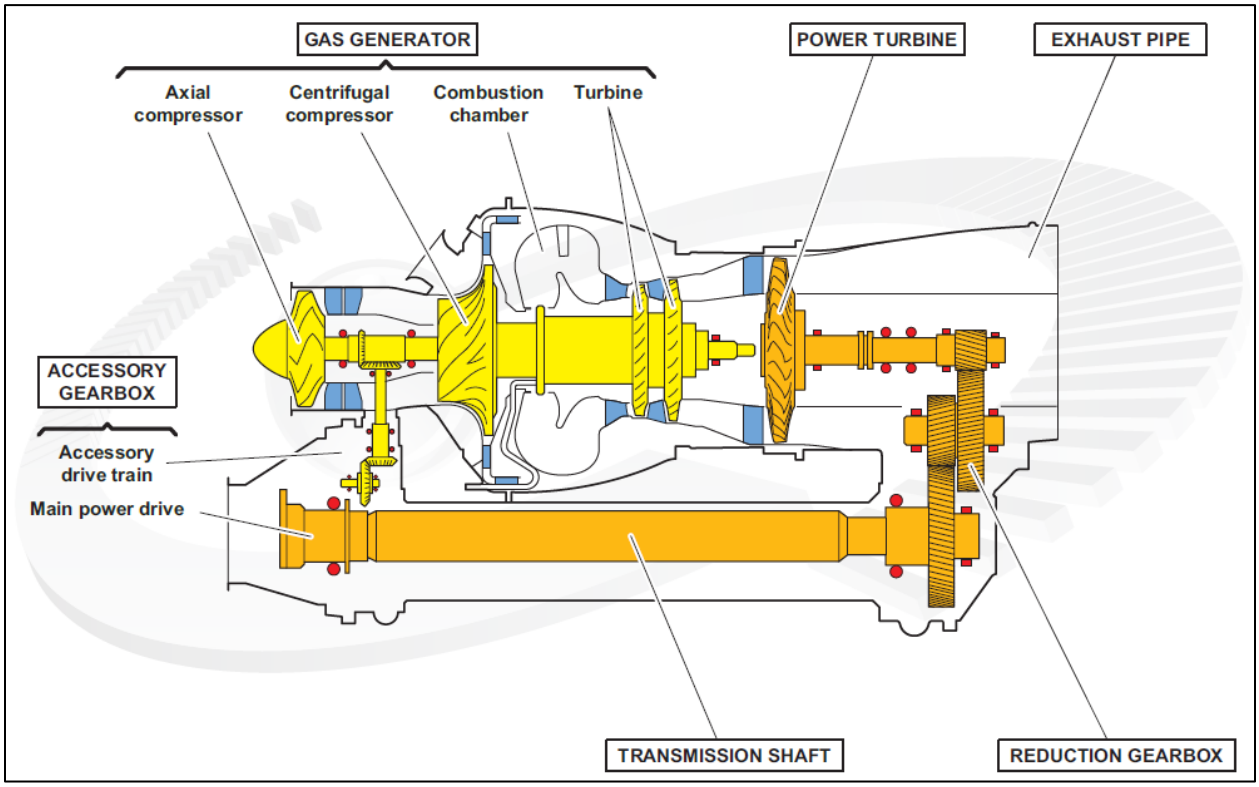

Figure 1: Arriel 1E2 Engine Description

(Source: Safran Helicopter Engines)

According to the Federal Aviation Administration Type-Certificate Data Sheet, Revision 16, dated February 7, 2017, the Arriel 1E2 engine model has a maximum continuous shaft horsepower (shp) rating of 692 shp, while the one-engine-inoperative rating (both 2-1/2 and 30-minute conditions) is 708 shp. Engine ratings are based on a calibrated test rig under the following conditions: 1) static, sea level standard conditions of 59°F, 29.92' Hg, 2) no airbleed or accessory power extraction, 3) 6,000 revolutions per minute (rpm) output shaft drive speed, and 4) heating value of fuel is 18,556 British Thermal Unit per pound (BTU/lb).

All directional and numbering references (front, rear, right, left, top, bottom, clockwise, counterclockwise) are made aft-looking-forward unless otherwise specified. References to clock positions are approximate.

2.0 Engine Maintenance History

According to the NTSB Form 6120.1 Incident Report submitted by the operator, the left no. 1 engine (serial number (s/n) 47281, Photo 1) and right no. 2 engine (s/n 47285, Photo 2) engine were manufactured on February 15, 2010. Both engines had accumulated 3,695.3 hours time since new when the accident occurred, and had accumulated 559.6 hours time since last overhaul.

Photo 1: Left No. 1 Engine Data Plate.

Photo 2: Right No. 2 Engine Data Plate.

According to the engine log book, the last maintenance performed was a 30-hour inspection of both engines by the Virginia State Police Aviation Unit in Abingdon, Virginia, USA on February 22, 2022. Both engines had accumulated 3,670.5 total hours time when this maintenance occurred.

According to the aircraft maintenance log, the left no. 1 engine N1* rigging was adjusted in response to the crew reporting "The rigging appears to be not right on engine #1 throttle. Rolling the engine to 20 percent for a cold start is way too much which results in the temperature rising too quick and too high. Engine must be started at 18 percent cold and 10 percent hot." The engine rigging was conducted by the Virginia State Police Aviation Unit in Abingdon, Virginia, USA on March 4, 2022 to address the maintenance write-up. Both engines had accumulated 3,683.0 total hours time when the engine rigging was adjusted.

*: Gas generator rotation speed

3.0 Engine Examination

Examination of the accident engines occurred on April 26-27 in Abingdon, Virginia, USA. Both engines were still securely installed in the accident helicopter and showed no evidence of uncontainment or external fire (Photo 3 and Photo 4). The gas generator of both engines could be rotated freely by hand with no abnormal noises. The power turbines of both engines could be rotated freely by hand and corresponding rotations of their respective transmission drive shafts were observed. The axial compressor blades viewed through the engine inlet appeared undamaged on both engines. The power turbine blades viewed through the engine exhaust nozzle appeared undamaged on both engines.

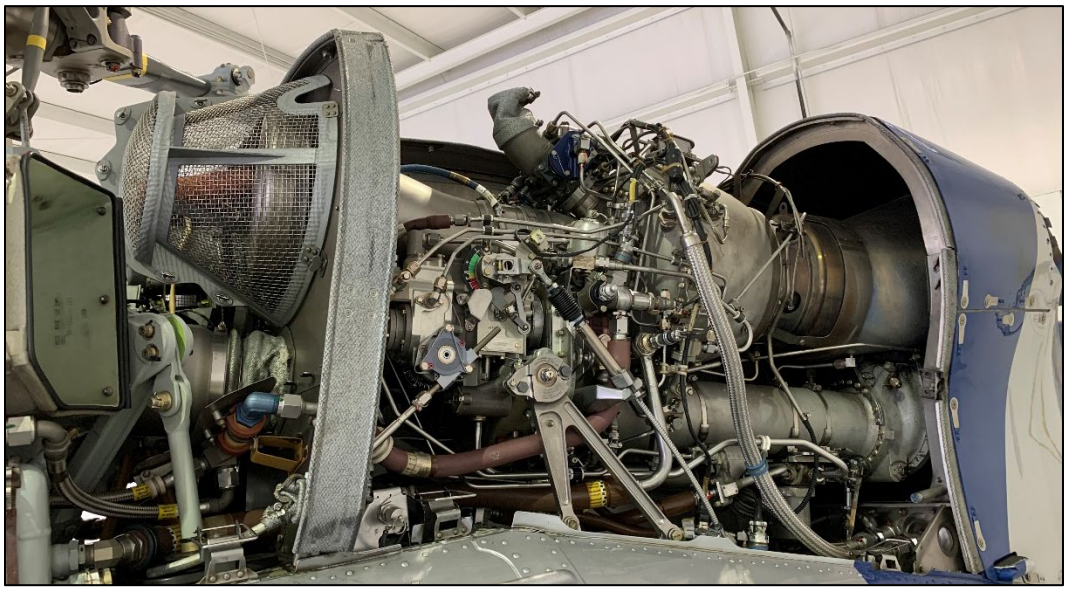

Photo 3: Left No. 1 Engine As-Installed in the Helicopter.

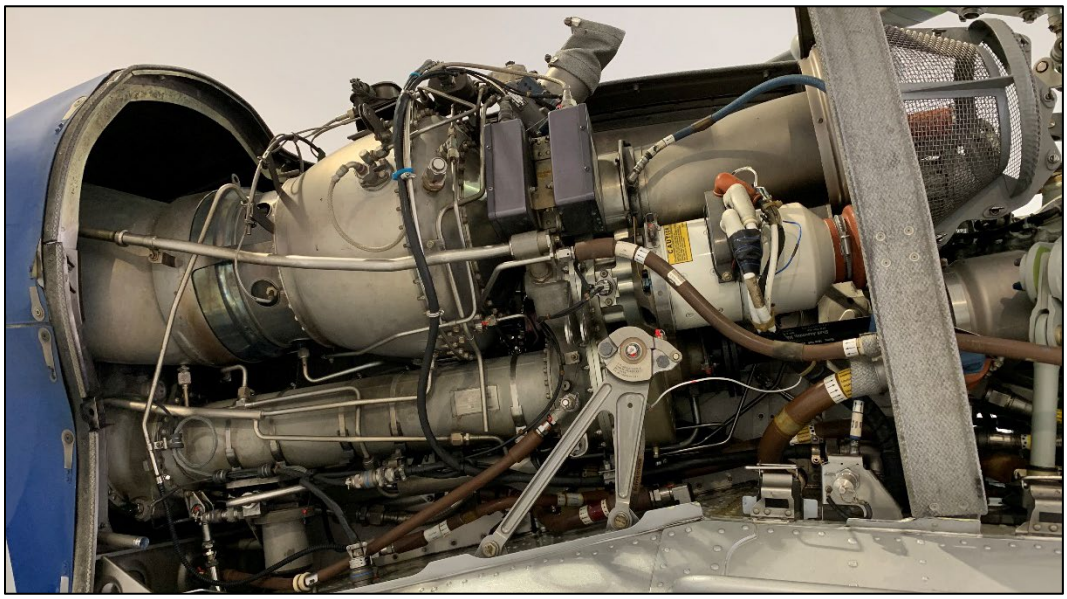

Photo 4: Right No. 2 Engine As-Installed in the Helicopter.

All oil and air line connections were torqued and safety wired. The torque stripe on the right no. 2 engine main fuel supply line connection to the main fuel filter bowl was found intact; however, the connector was not torqued and did not require any significant wrench pressure to loosen. There was no evidence of a fluid leak. Residual fuel was found still in the supply line when disconnected. All other fuel connections to the engine were tight and properly safety wired.

Continuity was confirmed between the twist grip in the cockpit and the throttles on both engines. The rigging between the twist grip and throttle lever quadrant on the fuel control units of both engines corresponded to the twist grip markings and were correct in accordance with Airbus maintenance manual Task 76-11-00, 5-1.

4.0 Engine Testing

Both engines were shipped to the Safran Helicopter Engine Facility in Grand Prairie, Texas, USA for engine testing on June 15-16, 2022. Both engines passed leak check, oil pressure, and vibration tests with no anomalies found. Each engine passed two fuel control unit stability checks at 52° and 61° throttle positions with stable operation and no uncommanded engine accelarations observed.

The torque transmitter check on the left no. 1 engine measured within the allowable limit. The right no. 2 engine measured 71.6 millivolts at 243.4 kilopascals, above the 71.4 millivolt limit.

Submitted by:

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