

# National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



ERA24FA075

## **AIRWORTHINESS**

Group Chair's Factual Report

April 16, 2024

## **A ACCIDENT**

Location: Miami, Florida  
Date: December 27, 2023  
Time: 1300 eastern standard time  
Helicopter: MD Helicopters 369E, registration N757TB

## **B AIRWORTHINESS GROUP**

|              |                                                                                          |
|--------------|------------------------------------------------------------------------------------------|
| Group Chair  | Chihoon Shin<br>National Transportation Safety Board<br>Washington, District of Columbia |
| Group Member | Nick Shepler<br>Rolls-Royce<br>Indianapolis, Indiana                                     |

## **C SUMMARY**

On December 27, 2023, about 1300 eastern standard time, a MD Helicopters 369E helicopter, N757TB, was substantially damaged when it was involved in an accident near Miami, Florida. The pilot was fatally injured and the passenger was not injured. The helicopter was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The helicopter was located at the bottom of a canal at a depth of about 20 feet. The tailboom was fractured and separated forward of the vertical stabilizer and was located in the canal about 450 feet away from the main wreckage. The wreckage was recovered and transported to Florida Air Recovery facilities in Jacksonville, Florida. On December 29-30, 2023, members of the Airworthiness Group convened at Florida Air Recovery facilities to examine the recovered wreckage.

## **D DETAILS OF THE INVESTIGATION**

### **1.0 Helicopter Information**

#### **1.1 Helicopter Description**

The MD Helicopters 369E has a five-bladed, fully-articulated main rotor system that provides helicopter lift and thrust, and a two-bladed, teetering tail rotor system that provides directional control of the helicopter. The 369E is equipped with a skid-type high landing gear. The helicopter is equipped with one Rolls-Royce 250-C20B

turboshaft engine. The helicopter is type certificated under Federal Aviation Administration (FAA) type certificate data sheet No. H3WE.

All left, right, up, and down orientations as well as clock positions referenced in this report are in the aft-looking-forward frame of reference unless otherwise specified.

## 1.2 Accident Helicopter History

The accident helicopter, N757TB, was serial number (S/N) 0166E and was manufactured in 1986. The engine installed on the accident helicopter was S/N CAE-835643. According to helicopter records, N757TB had an aircraft total time (ATT) of 7,497.1 flight hours at the time of the accident.

## 2.0 Wreckage Examination

### 2.1 Structures

The main fuselage was whole but exhibited inward crushing on its belly (**Figure 1**). The aft portion of the tail boom containing the tail rotor and T-tail stabilizer (empennage) was fractured and separated about 57 inches aft of the tail boom-to-main fuselage attachment and about 25 inches forward of the tail rotor gearbox attachment (**Figure 2**). The tail boom fracture and deformation were to the right and exhibited signatures consistent with main rotor blade contact (**Figure 3**). The landing gear remained installed and did not exhibit significant deformation or splaying. The engine inlet screen exhibited no evidence of blockages.



**Figure 1.** The recovered helicopter.



**Figure 2.** The recovered empennage wreckage.



**Figure 3.** The fractured tail boom, tail rotor drive shaft, and tail rotor control tube.

The fuel tank bladder remained installed within the main fuselage. The left bladder was pushed upward due to upward deformation of the belly of the airframe. The fuel quantity transmitter remained installed and no evidence of wiring was observed around the fuel quantity transmitter float. No significant quantity of fuel was observed within the left bladder.

## 2.2 Main Rotor System

The main rotor and main transmission remained installed on the helicopter. All main rotor head components remained installed with no evidence of separation or fractures. The main rotor blades were cut near their root ends to facilitate recovery of the wreckage. The main rotor blades did not exhibit fragmentation and all were full-length (**Figure 4**). The main rotor blades exhibited chordwise deformation, with two blades exhibiting significant chordwise and downward deformation near their root ends. At the trailing edge of one blade, the upper and lower skins had splayed open at the tip end.



**Figure 4.** The main rotor blades.

The engine-to-transmission (input) driveshaft remained installed and did not exhibit anomalous damage. Rotation of the input driveshaft in both directions resulted in rotation of the main rotor, confirming continuity of drive. Rotation of the engine power turbine in the driving direction resulted in rotation of the input driveshaft and the main rotor, confirming continuity of drive from the engine to the main rotor. Rotation of the input driveshaft resulted in no rotation of the engine power turbine, confirming operation of the overrunning clutch. The overrunning clutch was removed and its splines exhibited no anomalous damage.

### 2.3 Tail Rotor System

The tail rotor gearbox remained installed on the aft end of the tail boom, the latter of which was fractured and separated from the main wreckage (**Figure 5**). The tail rotor blades remained installed on the tail rotor hub and did not exhibit anomalous damage other than damage due to submersion in the canal. Rotation of the tail rotor resulted in a corresponding rotation of the tail rotor drive shaft that remained within the [separated] empennage.



**Figure 5.** The tail rotor gearbox and tail rotor.

The tail rotor drive shaft was fractured at the location of the tail boom fracture. Rotation of the tail rotor drive shaft resulted in a corresponding rotation of the main rotor, confirming continuity of tail rotor drive from the main transmission, with no evidence of binding.

## 2.4 Flight Control System

The helicopter was equipped with dual flight controls (**Figure 6**). Both left side and right side pedal sets and collective controls remained installed and intact. Both left side and right side cyclic control sticks were fractured near their base, but the base remained installed on the cyclic control tubes. Both left and right cyclic control sticks remained partially attached via their wiring.



**Figure 6.** The cockpit control installation.

Both pedal sets were found with the left pedal in the full-forward position. Movement of the right pedal set resulted in a corresponding movement of the left pedal set, confirming continuity of interconnect control between the two controls, as well as movement of the [fractured] tail rotor control tube at the tail boom. (The tail rotor control tube was fractured at a location similar to the fracture of the tail boom and tail rotor drive shaft.) After movement of the pedals, the pedals returned to a left pedal full forward position due to the pedal balance spring.<sup>1</sup>

Movement of the left collective control resulted in a corresponding movement of both the right collective control as well as the main rotor blades, confirming continuity of the collective control system (**Figure 7**). Movement of the collective

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<sup>1</sup> According to MD Helicopters, the pedal balance spring is designed to even out the pedal forces in flight while the tail rotor is rotating. When the tail rotor is not rotating, the left pedal will be in a forward position due to the pedal balance spring.

resulted in the collective balance spring pushing the collective control either in the full up (if moving upward) or full down (if moving downward) positions.



**Figure 7.** A portion of the cockpit flight control bellcranks and balance springs.

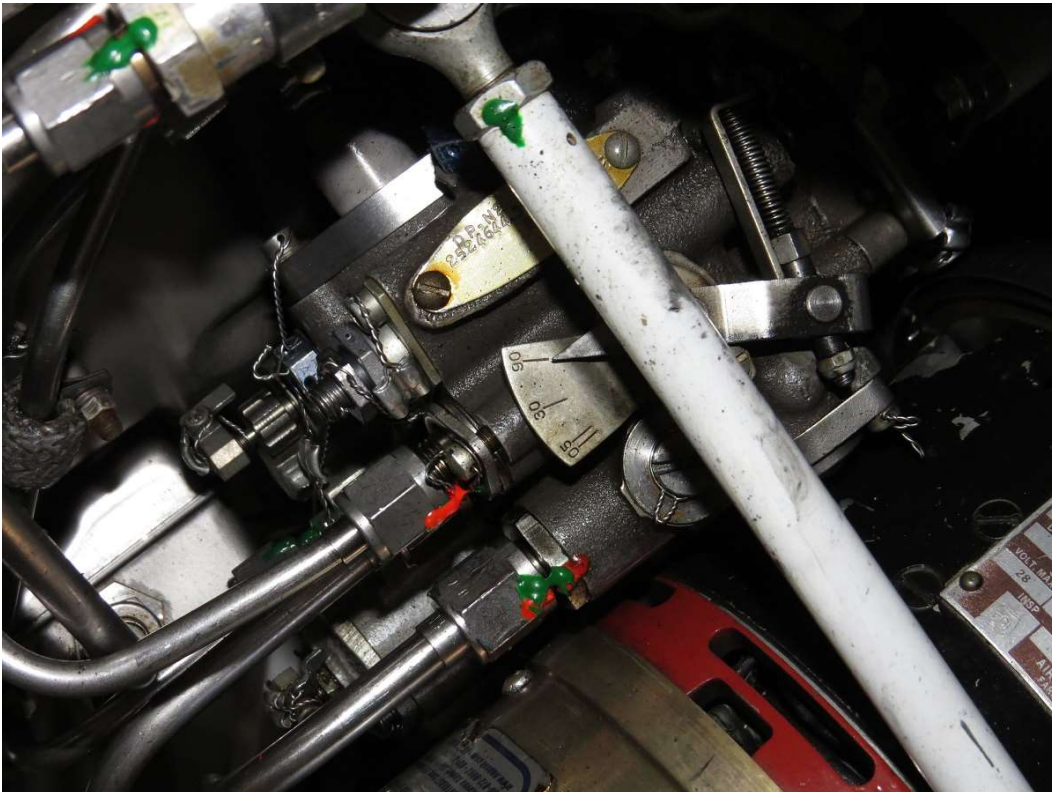
Movement of the left cyclic control in the lateral and longitudinal directions resulted in a corresponding movement of the right cyclic control as well as the main rotor blades. After movement of the cyclic in the longitudinal axis, the cyclic would return to the full forward cyclic position. After movement of the cyclic in the lateral axis, the cyclic would return to the full right cyclic position. The lateral and longitudinal trim actuators remained installed. The one-way lock (in the longitudinal control system) remained installed and its reservoir contained hydraulic fluid.

## **2.5 Engine**

The engine remained installed on the airframe (**Figure 8**). The left engine mount had a fracture at its rod end threads near the lower airframe mount. The remaining engine mounts were not fractured. The engine fuel control unit (FCU) power indicator was pointing to 90°, it's maximum setting (**Figure 9**). The engine power turbine governor (PTG) indicator was pointing between 80-90%. Continuity of control between the collective-mounted twist grip and the FCU was confirmed, but movement of the twist grip was restricted due to crushing of the airframe that impinged on the control cable. Continuity of control between the collective control and the input drive arm of the PTG was confirmed.



**Figure 8.** The engine installed on the airframe.



**Figure 9.** The engine FCU indicator showing 90°.

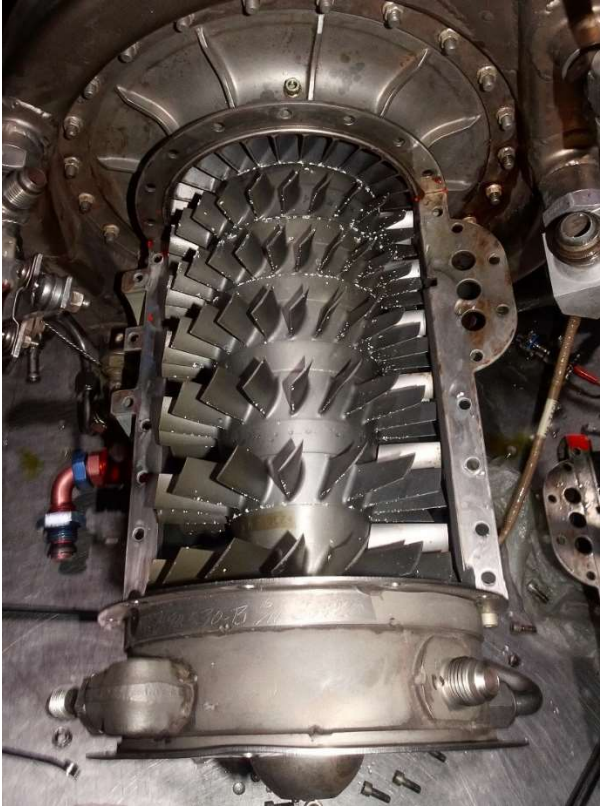
An engine fuel flow transmitter was installed on the airframe. The fuel line between the fuel flow transmitter to the engine combustor was removed and there were only a few drops of residual fluid. Removal of the fuel line from the check valve (downstream of the FCU) to the fuel flow transmitter resulted in residual fluid of about 3-4 ounces; the residual fluid had a smell consistent of Jet A.

The engine was removed from the airframe to facilitate further examination. The engine fuel filter bowl was removed and the filter element showed no evidence of debris or clogging. Remnant fuel was present in the fuel filter bowl. The engine fuel pump was removed and its driveshaft splines exhibited no anomalous damage. Rotation of the fuel pump driveshaft resulted in pumping out of residual fuel within the fuel pump. Viewing the fourth stage power turbine from the engine exhaust revealed no evidence of anomalous damage or deformation of the power turbine blades (**Figure 10**).

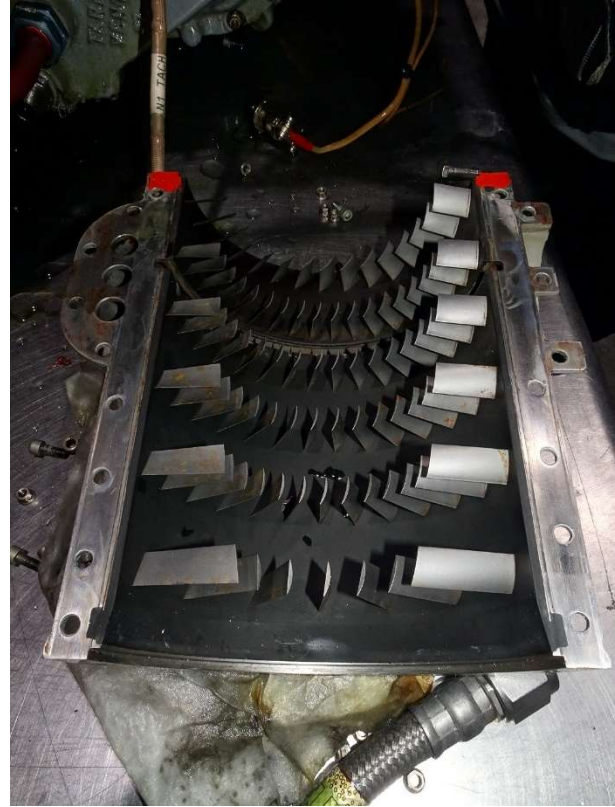


**Figure 11.** The fourth stage power turbine. (Image courtesy of Rolls-Royce)

The upper compressor case half was removed to facilitate inspection of the compressor rotor. The blades of all axial compressor blisks were present and did not exhibit anomalous damage or deformation (**Figure 11**). Salt crystals were present on the blade surfaces. The stator vanes on the compressor case half that was removed were all present and exhibited no anomalous damage or deformation (**Figure 12**). Removal of the fuel control and the power turbine governor showed no evidence of binding of those drive shafts.



**Figure 11.** The axial compressor blades after removal of a compressor case half.



**Figure 12.** The stators of the removed compressor case half.

## 2.6 Miscellaneous

The Hobbs meter in the helicopter wreckage showed 7497.1 hours. The airframe fuel shutoff, located on the instrument panel, remained in the open (normal) position. Actuation of the airframe fuel shutoff resulted in a closure of the fuel shutoff valve at the fuel tank access panel. The following cockpit circuit breakers were found extended:

|        |      |     |           |
|--------|------|-----|-----------|
| LDG LT | HSI  | USB | LOAD CELL |
| N2 GOV | TRFC | ELT |           |

## 2.7 Maintenance Records

An aircraft logbook was recovered with the wreckage of the helicopter. The last entry in this logbook was of a transponder test conducted by Flight Line Avionics, Inc. in West Palm Beach, FL on August 4, 2023 at an ATT of 7,467.3 hours. The next most recent aircraft logbook entry included multiple maintenance items accomplished by Dynamic Helicopter LLC in Pompano Beach, FL on March 13, 2023 at an ATT of 7,448.6 hours, an engine total time of 7448.6 hours, and a Hobbs time of 7,448.6 hours. These actions included adjusting the collective balance spring and replacing an antenna. **Attachment 1** of this report contains a copy of the last two

pages of the recovered aircraft logbook that includes the August 4, 2023, and March 13, 2023 entries.

A separate aircraft logbook entry, a copy of which was provided to the NTSB Investigator-in-Charge by Dynamic Helicopter LLC, was dated August 18, 2023, at an ATT of 7,468.3 hours, an engine total time of 7,864.3 hours, and a Hobbs time of 7,468.3 hours. This entry was not found in the recovered aircraft logbook. Multiple inspections and maintenance actions were performed, including a 100-hour/annual inspection as well as various scheduled airframe and engine inspections. **Attachment 2** of this report contains a copy of the August 18, 2023 aircraft logbook entry provided by Dynamic Helicopter LLC.

## **E LIST OF ATTACHMENTS**

Attachment 1 - Aircraft logbook entries for N757TB dated March 13, 2023, and August 4, 2023.

Attachment 2 - Aircraft logbook entry for N757TB dated August 18, 2023.

Submitted by:

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