Aviation Investigation Final Report

Location:	Miami, Florida	**Incident Number:**	DCA24LA079
Date & Time:	January 18, 2024, 22:34 Local	**Registration:**	N859GT
Aircraft:	Boeing 747-87UF	**Aircraft Damage:**	Minor
Defining Event:	Fire/smoke (non-impact)	**Injuries:**	5 None
Flight Conducted Under:	Part 121: Air carrier - Non-scheduled		

Analysis

During the airplane's initial climb after departure, the flight crew received engine overheat and fire warning indications for the No. 2 engine. The engine was subsequently shut down, one fire bottle was discharged, and the engine fire light extinguished. After declaring a mayday, the flight returned to the airport and made an uneventful landing.

A review of the airplane's maintenance records revealed that, 4 days before the flight, the airplane had undergone a borescope inspection of the No. 2 engine performed by a third-party vendor. The inspection required the removal of the port M borescope plug. The maintenance work card provided instructions for properly reinstalling the borescope plug to ensure that the locking feature was properly engaged. By initialing the work card, the technician who performed the work and the inspector who reviewed the work indicated that this task had been completed in accordance with the maintenance manual procedure.

A postincident inspection of the No. 2 engine revealed that the engine cases were intact with no evidence of an uncontained engine failure. The inspection also revealed burn through of the thrust reverser fan duct fixed inner wall located directly over the combustor diffuser nozzle (CDN) port M borescope plug. The CDN case port M borescope plug was not secured in the engine case and was found loose in the engine cowling. The open CDN port allowed hot gases to escape from the engine, which caused thermal damage to the thrust reverser.

A postincident inspection of the port M borescope plug revealed no anomalies to the plug's material composition, dimensions, threads or locking components. The plug was threaded into an exemplar engine without binding or stiffness and locked as designed. Although the work card had been initialed by a technician and an inspector, it is likely that the port M borescope

plug was not properly secured and inspected according to maintenance manual procedures and that the improperly secured plug resulted in the engine fire.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be:

Maintenance personnel's improper installation and inspection of the port M borescope plug, which resulted in an engine fire.

Findings

Personnel issues	Installation - Maintenance personnel
Personnel issues	Post maintenance inspection - Maintenance personnel

Factual Information

History of Flight

Enroute-climb to cruise	Fire/smoke (non-impact) (Defining event)

On January 18, 2024, Atlas Air flight 3885, a Boeing 747-87UF, N859GT, sustained minor damage as a result of a No. 2 (left inboard) undercowl engine fire after departure from Miami International Airport (MIA), Miami, Florida. The five occupants aboard the airplane were uninjured. The international cargo flight was conducted under Title 14 *Code of Federal Regulations* Part 121 and was destined for Luis Munoz Marin International Airport (SJU), San Juan, Puerto Rico.

The flight crewmembers reported that, after departure, while the airplane was passing through an altitude of about 3,000 ft mean sea level (msl), they received an OVHT ENG 2 NAC [overheat engine No. 2 nacelle] caution message followed by a FIRE ENG 2 warning message on their engine indicating and crew alerting system displays. Simultaneously, the fire warning light illuminated, and the fire bell sounded. The captain declared a mayday with air traffic control, and the flight was cleared back to MIA via radar vectors for a landing on runway 9.

The crew completed the electronic non-normal checklist and shut down the No. 2 engine. One fire bottle was discharged, and the fire warning light subsequently extinguished. The airplane made an uneventful three-engine landing, and the airplane was met by firefighting personnel, who subsequently cleared the airplane to taxi under its own power to the parking location.

A review of the airplane's maintenance records revealed that, on January 14, 2024, the airplane underwent a borescope inspection of the No. 2 engine, a General Electric (GE) GEnx-2B67

engine. The inspection, performed by a third-party vendor, required the removal of the port M borescope plug; see figure 1 for the location of port M.

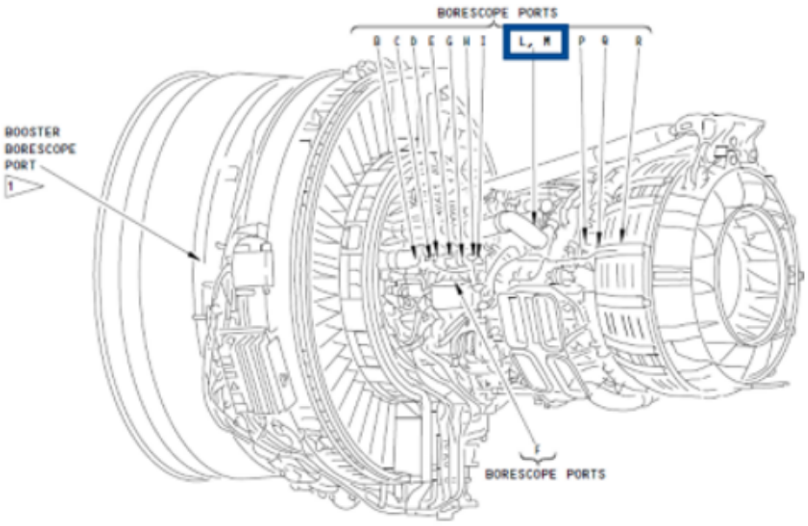

Figure 1. Engine diagram with port M depicted in the combustor diffuser nozzle (Source: General Electric).

The maintenance work card provided instructions on how to properly reinstall the borescope plug to ensure that the locking feature was engaged. The locking design on the borescope plug incorporated a plug cap that utilizes fingers, detents, an internal spring, and a locking slot, as shown in figure 2. When properly installed with the locking slot engaged on the engine, case friction is generated by the fingers and detents, and the plug would be prevented from backing out. The work card was initialed by the technician who performed the work and an inspector

who reviewed the work. Initialing a maintenance item indicated that the task was completed in accordance with the maintenance manual procedure.

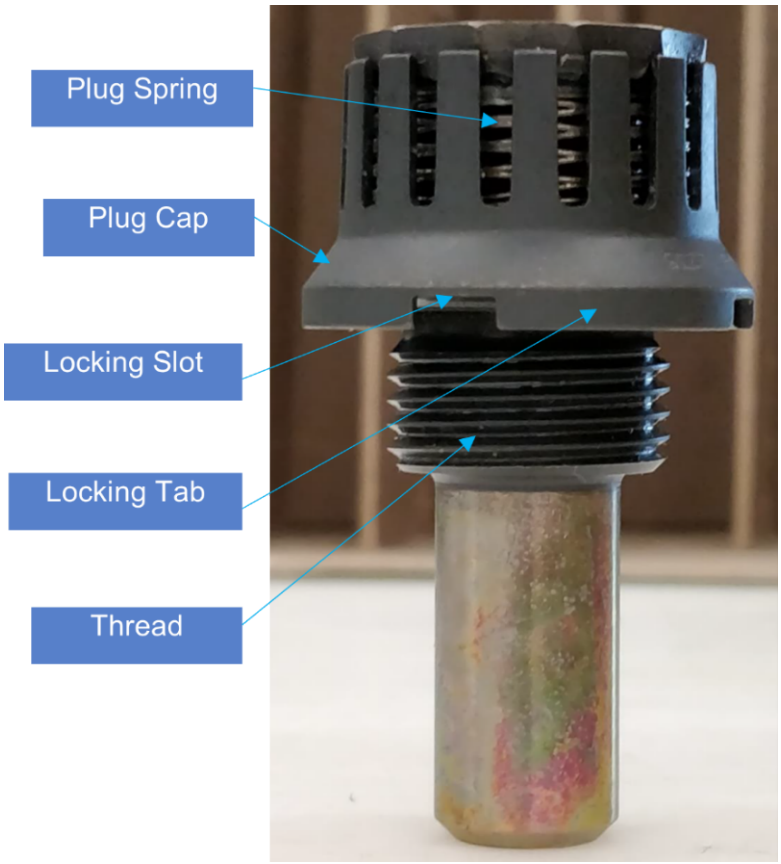

Figure 2. Exemplar borescope plug (Source: General Electric).

A postincident inspection of the No. 2 engine revealed burn-through of the thrust reverser fan duct fixed inner wall (see figure 3). The engine cases were intact with no evidence of an uncontained engine failure. The combustor diffuser nozzle (CDN) case port M borescope plug was not secured in the case and was found loose in the engine cowling. The burn-through observed on the thrust reverser wall was directly above the open CDN port M. The engine low-pressure spool (N1) and high-pressure spool (N2) rotated smoothly with manual rotation. A borescope inspection through CDN port M was performed, and no combustor damage was visible. A review of quick access recorder, flight data recorder, and continuous engine operating data showed no evidence of engine failure or surge/stall.

Figure 3. Burned area above borescope port M (Source: Atlas Air).

A postincident inspection of the port M borescope plug (see figure 4) revealed general debris and oxidation. The plug's geometry/features conformed to the drawing requirements with no anomalies noted to the plug's threads and its locking components. The plug's materials and coatings were consistent with the design requirements. The plug was threaded into an exemplar engine without binding or stiffness, and the locking feature engaged as designed.

Figure 4. Borescope plug recovered from the incident airplane (Source: General Electric).

Pilot Information

Certificate:	Airline transport	**Age:**	54,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	5-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	January 9, 2024
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	June 6, 2023
Flight Time:	3791 hours (Total, this make and model)		

Co-pilot Information

Certificate:	Airline transport	**Age:**	
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):		**Restraint Used:**	5-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):		**Toxicology Performed:**	
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	November 4, 2023
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	August 13, 2023
Flight Time:	3182 hours (Total, this make and model)		

Other flight crew Information

Certificate:	Airline transport	**Age:**	
Airplane Rating(s):		**Seat Occupied:**	Center
Other Aircraft Rating(s):		**Restraint Used:**	5-point
Instrument Rating(s):		**Second Pilot Present:**	Yes
Instructor Rating(s):		**Toxicology Performed:**	
Medical Certification:		**Last FAA Medical Exam:**	
Occupational Pilot:		**Last Flight Review or Equivalent:**	
Flight Time:			

Aircraft and Owner/Operator Information

Aircraft Make:	Boeing	**Registration:**	N859GT
Model/Series:	747-87UF	**Aircraft Category:**	Airplane
Year of Manufacture:	2015	**Amateur Built:**	
Airworthiness Certificate:	Transport	**Serial Number:**	62441
Landing Gear Type:	Retractable - Tricycle	**Seats:**	10
Date/Type of Last Inspection:	January 18, 2024 Continuous airworthiness	**Certified Max Gross Wt.:**	990000 lbs
Time Since Last Inspection:		**Engines:**	4 Turbo fan
Airframe Total Time:	36468 Hrs as of last inspection	**Engine Manufacturer:**	GE
ELT:	C126 installed, not activated	**Engine Model/Series:**	GEnx-2B67/P
Registered Owner:	ATLAS AIR INC	**Rated Power:**	66500 Lbs thrust
Operator:	ATLAS AIR INC	**Operating Certificate(s) Held:**	Flag carrier (121), Supplemental

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night
Observation Facility, Elevation:	KMIA,5 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	10:53 Local	**Direction from Accident Site:**	259°
Lowest Cloud Condition:	Scattered / 1800 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	Broken / 10000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	13 knots / None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	100°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.15 inches Hg	**Temperature/Dew Point:**	26°C / 21°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Miami, FL	**Type of Flight Plan Filed:**	IFR
Destination:	Carolina, PR	**Type of Clearance:**	IFR
Departure Time:		**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	3 None	**Aircraft Damage:**	Minor
Passenger Injuries:	2 None	**Aircraft Fire:**	In-flight
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	5 None	**Latitude, Longitude:**	25.786095,-80.314838

Administrative Information

Investigator In Charge (IIC):	Banning, David
Additional Participating Persons:	Todd Gentry ; FAA; DC Bryan Brown ; Atlas Air; KY Eric East; Boeing Dave Budd; GE Aerospace
Original Publish Date:	October 16, 2024
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this incident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=193682