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

CEN22LA430

AIRWORTHINESS

Group Chair's Factual Report

August 14, 2023

A. ACCIDENT

Location: Houma-Terrebonne Airport (KHUM), Terrebonne Parish, Houma, LA
Date: September 24, 2022
Time: 2311 Universal Coordinated Time (UTC); 1811 Central Daylight Time
Helicopter: Leonardo AW139, registration N811TA

B. AIRWORTHINESS GROUP

Group Chair	Matthew Walker National Transportation Safety Board Washington, DC
Group Member	Chihoon Shin National Transportation Safety Board Washington, DC
Group Member	Myron Billiot Federal Aviation Administration Baton Rouge, LA
Group Member	Stuart Stavley Bristow Group, Inc. Houston, TX
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C. DETAILS OF THE INVESTIGATION

On September 24, 2022, a Leonardo AW139 helicopter, N811TA, operated by Era Helicopters, LLC ("Era Helicopters"), a subsidiary of Bristow Group Inc., was returning from an offshore mission with 2 pilots and 4 passengers on board. While en route, the crew declared an emergency due to smoke in the cockpit and a partial loss of control. The helicopter made a hard landing on Runway 36 at Houma-Terrebonne Airport (KHUM) in Houma, Louisiana and went off the right side of the runway. The helicopter remained upright but suffered substantial damage.

On October 04, 2022, members of the Airworthiness Group met at the operator's facility at KHUM to examine the helicopter.

1.0 Helicopter Information

1.1 Helicopter Description

The Leonardo AW139 is type certificated under Federal Aviation Administration (FAA) type certificate data sheet (TCDS) No. R00002RD. The AW139 has a five-bladed fully articulated main rotor system that provides helicopter lift and thrust, and a four-bladed fully articulated tail rotor system that provides thrust for directional control. The cockpit flight controls are hydraulically-assisted via a dual hydraulic system. The helicopter is equipped with two Pratt & Whitney Canada (P&WC) PT6C-67C turboshaft engines, mounted behind the main gearbox. The helicopter has a retractable wheeled landing gear in a tricycle configuration.

1.2 Accident Helicopter History

The accident helicopter, registration number N811TA, serial number (S/N) 41269 was operated by Era Helicopters. It was assembled at the Leonardo Helicopter facility in Philadelphia, Pennsylvania in 2011, with components and airframe primarily manufactured by Leonardo in Italy and Poland. The helicopter had an aircraft total time (ATT) of 7,491 flight hours at the time of the accident.

Engine No. 1, S/Ns KB0163, utilized P&WC engine Data Collection Unit (DCU) part number (P/N) 3059179-02, S/N DP06-377, and had approximately 7,046.2 hours at the time of the accident. Engine No. 2, S/N KB1053, also had a P&WC DCU (P/N 3075857-01, S/N 16046257), and had approximately 6,987.4 hours at the time of the accident.

2.0 Helicopter Exam

Prior to the examination, the helicopter had been defueled and moved to a maintenance hangar (Photo 1).

Photo 1: N811TA in the hangar at Houma Terrebonne Airport.

2.1 Exterior

The main landing gear remained extended but collapsed (Photo 2).

Photo 2: N811TA's collapsed landing gear.

The left main[1] landing gear tire showed significant wear / loss of tread. (The accident helicopter had landed hard, at high speed, and departed the runway laterally at the end of the emergency landing.)

There was evidence of thermal degradation along the rivet line just aft of the

[1] All directional references to front and rear, left and right, top and bottom, and clockwise and counterclockwise are made ALF, as is the convention. All numbering is in the circumferential direction, starting with the No. 1 position at the 12:00 o'clock position or immediately clockwise from the 12:00 o'clock position and progressing sequentially clockwise, ALF.

greenhouse where the cockpit joins to the fuselage, above the mixing unit (Photo 3 and Photo 4).

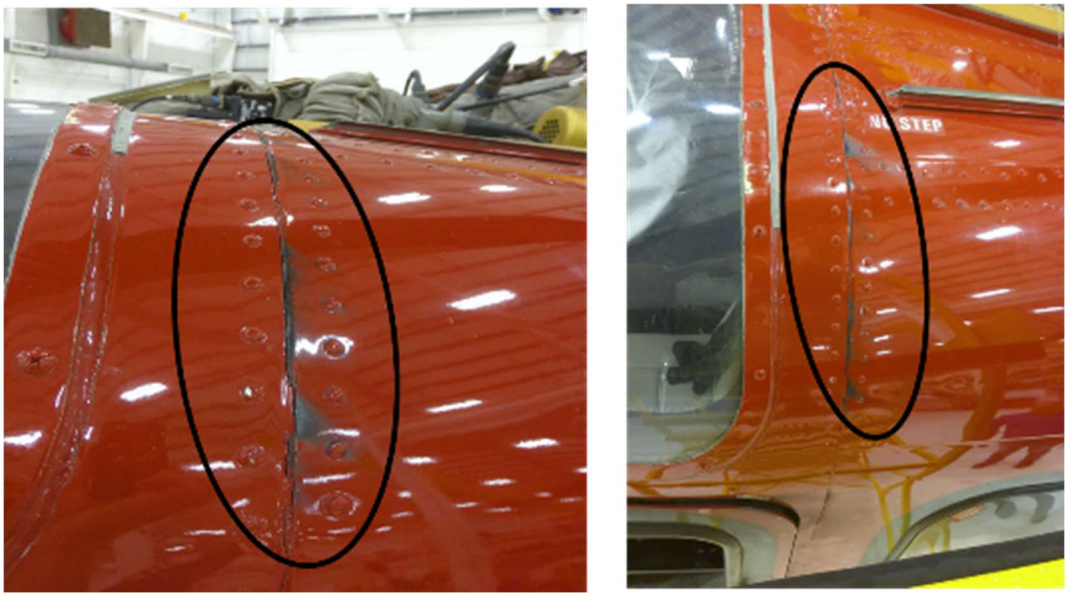

Photo 4: Thermal degradation along the rivet line

Photo 3: Soot and thermal degradation behind the greenhouse (Photo modified by NTSB).

No anomalous damage was observed on the main or tail rotor systems, engines, transmission deck, accessory drives, or main or tail rotor gearboxes.

2.2 Collective Flight Controls

The pilot and copilot collective (Part "A", Figure 1) are connected via torque tube "C1" (Figure 2) beneath the pilot seats, under a composite cover. A single, metal control rod, "C2" (Figure 2) runs vertically up the left side of the helicopter, behind the left seat pilot inside the "broom closet" and connects via a linkage to the collective torque tube "C3", which is made of wrapped carbon fiber and runs laterally above and behind the copilot to the mixing unit.

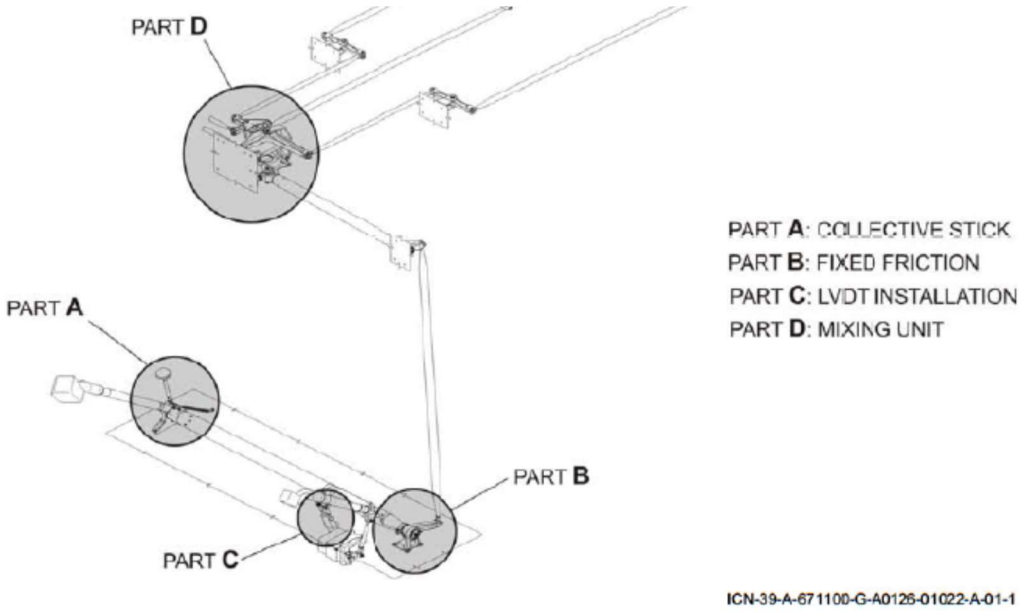

Figure 1: Collective Pitch Control System (Courtesy of Leonardo Helicopter)

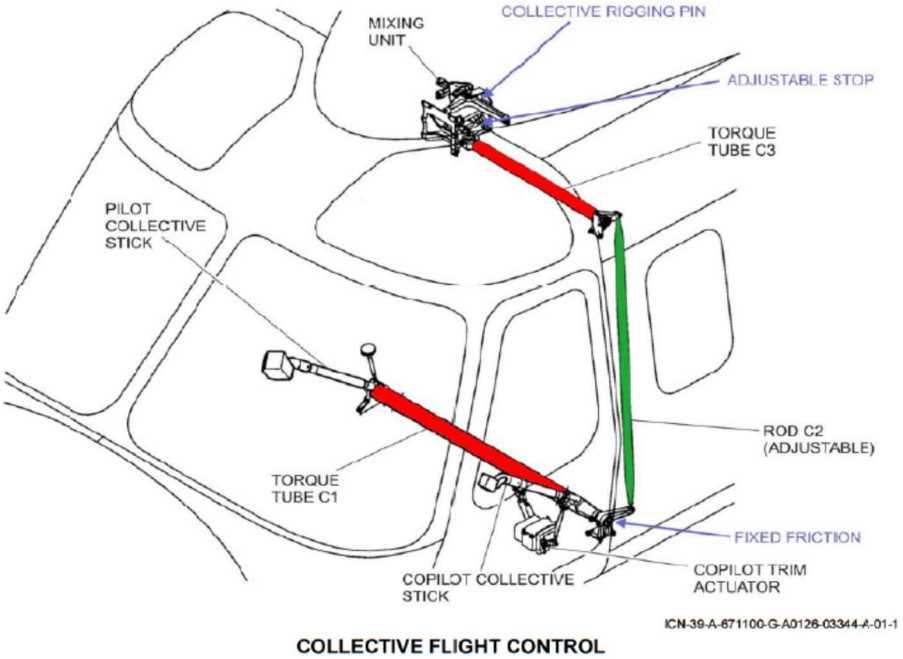

Figure 2: Collective Flight Controls (Courtesy of Leonardo Helicopter)

C3 exhibited evidence of thermal damage; there was a visible longitudinal split in the carbon fiber the length of the tube, and the exposed fibers were brittle and sooted (Photo 5). A test with no hydraulic power, or boost, applied while manipulating the collective control was conducted by moving the collective control between its minimum and maximum stops, and observing the torque tube. C3 did not exhibit fragmentation and remained installed at both ends, with fasteners installed and intact. Limited transfer of rotation was observed between the pilot (right seat) collective control and the mixing unit, as the outboard end of collective tube C3 was twisting while the inboard end (by the mixing unit) did not; rather, C3 deformed torsionally. In a typical AW139 helicopter, because the flight controls are hydraulically assisted, no motion of the cockpit flight control system should be possible without hydraulic pressure.

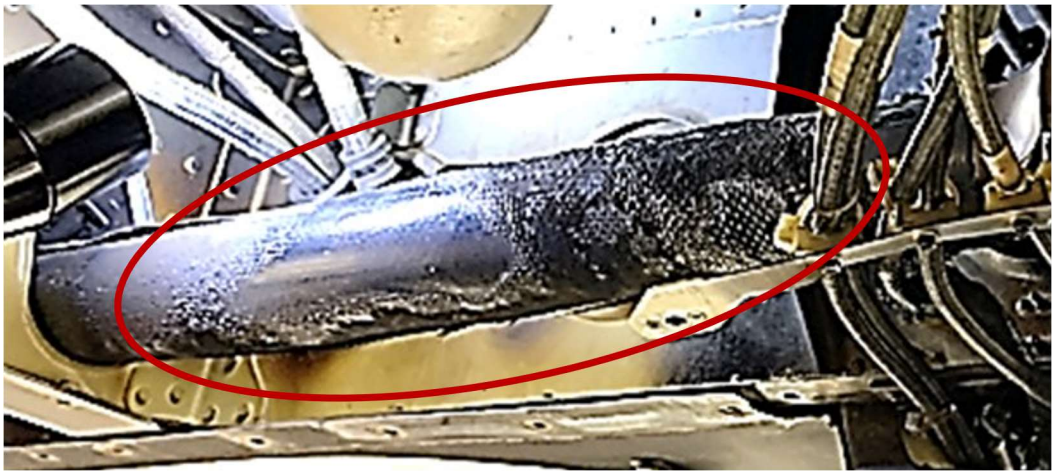

Photo 5: Collective Flight Control Torque Tube C3.

There was no evidence of thermal damage to control rod C2. Sooting was present laterally along the overhead adjacent to C3 and the panels that covered it, in addition to melted resin from C3 (Photo 6).

Photo 6: Melted Resin from C3 onto the Overhead Panel

2.3 Electrical

The AW139 is powered by two, 30 volt (V) 300 ampere (A) DC generators. Wire P190A6-G (3G9B11A1911) receives power from the No. 1 generator through Terminal T3 on the No. 1 Diode Module and supplies it to distribution bar No. 5 on Essential Bus No.1 in the cockpit overhead. It was found chafed through its insulation and contacting the collective torque tube C3 (Photo 7). The chafed area was in-line with a rivet line running circumferentially on C3.

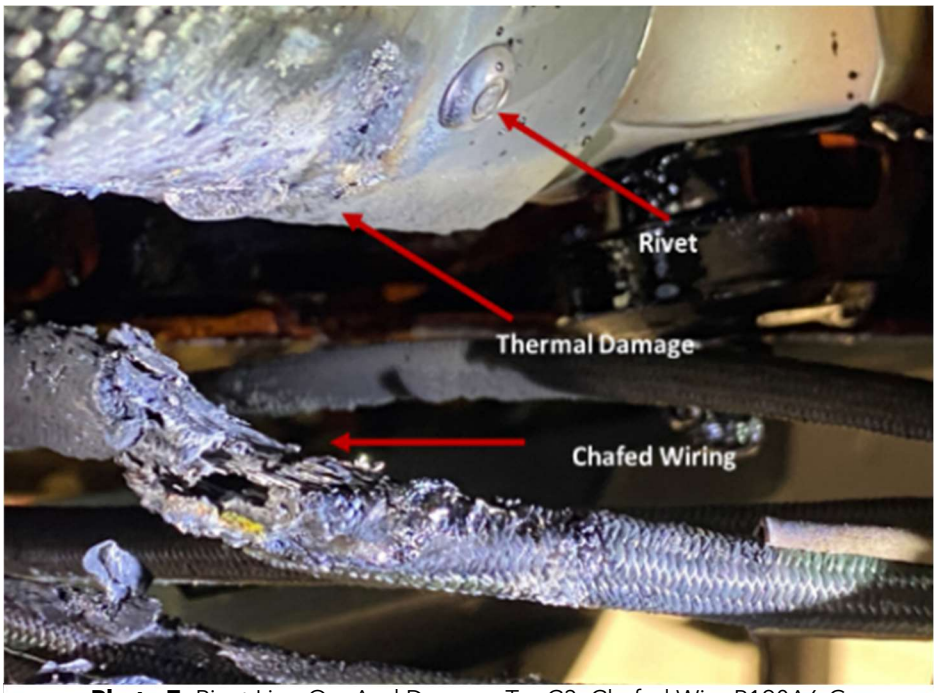

Photo 7: Rivet Line On, And Damage To, C3. Chafed Wire P190A6-G

Circuit Breakers 47 and 3 (50 amps each) on Terminal Block 7 in the Power Distribution Panel (PDP) No. 1 were found extended (Photo 8). The Essential Bus Tie (ESS BUS TIE) circuit breaker on the overhead panel was also extended.

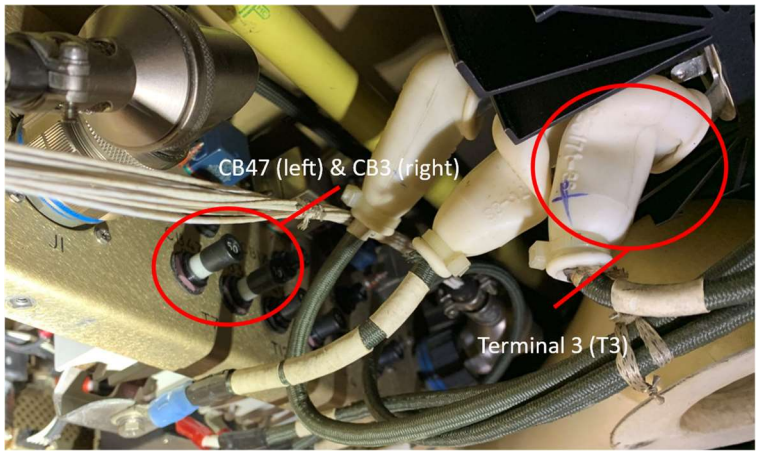

Photo 8: Circuit Breakers (CB) 3 and 47, And Terminal 3 (T3) on PDP No. 1

Retaining clips for the wire bundles to the overhead circuit breaker panel are meant to route the wire bundles under the support strip at C3 as required by the engineering drawings (Photo 9).

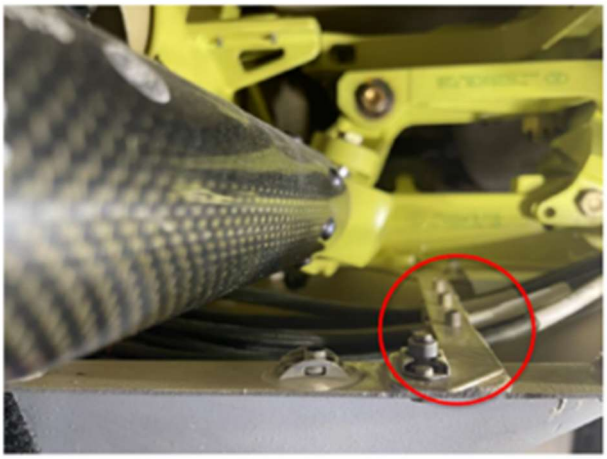

Photo 9: Wire Correctly Routed Below the Support Strip (Courtesy of Leonardo Helicopter)

On the accident helicopter, the retaining clips were oriented such that the wire bundles on both the left and right sides were routed over the support strips (Photo 10).

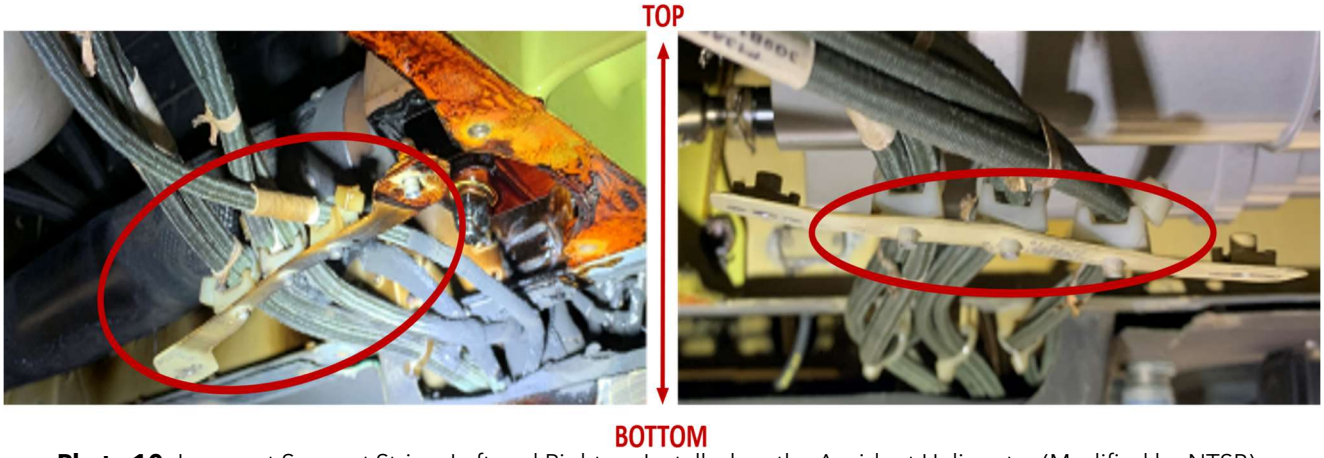

Photo 10: Incorrect Support Strips, Left and Right, as Installed on the Accident Helicopter (Modified by NTSB)

The left-hand support strip was marked as follows:

3P5315A10531 ISSB
3768491
26.10.10

The right-hand bracket was marked as follows:

3P5315A12931 ISSA
3768497
29.10.10

The same wire was found chafed further aft in the main cabin overhead, rubbing against the lower outer corner of a cooling fin on the No. 1 Diode Module (labeled A77) (Photo 11). The external sheathing to the wire was damaged, but no internal wiring was exposed.

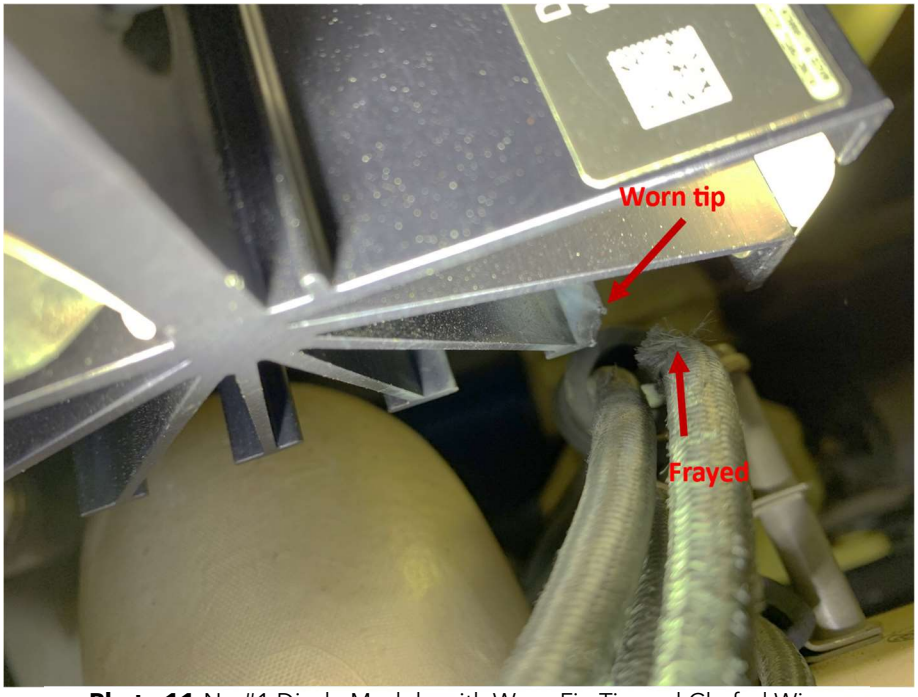

Photo 11: No.#1 Diode Module with Worn Fin Tip and Chafed Wire

PDP No. 1 (A3) is mounted on the roof of the cabin, on the left side. The PDP No. 1 is an electronic box with an aluminum cover. The PDP No. 1 contains: the No. 1 DC current-transformer (T3) (See Photo 8) of the hot side of the output of the No. 1 generator; the power relays of the No. 1 power-distribution system; and the power protection contactors and most protection devices, including circuit breakers CB3 and CB47.

3.0 Maintenance Records

Era Helicopters maintained the accident helicopter under an FAA-approved continuous airworthiness maintenance program (CAMP) for their AW139 helicopters. Originally approved on January 1, 2006 and with seventeen subsequent revisions, the documents for the original issue and subsequent revisions to the Era Helicopters CAMP for the AW139 ("Era CAMP") typically contained an Era logo on the header. On July 19, 2021, the Era CAMP was reissued and internally approved within Bristow ("Bristow CAMP"), with the reissued documents now containing a Bristow logo on the header. At that reissue, the revision numbering sequence was reset from Revision 15 to Revision 00 at Issue 1. On August 19, 2021, Issue 1 Revision 00 of the Bristow CAMP [for the AW139] was approved by the FAA Baton Rouge Flight Standards District Office (FSDO) and subsequently enacted within Era Helicopters.

In the Bristow CAMP, the airframe-related sections are based upon the Standard Inspection Program as defined in the Leonardo Aircraft Maintenance Planning Instruction (AMPI), Chapter 5. Section 3 of the Bristow CAMP defines the Phase (1-6) and Airframe Inspections (1-3 and "A"-"D") for scheduled inspections and maintenance. The Phase Inspections 1 through 6 capture the 300- and 600-Flight Hour maintenance items, broken down into tasks to be completed in an eight-hour work shift. The only 100-hour item in Phase is the damper bearings inspection; other more involved tasks are completed as part of Airframe Inspection 1. Airframe Inspections 1-3 cover the flight-hour driven maintenance, while "A" through "D" captures calendar maintenance items.

Inspection	Limit		Inspection	Limit
Phase Inspections (1-6)	100 Hours/12 Months		Airframe Inspection A	12 Months
Airframe Inspection 1	100 Hours		Airframe Inspection B	24 Months
Airframe Inspection 2	300 Hours		Airframe Inspection C	48 Months
Airframe Inspection 3	1200 Hours		Airframe Inspection D	96 Months

Table 1: Bristow Group's CAMP Inspection Timelines for the AW139

AMPI Task 24-03, as per AgustaWestland (now Leonardo)'s AW139 Interactive Electronic Technical Publication (IETP), requires "a general visual inspection (GVI) to detect corrosion or mechanical damage of bundles and condition, safety, and security of connectors every 2 years in accordance with Technical Publication 39-A-24-61-00-00A-310A-A", titled DC Electrical Load Distribution System. Technical Publication 39-A-24-61-00-00A-310A-A requires a visual inspection of No. 1 and No. 2 PDPs, specifically ensuring the electrical connectors on the PDPs are correctly attached, with no corrosion damage or chafing, and the adjacent wiring harness are properly attached to the structure with no signs of damage, chafing or overheating. No specialized tooling or additional requirements are specified.

Prior to issuance of the Bristow CAMP, the scope of AMPI Task 24-03, referenced to Technical Publication 39-A-24-61-00-00A-310-A-A, was contained in the Phase 1 Inspection of the Era CAMP. According to the maintenance records for N811TA, the Phase 1 Inspection [under the Era CAMP] was last accomplished on May 14, 2021, at an ATT of 6,064.7 hours. AMPI Task 24-03 was subsequently moved from the Phase 1 Inspection [of the Era CAMP] to Airframe Inspection B [of the Bristow CAMP] during the AW139 CAMP reissue. According to the maintenance records for N811TA, the last Airframe Inspection B was accomplished on August 1, 2021, at an ATT of 6,246.4 hours. This inspection occurred after Bristow approval of the Bristow CAMP, but prior to FAA approval of the Bristow CAMP. The documents for this last accomplishment of Airframe Inspection B showed Revision 13 dated January 14, 2019, but the documents did not contain an Era or Bristow logo on their headers. According to the Era CAMP for the AW139, Airframe Inspection B was last at Revision 13 dated January 14, 2019, prior to the transition to the Bristow CAMP.

APMI Tasks 67-01 and -02 require an inspection of the flight controls and mixing unit and may require a mirror and portable light source for examining the main rotor controls.

Era Helicopters required AMPI 67-01 and -02 to be performed during Airframe Inspection A. Per Step 2.7 of AMPI Task 67-02, an inspection for condition and damage of the collective torque tube C3 is required in accordance with the AW139 Maintenance Manual Chapter 39 Reference A-67-10-00-00A-31AA-A. Per the maintenance logbook, at an ATT of 7,399.2 hours, Log Page No. 3115108, Airframe Inspection "A" was completed on August 28, 2022 with no anomalies or damage noted. Although these inspections took place in the vicinity of where the damage was found and included checking for chafing, none of these AMPI tasks required or suggested inspecting the routing of the wiring.

Inspection	Revision	Revision Date	Last Completed Date	ATT (hours)
Airframe Inspection A	Bristow 01	March 1, 2022	August 28, 2022	7,399.2
Phase 4	Bristow 00	July 19, 2021	August 24, 2022	7,390.7
Airframe Inspection 1	Bristow 00	July 19, 2021	August 24, 2022	7,390.7
Phase 3	Bristow 00	July 19, 2021	July 24, 2022	7,303.5
Phase 2	Bristow 00	July 19, 2021	June 23, 2022	7,223.4
Airframe Inspection 2	Bristow 00	July 19, 2021	June 10, 2022	7,181.6
Phase 1	Bristow 00	July 19, 2021	May 22, 2022	7,133.2
Phase 6	Bristow 00	July 19, 2021	April 20, 2022	7,044.6
Phase 5	Bristow 00	July 19, 2021	March 17, 2022	6,952.5
Airframe Inspection 3	Bristow 00	July 19, 2021	January 19, 2022	6,755.7
Airframe Inspection B	(No Logo) Revision 13	January 14, 2019	August 1, 2021	6,246.4
Airframe Inspection C	(No Logo) Revision 11	March 17, 2017	September 16, 2020	5,437.0
Airframe Inspection D	Era Revision 11	March 17, 2017	August 30, 2019	4,794.8

Table 2: Completed Maintenance Inspections for N811TA in Reverse Chronological Order

4.0 Assembly Tasks and Manufacturing Job Cards

The accident helicopter was assembled in 2011 at Leonardo's production facility in Philadelphia, Pennsylvania. The assembly task job cards active at that time had been issued in 2007and last revised in 2014.

The "Closings After Rain-Test Card" (No. 41269352; issued August 20, 2008; revised on November 22, 2010) did not include any diagrams or photos of the wiring assembly, and no instructions regarding inspection of the wiring in the overhead panel. The card was updated to Version 8 (published December 20, 2014), retitled as "3NB Pax Ceiling Panels Closeout Card", and included the following diagrams (Figures 3 and 4):

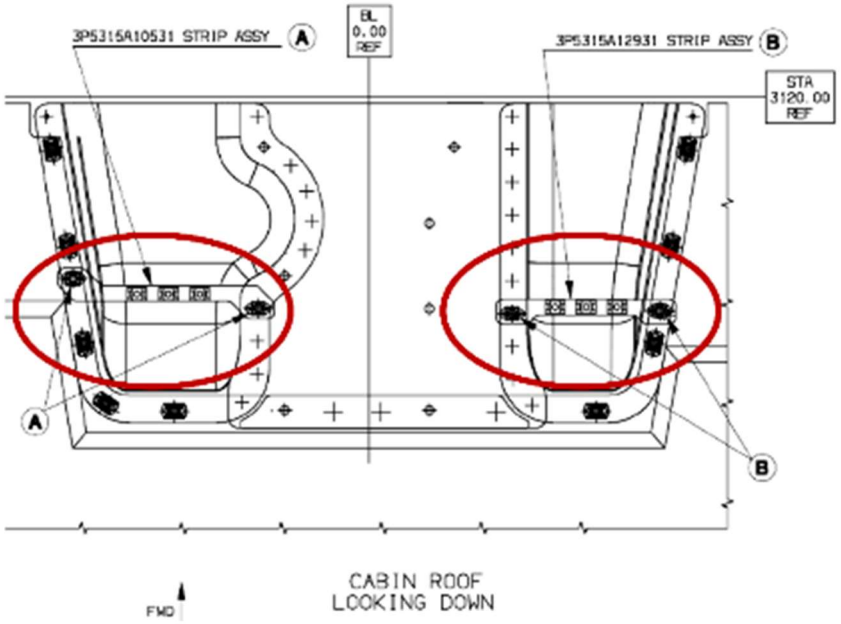

Figure 3: Page 3 of Version 8 of the 3NB Pax Ceiling Panel Closeout Job Card (Red Highlights Modified by NTSB)

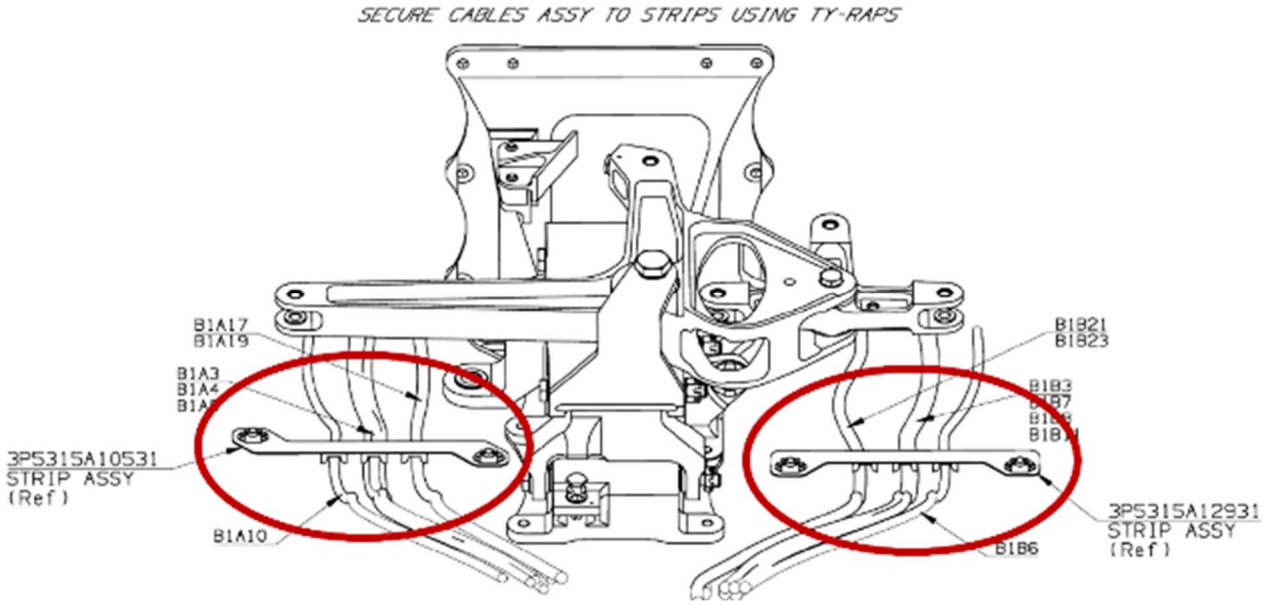

Figure 4: Page 4 of Version 8 of the 3NB Pax Ceiling Panel Closeout Job Card (Red Highlights Modified by NTSB)

The page following the diagrams stated: "ENSURE THAT THE MOVING PARTS OF THE FLIGHT CONTROL RODS IN THE AREA HAS ATLEAST 0.5 INCH CLEARANCE FROM THE SURROUNDING FIXED PARTS." No mention, or specific instructions for inspection, of wiring was called for in these cards.

The "3NB Pax Ceiling Panels Close-out Card", Version 5 replaced the "Closings After Rain-Test Card"; however, it also did not include any diagrams or photos of the wiring

assembly, nor any instructions regarding overhead wiring.

The "Completion and Finishing of Power C/A Card" (identification No. 3G0630A04112C4R) applicable to the accident helicopter during its manufacture contained instructions on the installation and routing of power cables from the cockpit nose area to the cabin roof (Figure 5).

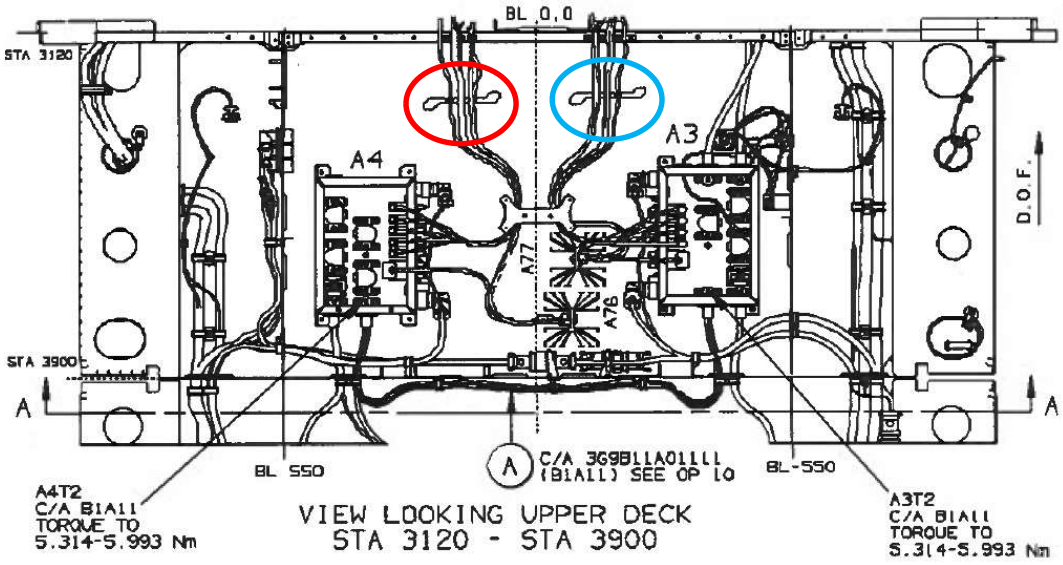

Figure 5. An excerpt from the "Completion and Finishing of Power C/A Card" showing the power cable routing on the roof thru the right strip assembly (red circle) and the left strip assembly (blue circle). This view is looking up to the roof with aircraft forward at the top of the image. (Courtesy of Leonardo, modified by NTSB)

The assembly cards contained views of the left and right strip assemblies installed with power cables routed through them. In the views looking upwards (from within the cabin), the power cables were solid lines with the strip assemblies as solid lines behind them, inferring that routing of the power cables were under the strip assemblies (Figures 6 and 7). Additionally, the shape of the right strip assembly was identical to the left strip assembly in these views, even though the right strip assembly is of a different shape than the left strip assembly. There was no specific instruction to verify that the power cables were routed underneath the strip assembly.

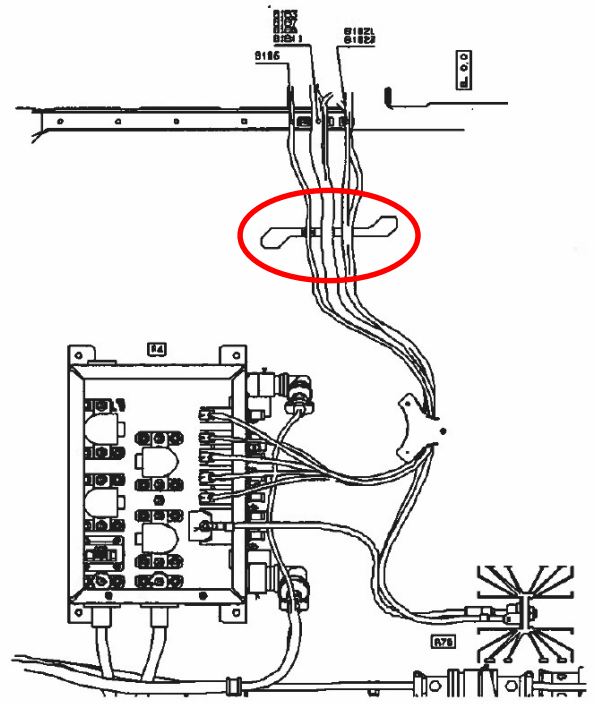

Figure 6. A detail excerpt from the "Completion and Finishing of Power C/A Card" showing the power cable routing on the right strip assembly (red circle). (Courtesy of Leonardo, modified by NTSB)

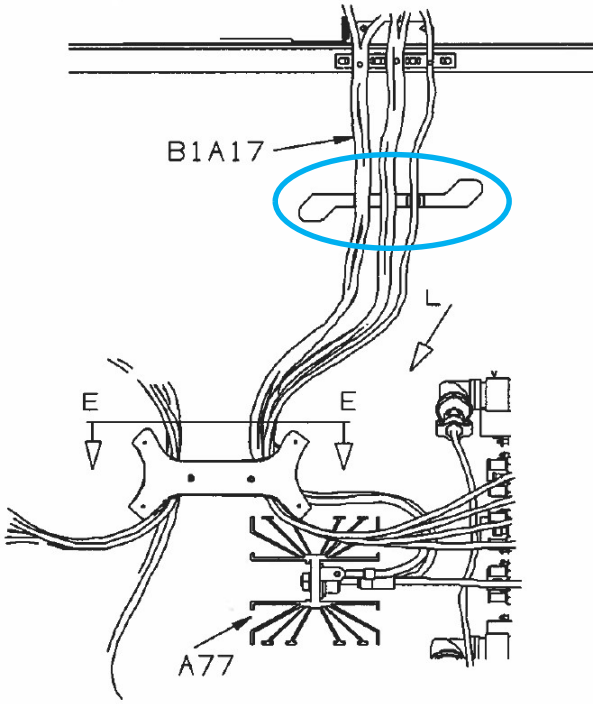

Figure 7. A detail excerpt from the "Completion and Finishing of Power C/A Card" showing the power cable routing on the left strip assembly (blue circle). (Courtesy of Leonardo, modified by NTSB)

At the time of its manufacture, the manufacturing job card for the left side wiring support strip assembly, No. 3P5315A10531, contained only a single planform view of the strip assembly. Figure 8 shows an excerpt of this view taken from the manufacturing job card for the left side strip assembly. According to Leonardo, the solid [drawing] lines for the nut plates[3] versus the dashed [drawing] lines for the electrical supports[4] inferred that the electrical supports were mounted on the side opposite that of the nut plates.

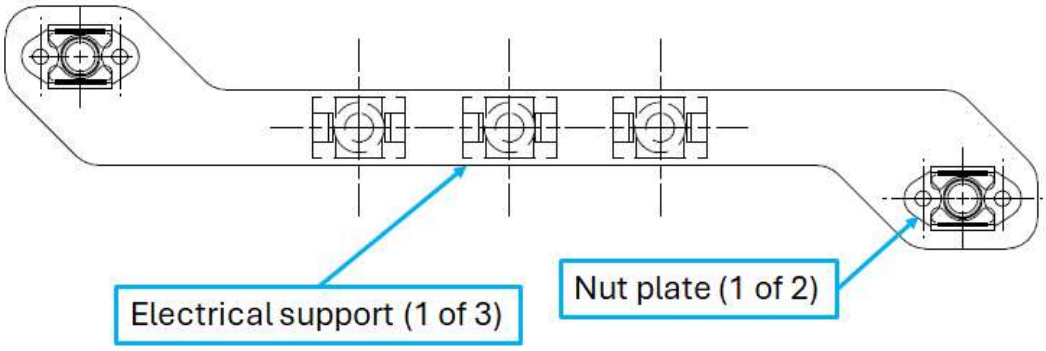

Figure 8. The single view of the left strip assembly in its manufacturing job card. (Courtesy of Leonardo, modified by NTSB)

[3] The nut plates were also referred to as "anchor nuts".

[4] The electrical supports were also referred to as "retaining clips".

At the time of its manufacture, the manufacturing job card for the right side wiring support strip assembly, No. 3P5315A12931, contained two views of the strip assembly. Figure 9 shows an excerpt of this view taken from the manufacturing job card for the right side strip assembly. These two views of the strip assembly distinctly show that the electrical supports were mounted on the side opposite that of the nut plates.

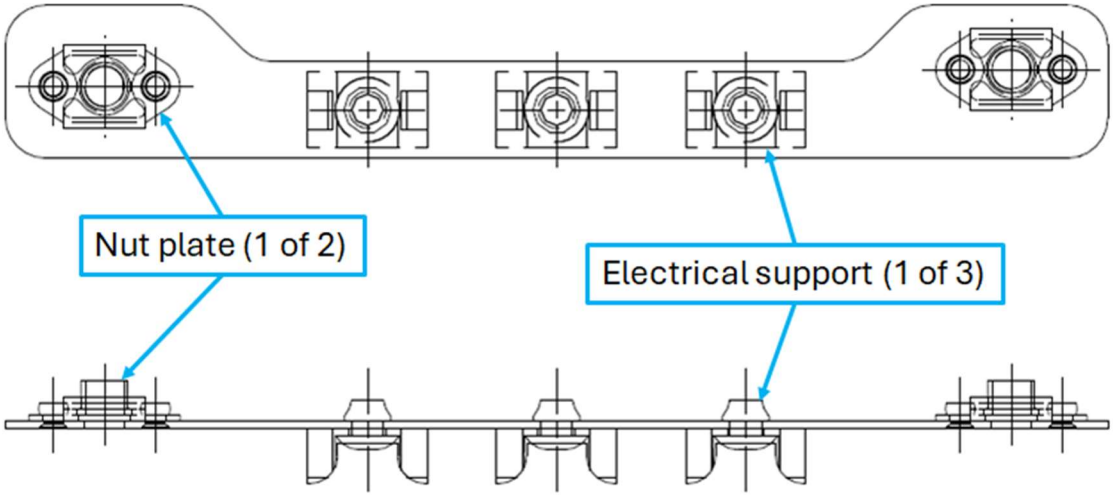

Figure 9. The two views of the right strip assembly in its manufacturing job card. (Courtesy of Leonardo, modified by NTSB)

On the accident helicopter, the electrical supports and nut plates were both mounted on the same [upper] side for both the left and right strip assemblies.

5.0 Data Recorders

The Multi-Purpose Flight Recorder (MPFR), which performs the functions of both a cockpit voice recorder (CVR) and a flight data recorder (FDR), remained installed in the accident helicopter. The FDR portion of the MPFR was downloaded during the wreckage examination under supervision from an NTSB investigator, and the data was brought back to the NTSB Recorders Lab for processing. The CVR portion of the MPFR was not accessed or downloaded for this investigation; it was quarantined with Bristow in New Iberia, LA, while the NTSB Recorders Lab reviewed the FDR data.

The engine data collection units (DCUs) were removed from the helicopter and sent to P&WC for download and analysis.

5.1 Flight Data Recording

FDR data provided by the NTSB Recorders Lab showed the accident flight began at 1713 local time. No helicopter anomalies were observed prior to the event. The radar altimeters (RADALTs) begin to cycle approximately 30 minutes before the accident occurred; however, this is considered normal by Leonardo, as the AW139 RADALTs are certified up to 2500 feet above ground level (AGL) and anything above that value is

automatically masked from the crew display. A summary of the major events for the accident flight is found in Table 3.

Time Stamp	Local Time	Event
85870	1713	Start of event flight
87310	1737	RADALTs begin cycling (4000 feet to zero)
89110	1807	Descent from 4500 feet starts. Flight Director Active Collective Mode (FdActiveColMod) switch from Alt Hold (ALT) to Alt Acquire (ALT-A)
89170	1808	ESS Bus 1 & 2 brief spike
89230	1809	1st spike in No.1 & No. 2 ammeters
89325	1810.35	Main Rotor Speed (Nr) @ 98.75%
89356	1810.36	Aircraft at 2,924 feet
89327	1810.37	Nr at 90.75%
89330	1810.40	All engine parameters increase except Fuel pressure (FP) and inlet temperature. FP and inlet temperatures decrease. Collective pitch and pitch trim went negative (pitch -20%; trim -10%). Collective pitch trim fluctuates between 0 and -10% for about 2 minutes (1812). Collective pitch fluctuates between 0 and -20% for about 5 minutes (1816-1817). "ROTOR LOW" annunciation (Nr <98%). Master Caution Light. Master Warning Light
89350	1811	Aircraft begins rapid climb (as much as 2600 feet/minute). 2nd spike in No.1 & No. 2 ammeters. ESS Bus 1 drops from 30VDC to 10VDC. Left ENG Fire DET. Collective No. 1 Fail. Accelerometers for all 3 axis drop to zero. Master Caution. Master Warning.
89410	1812	Collective pitch trim stabilizes a 0%
89442	1812.32	Nr at 77.875%
89452	1812.42	Nr at 99.375%
89472	1813.02	Aircraft reaches 6722 feet
89650	1816-1817	Coll pitch spikes back to 50% (no fluctuations). Aircraft descending at 480-500 feet per minute
89686	1816.36	Nr reaches maximum value of 101%
90040	1822:30	Aircraft at 1000 feet pressure altitude (PA); begins RH orbits
	1823:14	FdActiveColMod (1 & 2) drops to Standby
90400	1828:30	Collective pitch drops to 0%; Nr drops to 74.625%
90670	1833	Flight / recording ends

Table 3: Summary of Significant FDR Events

Additional details on the FDR data can be found in the NTSB Recorders Lab report in the docket for this investigation.

5.2 Engine Data Collection Units (DCUs)

The engine DCUs were removed under FAA supervision and shipped to P&WC for download and analysis. The data analysis showed the engines were within normal parameters until approximately 1810.35[5] (FDR time). At 1810.25, the engine control system detected both the power turbine speed (Nf) and the Nr were below the required 100% setting (89.94% and 89.79% respectively). The engine control system commanded a power increase to regain 100%, switching several times between gas generator speed governing and torque governing in order to avoid exceeding engine limitations.

Between approximately 1812.35 and the securing of aircraft power at the end of the accident flight, there were three recorded instances on each engine of a Fault Code 35 – Collective Pitch Angle Fault. The second and third events on both engines coincided with Event Code 1001, indicative of a command to shift from Manual to Automatic mode. Additionally, the No. 1 engine (S/N KB0163) recorded a Fault Code 27 – Manual Relay Wraparound Fault, a disparity between software expectation and hardware reality, which coincided with an Event Code 1000, the command to shift from Automatic to Manual mode. According to P&WC, this is suggestive of an intermittent, erratic signal to the engine control system.

6.0 Corrective Actions

6.1 Operator's Response

As a result of the findings of this investigation, the parent company of Era Helicopters, Bristow Group Inc., conducted a fleet inspection and data call in October 2022 across both the Era Helicopters certificate and all their global operating certificates. The results accounted for 9 additional helicopters in their fleet with the issues affecting this wire bundle: 8 with incorrectly routed wiring, and 1 with the wiring routed correctly but the support straps mounted with incorrect hardware. Of those 9, only 1 also had chafing at the cooling diode.

6.2 Service Bulletins and Airworthiness Directives

On September 30, 2022, Leonardo Helicopters released an In-Service Event Notification (ISEN) letter to all AW139 operators, informing them of the event, which was followed with a Technical Information Letter (TIL) from Leonardo Helicopters on October 5, 2022, announcing Emergency Alert Service Bulletin (ASB) ASB139-731. This ASB, released on October 11, 2022, addressed both the subject chafed wiring and additional chafing at the PDP diode and required "a one-time inspection of the Forward Cabin Roof Ceiling

[5] The engine electronic controls (EEC) automatically store data in the DCU in a snapshot format when an event or a fault occurs. The snapshots reference engine runtime and provide an event / fault code reference. The DCU engine run time cannot be referenced to the engine Time Since New (TSN) nor directly to time of day. The engine run times are expressed in hours. For ease of comprehension, the DCU engine running time was rounded to 4 digits and converted to hours, minutes, and seconds, then referenced to known Flight Data Recorder events for time.

Harnesses and its installation in the area between airframe station (STA) 3120 and 3340". They received reports of an additional 23 affected helicopters: 8 with incorrectly routed wire bundles; and 15 with evidence of chafing at the aft cooling diode.

Emergency Airworthiness Directive (AD) No. 2022-0209-E from the European Union Aviation Safety Agency (EASA), covering both AB139s and AW139s, was released October 12, 2022. It described how "the initial investigation evidence revealed signs of short circuit inside the forward cabin roof ceiling panel, due to chafing of an electrical cable against the rivets of the upper torque tube. It was determined that the chafed electrical cable was not routed in accordance with the applicable production drawings." The AD required:

- Within 10 flight hours from the effective date of the AD, a borescope inspection of the cable installation in the forward cabin ceiling in accordance with Section 3 Part I of the ASB; and (2) Within 25 flight hours from the effective date, a visual inspection for damage of the cables and the diode in the forward cabin ceiling must be completed in accordance with the instructions of Section 3 Part II of the ASB.
- If, during the borescope inspection (1), an incorrect cable installation is detected, a visual inspection inside the forward cabin roof ceiling for chafing of the cables and damage of the torque tube was required before the next flight (per Section 3 Part I of the ASB). If the visual inspection identified any discrepancy, as described in the ASB, Leonardo must be contacted before the next flight for approved corrective action(s).
- If the borescope inspection (1) revealed an incorrect installation of cables, as specified in the ASB, the cable installation must be corrected in accordance with Section 3 Part I of the ASB before the next flight.
- If the visual inspection within 25 flight hours of the AD (2) revealed any cable chafing, Leonardo had to be contacted for approved corrective action(s), which had to be completed prior to the next flight.
- If, during the visual inspection (2), the clearance between the cable and the diode was less than 10 mm (millimeters), the required clearance had to be restored before the next flight in accordance with the instructions of Section 3 Part II of the ASB.
- If, during the visual inspection (2), the diode was found to be damaged, Leonardo was to be contacted for approved corrective action(s), which had to be completed prior to the next flight.
- Any discrepancy defined in the ASB had to be reported to Leonardo within 30 days.

AD No. 2022-22-03 from the FAA was released November 2, 2022, and became effective November 17, 2022. It required accomplishment of the actions as specified in EASA AD 2022-0209-E, with the differences that where EASA required contacting Leonardo for corrective action instructions, the FAA AD required repairs done in accordance with a specific method, and while EASA required reporting of the inspection results within 30 days, the FAA required inspection results within 10 days.

6.3 Job Card Updates

The manufacturing job card, No. 3P5315A10531, was updated on October 24, 2022, to include a 3-dimensional (3D) graphic of the completed strip assembly (Figure 8).

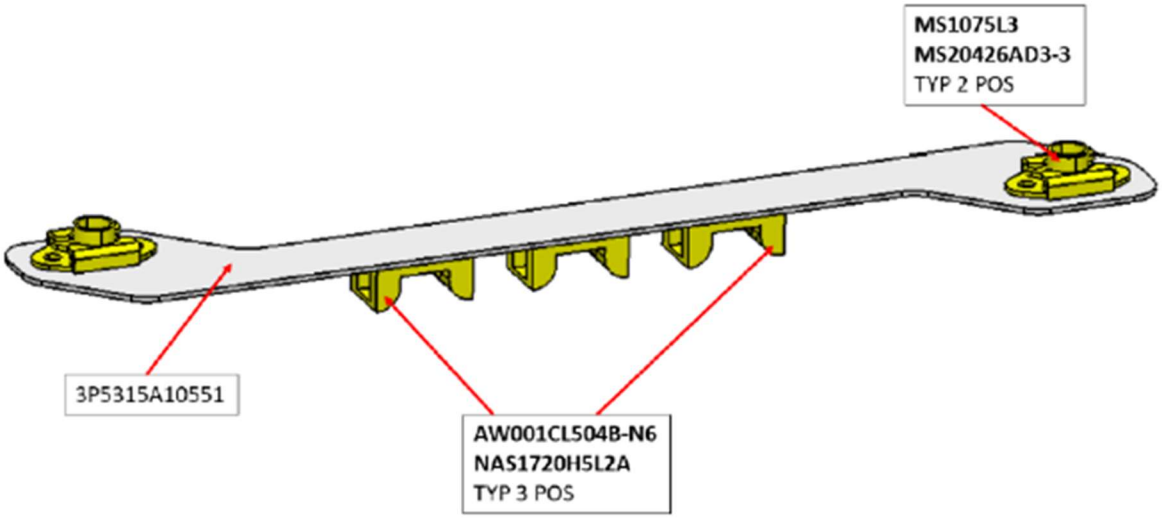

Figure 8: The 3D figure in the New Strip Assembly Manufacturing Card, 3P5315A10531

The new card includes the following next to the Figure: "Note: Pay attention to correct assembly: the anchor nuts must be mounted on the side opposite to the electrical supports" (translated from Polish).

Revisions to the Production Assembly job card (No. 3P5333A00134C1, Version 9) include a diagram (Figure 9) with a follow-on photo (Figure 10) showing proper installation.

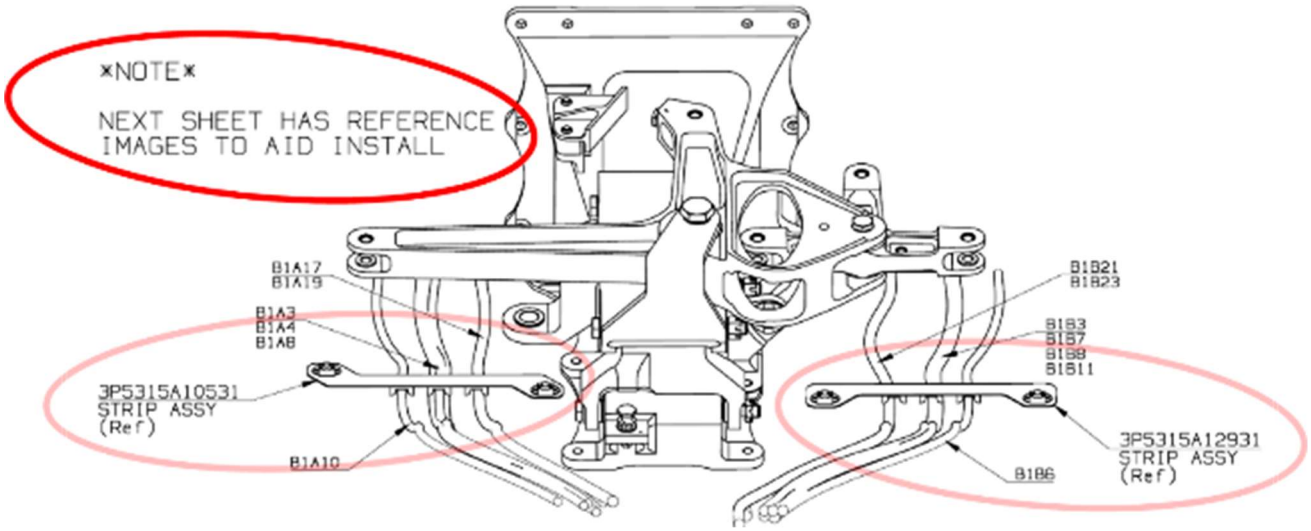

Figure 9: Page 4 of Version 9 of 3NB Pax Ceiling Panels Closeout Job Card. Pale Red Highlights Show the Previous Update; Dark Red the Newest (Modified by NTSB)

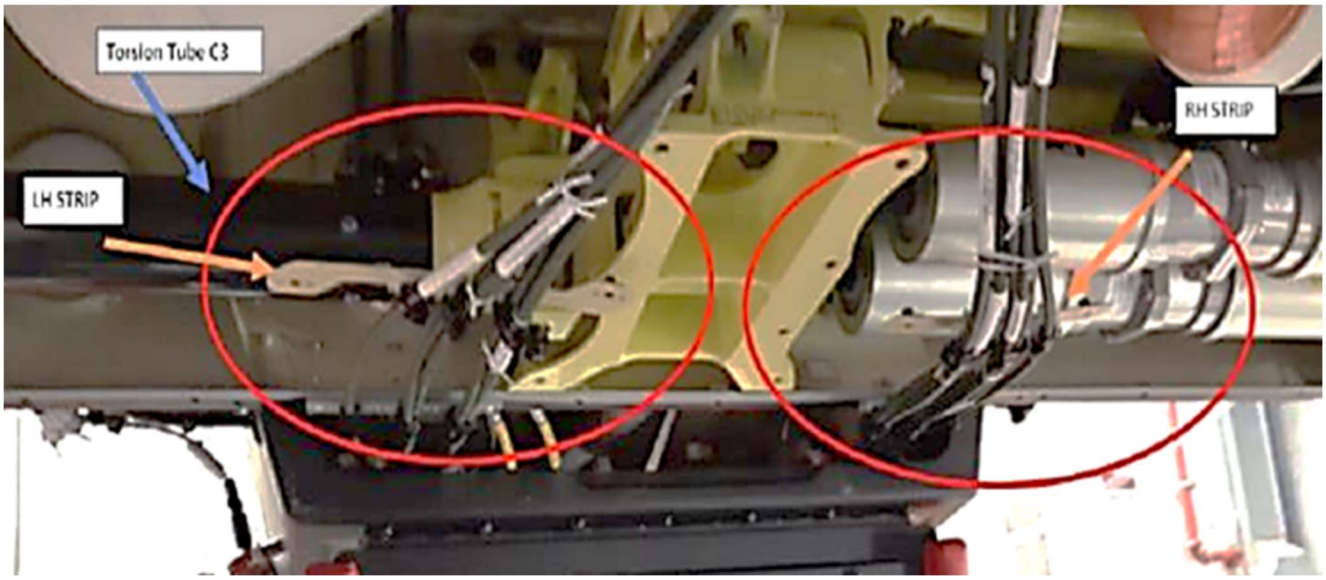

Figure 10: Page 5 of Version 9 of 3NB Pax Ceiling Panels Closeout Job Card (as published)

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