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Safety Investigation Report

Ref. AAIU-2022-09-08-02
Issue date: 15 January 2026
Status: Final

Scope: Limited

As per ICAO Annex 13 and EU regulation EU 996/2010, decisions regarding whether to conduct a civil aviation safety investigation, and the extent of an investigation, are based on many factors, including the level of safety benefit expected to be drawn from such an investigation.
For this occurrence, a limited-scope, fact-gathering investigation and analysis was conducted in order to produce a short summary report. The investigation mainly focussed on the actions and conditions directly relating to the occurrence and might not cover all aspects of the aircraft operation and/or possible underlying safety factors due to the expected safety benefit of it and/or the extent of evidence/resources available.

SYNOPSIS

Occurrence class	Serious Incident
Occurrence category	Powerplant failure or malfunction (SCF-PP)
Date and time[1]	Thursday 8 September 2022 21:42 UTC
Location	50°42'14.77"N - 5°15'43.67"E, elevation 370 feet Allée du Long Pré, 4300 Waremme
Aircraft	Boeing 747-400
Aircraft category	Fixed wing - Large aeroplane (MTOW > 5700 kg)
Location of departure	Airport of Liège (EBLG)
Planned destination	Airport of Luqa, Malta (LMML)
Type of operation	Commercial Air Transport - International - Cargo
Phase of flight	Initial climb
Injuries	None
Aircraft damage	Minor

What happened

A heavy metallic cowling fell from a flying aircraft in a garden in Waremme, Belgium. Beside the physical damage to the aircraft and to the roof of a garage, nobody got injured. This event is classified as a serious incident, considering the size and weight of the falling part and the urban area where it fell.

[1] All time data in this report are indicated in UTC, unless otherwise specified

1. THE OCCURRENCE

A local citizen in Waremme, Belgium, reported that, during the night, he heard the noise of a low flying aircraft, followed by a loud thud. In the morning, he noticed the presence of an aircraft engine cowling in the garden and damage to the roof of his garage where the part fell.

Upon landing in Malta, the crew of flight CC320 found out that the lefthand (LH) core cowl of engine No. 4 was missing and the outboard core cowl was still present but deformed.

During the afternoon preceding the flight, maintenance works were performed, including the replacement of the fan air modulating valve on Engine No. 4. This task required the opening of the engine cowls and its closing after completion. A service check, including a transit check, was also performed, as part of the routine maintenance of the aircraft.

As explained and demonstrated to the AAIU investigators, the completion of the tasks, by different technicians, involves the verification of the closing and latching of the engine cowls. The job cards were duly stamped to confirm the correct completion of all tasks. The final certificate of release to service, entered in the airplane technical log involves also a “general verification of the work area; to ensure that the aircraft is clear of all tools, equipment and any extraneous parts or material, and that all access panels removed have been refitted”.

Once the works were completed, around 15:00, there were no additional maintenance tasks performed by Air Atlanta Icelandic technicians until the time of the flight in the evening of the 8 September. The airplane stood until 21:38 on the parking stand 45/46 of EBLG.

Prior to the flight, a walkaround inspection of the aircraft by maintenance staff and the air crew was performed. This involves a specific sign-off in the airplane technical log.
The content of the walkaround inspection is described in the flight crew operating manual and includes a verification of the condition of engine No. 4. This normal preflight inspection was done by the captain who reported no finding. The crew was aware of the works performed on aircraft as noted in the aircraft technical log.

These last inspections were performed at night with non-optimal lighting conditions. The captain performing the walkaround recalls it was dark but the area around the aircraft is lit, but not as if it was during daylight.

The airplane took off from EBLG at 21:42.

During climb out on the “LNO8S” SID (standard instrument departure) the flight crew requested a right turn from the SID to avoid weather, the deviation was approved by ATC, when clear of weather the flight continued the flight plan route. Shortly after, the loose Engine No. 4 RH cowl was torn away.

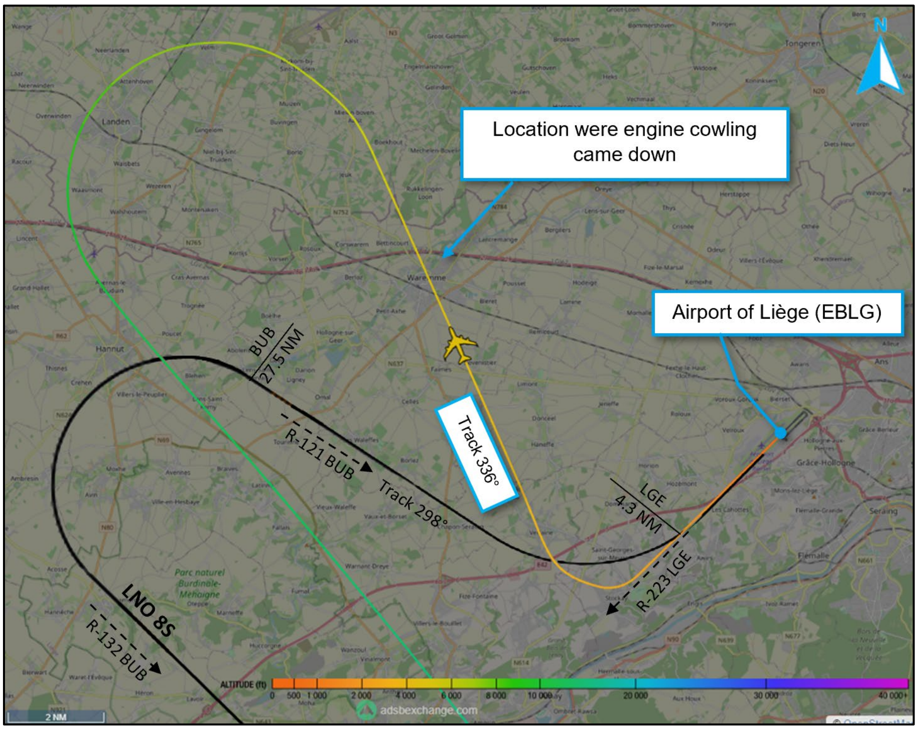


Figure 1 : Initial aircraft track when climbing out from EBLG.
In black the published standard instrument departure (SID) LNO 8S

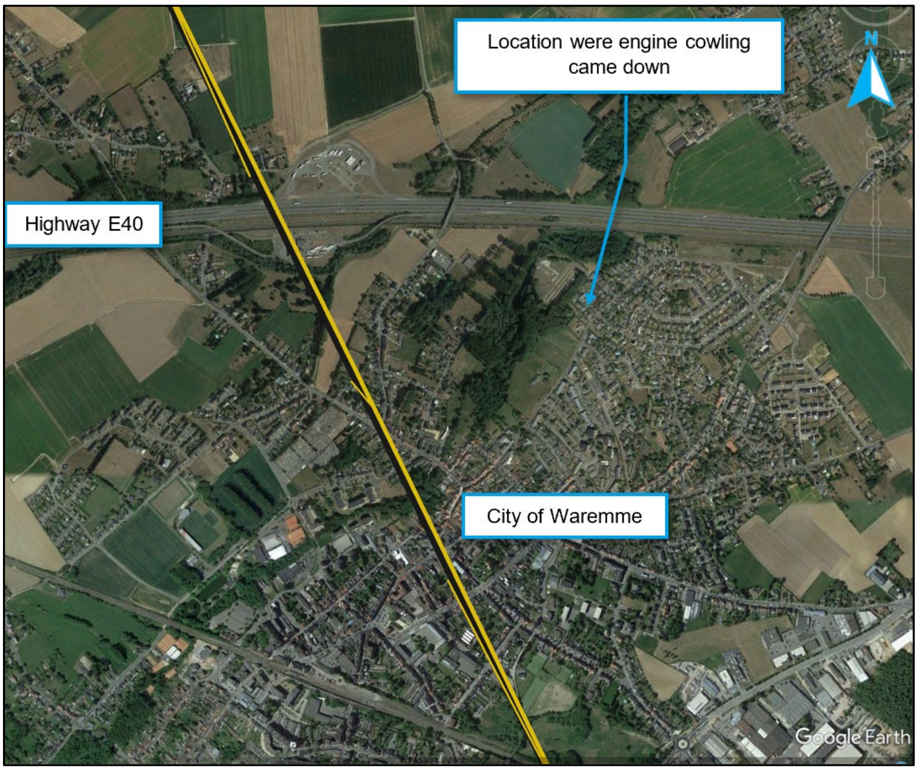


Figure 2: Location where engine cowling came down.

The cowl fell on the lower part of the roof of a garage attached to a house, before ending up in the front yard garden in Waremme.


Figure 3 : damage to the roof (left) and the fallen engine No.4 LH core cowl (right)

During all phases of flight to destination, there were no abnormal engine indications.
At the destination airport a routine inspection was done by a mechanic who reported to the flight crew that the engine No. 4 has a missing part of the core cowling, and a flap track fairing was also damaged.

Figure 4: Remaining righthand (RH) core cowl on engine No. 4 after the landing, showing 4 loose laches

2. CONTEXTUAL INFORMATION

2.1 Damage

On the aircraft

The Engine No. 4 LH half core cowl was torn from its structure connected to the hinges on the engine pylon. The RH half core cowl was deformed on aircraft, however after removal from aircraft it retained much of its original shape.

A flap track fairing was also damaged.

On ground

Garage roof tiles and slats were damaged.

2.2 Aircraft information

General

Boeing B747-412F – msn 26563 registered in Iceland.
Manufactured in August 1994

Total Flight Hours: 104418:10
Total Flight Cycles: 18962

Last C-Check was performed on 18 June 2022
Last A-Check was completed on 31 August 2022.

Engine manufacturer and model: Pratt and Whitney PW4056

Core cowl Engine No. 4:

RH panel

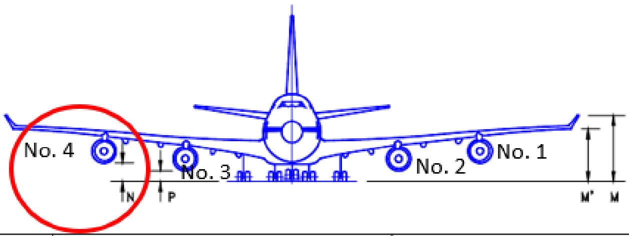
Part number:	314T4210-78
Serial number:	000650

LH panel

Part Number:	314T4210-77
Serial number:	000652

The Engine No. 4 is the most righthand engine as seen from the point of view from the pilot in the aircraft.

Figure 5 shows the minimum and maximum vertical clearances, depending on the loading of the aircraft.



Dimension	MINIMUM		MAXIMUM	
	FT - IN	M	FT - IN	M
A	38 - 2	11.79	40 - 2	12.24
B	15 – 6	4.72	17 – 2	5.23
C	15 - 7	4.74	17 - 8	5.37
D	9 - 0	2.75	10 - 9	3.28
E	7 – 1	2.16	8 – 1	2.47
F	9 – 6	2.89	10 – 7	3.23
G	10 – 2	3.10	11 – 4	3.46
H	27 – 9	8.46	31 – 7	9.63
J	16 - 3	4.97	17 - 8	5.38
K	61 - 11	18.87	64 - 1	19.54
L	27 - 9	8.47	29 - 11	9.12
M	22 - 0	6.71	24 - 0	7.32
M'	16 - 9	5.11	18 - 9	5.71
N (PW)	4 – 7	1.40	5 – 10	1.78
N (GE)	4 - 7	1.40	5 – 11	1.80
N (RR)	4 – 4	1.32	5 – 7	1.71
P (PW)	2 – 4	0.71	3 – 0	0.91
P (GE)	2 – 5	0.72	3 – 0	0.91
P (RR)	2 - 4	0.71	3 – 0	0.91
U	16 - 3	4.97	17 - 5	5.31

NOTES:

1. VERTICAL CLEARANCES SHOWN OCCUR DURING MAXIMUM VARIATIONS OF AIRPLANE ATTITUDE. COMBINATIONS OF AIRPLANE LOADING AND NLOADING ACTIVITIES THAT PRODUCE THE GREATEST POSSIBLE VARIATIONS IN ATTITUDE WERE USED TO ESTABLISH THE VARIATIONS SHOWN.

Figure 5 : Extract from the 747-400 Airplane Characteristics for Airport Planning – Ground Clearances. (PW) standing for the configuration with the PW4000 engines

The core cowl panels are secured closed by four latches attached to the lower edge of the right panel, each of which contains a hook that engages in an adjustable eyebolt fitted in the lower edge of the left panel. The hook is operated by an over-centre linkage in the latch, driven by a pivoted handle, which is locked with a spring-loaded catch engaging in pins on the hook.

Opening the latch requires releasing the catch, which is achieved by pressing a release lever in the centre of the handle.
When fully locked, the latch assembly fits flush with the outside of the panels.

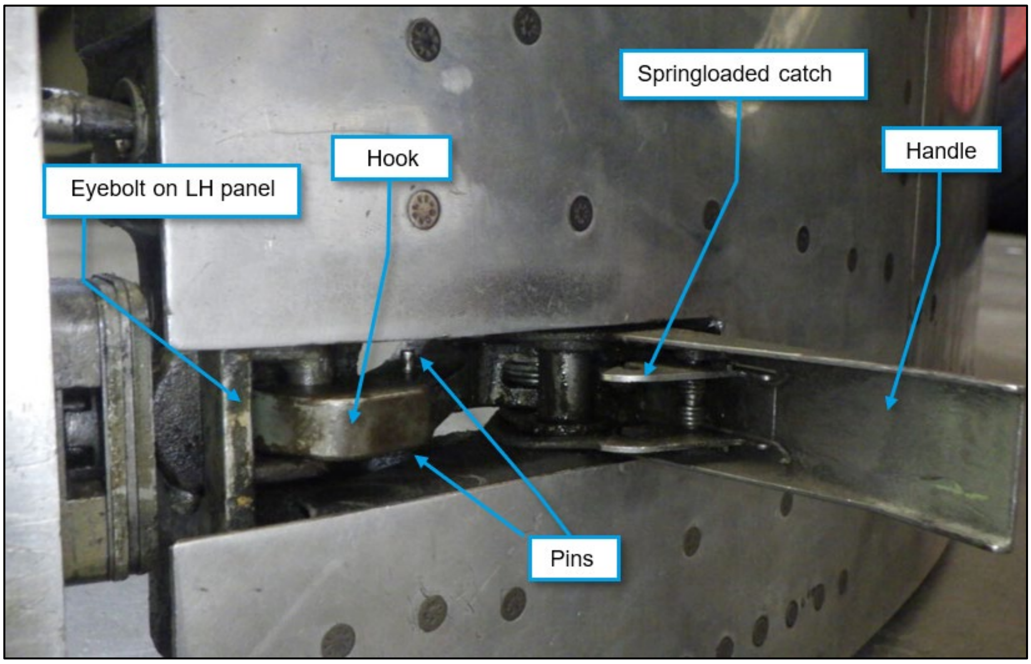


Figure 6 : parts of the latch system

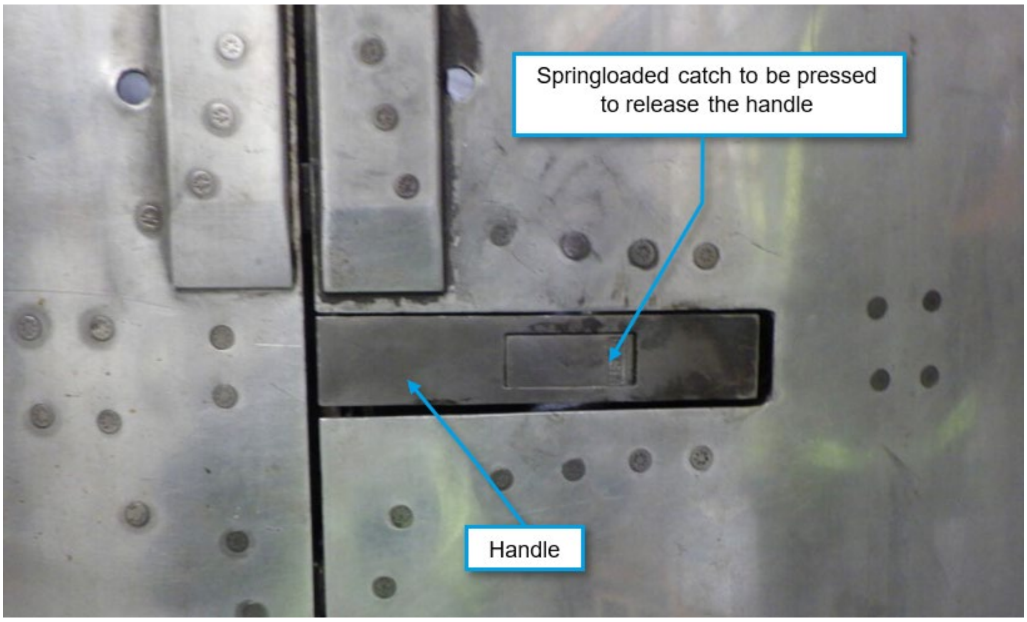


Figure 7 : latch flush when locked

2.3 Personnel information

Flight crew

The captain, who performed the walk-around inspection has 5000 FH experience on B747 out of a total of 10500, flying for Air Atlanta Icelandic since 2004.

Maintenance personnel

The maintenance technicians who performed the tasks involving the opening and closing of the engine core cowl.

Technician 1 – holder of a Part-66 Aircraft Maintenance Licence, category B1.1. for B747-400 and a company authorization for CRS and duplicate inspection since 2018. Initial training on procedure in 2018, last recurrent (every 2 years) training in 2020 (including CRS and pre-flight procedure).

Technician 2 – holder of a Part-66 Aircraft Maintenance Licence, category B1.1. for B747-400 and a company authorization for CRS, duplicate inspection, parts receiving inspection and OJT supervisor since 2005. Initial training on procedure in 2010, last recurrent (every 2 years) training in 2021 (including CRS and pre-flight procedure).

The technicians issuing the subsequent CRS of the aircraft and after service check, including the inspection for completion of the task;

Technician 3 – holder of a Part-66 Aircraft Maintenance Licence, category B1.1. for B747-400 and a company authorization for CRS since 2016. Initial training on procedure in 2014, last recurrent (every 2 years) training in 2021 (including CRS and pre-flight procedure).

Technician 4 - holder of a Part-66 Aircraft Maintenance Licence, category B1.1. for B747-400 and a company authorization for CRS, engine run-up, duplicate inspection, parts receiving inspection and OJT supervisor since 2000. Initial training on procedure in 2010, last recurrent (every 2 years) training in 2021 (including CRS and pre-flight procedure).

2.4 Meteorological information

The sunset at Liège that day was at 20:08.

The different METAR reports for the period covering the walk-around and the take-off:

082150Z 18009KT 9999 -RA BKN019 15/13 Q1009 TEMPO 4000 SHRA=
082120Z 20012KT 9999 -RA BKN023 16/13 Q1010 TEMPO 4000 SHRA=
082050Z 22012KT 9999 -RA BKN023 17/14 Q1009 TEMPO 4000 SHRA=
082020Z 20009KT 9999 -RA SCT036CB 17/14 Q1009 TEMPO 4000 SHRA=

So, the conditions were dark and rainy.

2.5 The operator

Air Atlanta Icelandic holds an Air Operator Certificate issued by the Icelandic Transport Authority. The company was founded in 1986.
It specialises in wet leasing (ACMI services) of its fleet of aircraft (14 aircraft in 2020, mostly B747 aircraft) to customer airlines, providing aircraft, crew, maintenance and insurance.

The maintenance of the Air Atlanta Icelandic aircraft at the Liege line station is performed under the Part-145 Approved Maintenance Organisation certificate (reference number IS.145.001) issued by the Icelandic Transport Authority. The continuing airworthiness of the aircraft is managed by the approved organisation (reference number IS. CAMO.008). Both organisations are part of Air Atlanta Icelandic.

During the inspection of the engine cowls, at the Air Atlanta Icelandic line station facility of Liege, the AAIU investigators were shown a well-kept facility, manned by qualified technicians, holding current part-66 aircraft maintenance licences. The technicians have been following a course on procedures, initial and recurrent (every 2 years). The recurrent training includes a chapter on walkaround inspection with attention on closed engine cowls. Regular quality audits were performed to check the compliance with the company's procedures. During the visit, the AAIU investigators observed no obvious departure from the EASA part-145 standards.

2.6 Similar events and safety actions

There were in the past several occurrences on various aircraft types involving the opening of engine cowls in flight, due to them not being properly latched prior to the flight.

A common safety issue among these occurrences involves a human error (lapse / omission) leading to the engine cowl doors being left unlatched following scheduled maintenance on the aircraft. The unlatched condition of the fan cowl doors being further not identified by the individuals performing a routine inspection prior to the aircraft's departure.

This safety issue was particularly sensitive for the fan cowl of the Airbus A319/20/21 series where the latches are positioned at the bottom of the engine nacelle in close proximity to the ground, making it difficult to detect unlocked latches during routine walkaround.
To address the safety issue, Airbus and regulatory agencies introduced a series of measures aimed at improving the visibility of non-secured latches (hold open device, anti-swivel plates, painting of latch handles, "remove before flight" flag, warning decals on cowlings, warning message in the AMM). NTSB recommended the introduction of a dual inspection on the latching of the cowls.

EASA issued a Proposed Special condition on Certification Specifications CS25.1193 – "Engine cowl retention". It is intended to introduce a design requirement for the retention system for each removable or openable cowling, that must keep the cowling closed and secured under the operational loads following improper fastening of any single latching, locking, or other retention device, or the failure of single latch or hinge, as well as have a reliable means for effectively verifying that the cowling is secured prior to each take-off.

The proposal was subjected to public consultation closed on 10 January 2013. A Comment Response Document was issued with comments, among others, from Airbus and Boeing.

3. FINDINGS

The 2 parts of the engine core cowl were inspected by investigators of AAIU. The findings were;

- The RH core cowl, that remained on aircraft, showed minimal damage.
- The LH core cowl that departed from aircraft and fell in Waremme was torn out of its hinges assembly, that remained on aircraft.
- The latching system – 4 independent latches - on both cowls showed minimal wear and damage. All 4 latches were still operational.
- After securing, the 4 latches cannot simultaneously accidentally open.
- When not latched, the latch handle cannot be pushed flush on the cowl.

Figure 8: latches on the involved cowls

From the above inspection, it can be concluded that the 2 parts of the engine core cowl were not securely latched prior to the flight.

The incident with Air Atlanta Icelandic is similar in nature with the incidents that occurred in the past, in particular with the A320 series aircraft, however there are important differences:

- The event concerns the engine core cowl, that are less frequently opened than the fan cowl (of the Airbus A320 series).
- On engine No. 4, the latches are located at (more or less) eye level (between 1,4 m and 1,78 m, see Figure 5) and when unsecured, the latch handle is hanging down. There are 4 latches. This makes the visibility of unsecured latches – at least in daylight condition – much more obvious than the Airbus A320 series fan cowl latches.

In this case, all the elements of the procedural system of the company seem to have being present to avoid such mishap. This includes the knowledge – technical and procedural – of the technicians involved with the maintenance of the aircraft, the clerical confirmation of the tasks, the availability of tooling and documentation.

The maintenance technicians involved in the completion of the tasks were duly qualified, working in the company for several years. They stated they were familiar with the performance of the task, having performed it several times in the past. There was no particular stress or rush to perform the task (it was a busy day, but not overly so), for which all information and tools were available and used. They also stated that, from their recollection of the event, after completion of the works, they had closed and secured the cowls and verified as per procedure.

Before departure, an exterior walk-around, which is a last opportunity and thus a final safety barrier, was performed by the crew, but did not detect the problem. Contributing to this could be that the inspection was made at nighttime in rainy weather, with minimal lighting. The nature of the works was indicated in the technical log, for the information of the crew, however not specifically stating that the engine cowls were open during maintenance.

4. SAFETY ACTIONS AND RECOMMENDATIONS

*A **safety issue** is a safety factor that (a) can reasonably be regarded as having the potential to adversely affect the safety of future operations, and (b) is a characteristic of an organization or a system, rather than a characteristic of a specific individual, or characteristic of an operational environment at a specific point in time.*

*A **safety action:** the steps taken or proposed to be taken by an organization or agency on its own initiative in response to a safety issue.*

*A **safety recommendation** is a proposal by the safety investigation authority in response to a safety issue and based on information derived from an investigation and/or study. It's aimed to improve the safety of an organisation and/or system and therefor always addressed to an organisation and/or agency, never to a specific individual. The sole purpose of a safety recommendation is the <u>prevention</u> of accidents or incidents and the <u>reduction of the consequences</u> of such occurrences. It, in no case has the purpose of creating a presumption of blame or liability for an accident or incident. Neither does it reflect the level of contribution to a specific accident or incident.*

*A **safety lesson learned** is the knowledge and insight gained through an individual's experience, intended to be applied to prevent similar events from occurring in the future.*

*A **safety message:** An awareness which brings to attention the existence of a safety factor and the lessons learned. AAIU can distribute a safety message to a community (of pilots, instructors, examiners, ATC officers), an organization or an industry sector for it to consider a safety factor and take action where it believes it appropriate. There is no requirement for a formal response to a safety message.*

4.1 Safety action: vigilance on closing and securing latches

After the incident, Air Atlanta Icelandic incorporated a supplementary 'human factors' training about the extra vigilance on closing and securing all latches, access doors and panels after maintenance. The training was given to the line maintenance personnel.

4.2 Safety issue: unlatched engine core cowl not captured

Next to the error of not securing the latches after maintenance, the pre-flight exterior walk-around inspection also failed as a safety barrier to identify the unsecured latches.

Therefore;

Safety recommendation BE-2026-01:

It is recommended that the operator, Air Atlanta Icelandic, implements an extra an error-capturing procedure that requires maintenance personnel to make an entry in the aircraft technical log to draw the attention to flight crews that engine (fan or core) cowl doors were opened and closed during the performance of maintenance tasks.

Safety recommendation BE-2026-02:

It is recommended that the operator Air Atlanta Icelandic, use the conclusions of this incident to remind their flight crew of the importance of a thorough and complete pre-flight exterior walk-around as already described in the FCOM. Their procedure should also ensure that a torch of effective brightness is used during the hours of darkness.

ABOUT THIS REPORT

General	
What?	Safety investigation reports are a technical document that reflects the views of the investigation team on the circumstances that led to the accident or serious incident and is conducted in accordance with Annex 13 to the Convention on International Civil Aviation and Regulation (EU) No 996/2010.
Objective	**The sole objective of safety investigations is the determination of the causes, and to define safety recommendations in order to prevent future accidents and incidents. It is not the purpose of this investigation to apportion blame or liability.** In particular, Article 17-3 of Regulation (EU) 996/2010 stipulates that the safety recommendations made in this report do not constitute any suspicion of guilt or responsibility.
Investigation authority	The Air Accident Investigation Unit of Belgium (AAIU for the rest of this publication). It is the Belgian permanent national civil aviation safety investigation authority as defined in Article 4 of Regulation (EU) No 996/2010 and established in accordance with the Royal Decree of 26 December 2022. This unit is part of the Federal Public Service Mobility and Transport and is functionally independent from the Belgian Civil Aviation Authority and other interested parties.
This investigation	
Investigation initiation	AAIU was notified of the occurrence at 09:11 by the ATC Tower of EBLG on the 9 September 2022 and by the Federal Police. Contact was immediately taken with the Liege Airport Inspection department for the retrieval of the fallen part and with the Safety Investigation Authority of Iceland that confirmed the origin of the cowling.
Scope	Limited As per Annex 13 and EU regulation EU 996/2010, each safety investigation shall be concluded with a report in a form appropriate to the type and seriousness of the accident and serious incident. For this occurrence, a limited-scope, fact-gathering investigation and analysis was conducted in order to produce a short summary report. The investigation mainly focussed on the actions and conditions directly relating to the occurrence and might not cover all aspects of the aircraft operation and/or possible underlying safety factors due to the expected safety benefit of it and/or the extent of evidence/resources available
Other parties involved	The Icelandic State Safety Investigation Authority and the Operator Air Atlanta Icelandic. AAIU would like to thank the mentioned parties above and all other entities and individuals that have contributed to this safety investigation.