

Synopsis



Figure 1: The aircraft involved in the event (Source: www.hhelikopter.hu)

On 7 July 2018, shortly after engine start, the pilot intending to take off for agricultural purposes perceived intense vibration from the direction of the tail part when clutching, so he aborted clutching and shut the engine. He got out of the aircraft and realised by visual inspection that a tube of the tail boom had fractured at the connection of the left-hand side horizontal stabilizer, the tail boom had been deformed, causing the tail rotor drive shaft to fracture at the carrier bearing № 4. No one was injured in the event and the aircraft sustained repairable damage.

On the basis of information available, the Investigating Committee of Transportation Safety Bureau, Hungary (hereinafter: "IC") attributes the event to fracture of a tube of the tail boom, the cause of which has not been identified clearly. The IC identified no circumstance which would warrant the issuance of a safety recommendation.

Factual information

Occurrence category:		Serious incident			
Date of occurrence:		21/07/2018, 11:20LT			
Location of occurrence:		Tata (South, 2 km)			
Type and registration of aircraft:		SA 318C Alouette II, HA-PPI			
Year of manufacture, serial number:		1964, 1944			
Type and number of engines:		Single engine, Turbomeca Astazou III A			
Purpose of flight:		Agricultural			
People	Number:	Crew	Passenger	Other	
	Injured:	1	0	0	
		0	-	-	
Damage to property:		The aircraft was damaged, but not beyond repair.			
Flight experience of PIC:		CPL(H), FCL.740			
Age and citizenship of PIC:		59 years old, Hungarian			
Flight experience of PIC:		Total	On the type	Last 90 days	Last 7 days
Flying hours:		5535	750	n. a.	3 hours 55 min.
Sources of information:		Notification, supplemental site inspection, witness interview, the operator's documents, documents obtained from other authorities.			

Flight summary

On 21 July 2018, the pilot of the helicopter type SA 318C Alouette II with registration marks HA-PPI carried out aerial spraying in the district of Tata town. On the day before the event, he viewed the working area, assigned a ground-based helper and delivered him a safety briefing. In the working area, he determined the areas for refuelling and chemical refill as well as the areas for the road vehicles to park and move during the day of the works. On the day of the works, he checked current meteorological information and checked the aircraft's spray equipment as well as its fastening. He prepared the maps needed for the flight tasks and prepared the helicopter for the flight, which he indicated and signed in the flight log book.

Before his tenth flight of the day, the pilot of the aircraft concerned started the helicopter's engine again and, after analysis of the parameters, he began to engage the clutch. He perceived intense vibration during the process, so he aborted the process immediately. Simultaneously, he saw the ground-based helper signalling him also that he should abort the take-off process. When the clutch mechanism got disengaged, he encountered a lateral movement of the helicopter and heard a loud bang.

After shutting the engine, he walked around the helicopter and saw that a tube of the tail boom had fractured at the connection of the left-hand side horizontal stabilizer and the tail rotor drive shaft had also fractured at the carrier bearing № 4. After assessing the damage, the helicopter pilot notified the operating and maintenance organisation (hereinafter: "Organisation"). The organisation notified TSB of the occurrence two days later.

Flight Crew

The pilot of the helicopter had extensive flight experience both in general and with the helicopter type concerned. He held valid pilot licence and medical certificate at the time of the event.

Aircraft

The SA 318C Alouette II was the first serially produced turbine-engine helicopter. The light, versatile aircraft can carry five occupants. It was used in the military initially, but later on it became widely used for agricultural purposes as well.

Fuselage length: 9.66 m

Rotor diameter: 10.20 m

Max. take-off mass: 1,600 kg

The aircraft had both Airworthiness Certificate and Airworthiness Review Certificate at the time of the event.

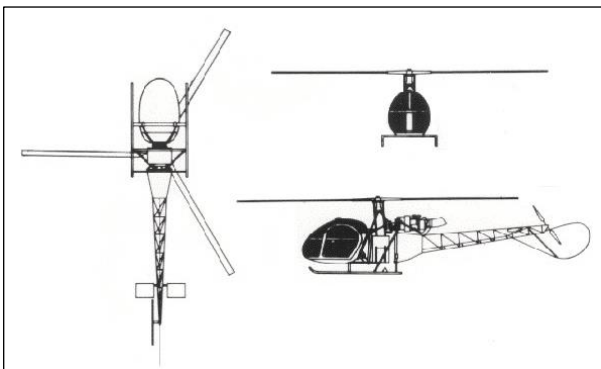


Figure 2: Three-view drawing of the helicopter
(Source: Wikipedia)

Aerodrome

Planned take-off location: dry soil in a field 2 km south of Tata town; coordinates: 47°37'09" N, 18°18'46" E; altitude above sea level: 146 m. The planned take-off location played no role in the occurrence.

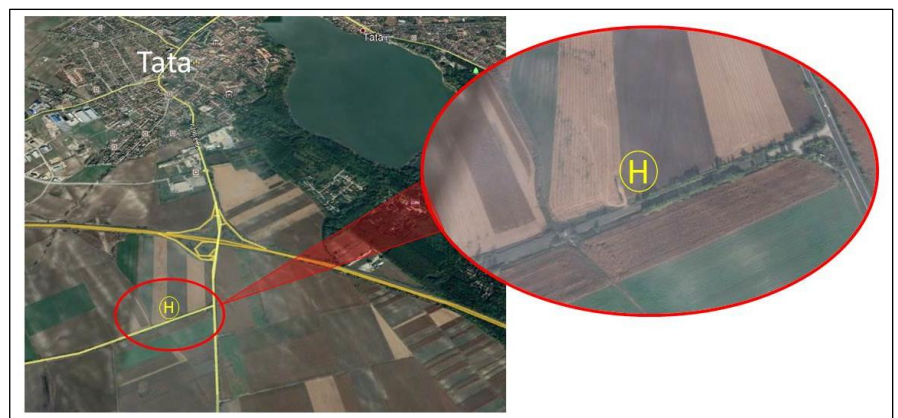


Figure 3: Location of the planned take-off

Malfunctioned Equipment

The tail boom is a hermetically sealed lattice structure made of tubes; it is filled with inert gas to a pressure which is different from atmospheric pressure so that it can signal possible damage of the lattice with the help of a dedicated apparatus.

The anchorage of the horizontal stabilizer consists of two pieces of tube welded into the tail boom at each side, and each tube piece contains two sleeves. The sleeves are fixed in the tubes by welding, and the pins running through the sleeves secure the horizontal stabilizer.

A tube of the tail boom fractured next to the rear left sleeve of the horizontal stabilizer (*Figure 4*), which deformed the tail boom to such extent that it caused the tail rotor drive shaft to fracture. On the basis of the photos taken at the supplementary site visit, the IC concluded that the structure of the tail boom showed possible signs of fatigue fracture, but the fact of this cannot be clearly established.

According to his account, the pilot detected no pressure change in the tail boom during the acceptance of the helicopter prior to the aerial spraying job.

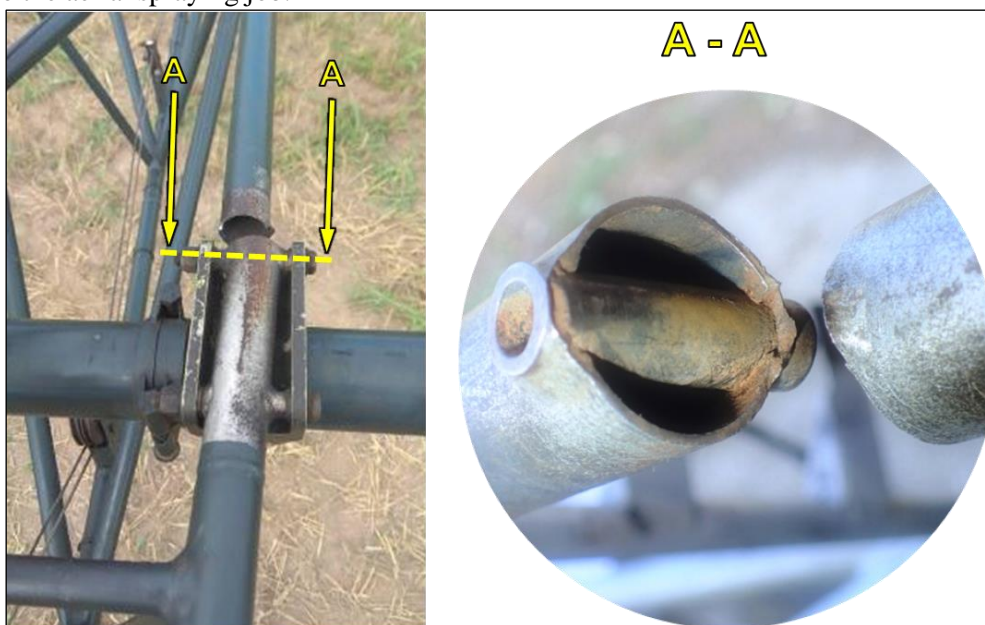


Figure 4: Fracture of a tube of the tail boom

Maintenance

The maintenance programme of the aircraft includes pre-flight/post-flight, 25-hour, 400-hour/annual, 800-hour and other periodical (calendar-based) maintenance tasks.

According to the documents received, 400-hour/annual maintenance was carried out on the helicopter on 09 November 2017, and it included the inspection of the tail boom as well. According to the maintenance report, the engine running time remaining till the next engine overhaul was 24 hours and 5 minutes at that time. According to the Certificates of Release to Service (CRS) available, the aircraft flew 7 hours and 39 minutes in total during the 8 months between the date of the 400-hour/annual maintenance (09 November 2017) and the date of the occurrence. According to documents, it flew 1 hour and 15 minutes from 9 take-offs on the day of the occurrence. In the absence of flight logs, the IC did not receive accurate data of the flights carried out during the 8 months between the date of the 400-hour/annual maintenance and the date of the occurrence.

The Organisation replaced the tail boom in the month after the event and issued a Certificate of Release to Service (CRS) relating to it on 10 August 2018.

According to its *Technical Measure* document, on 03 August 2018, the Organisation scheduled a crack test of the tail booms of its helicopters of similar type by pressurising the tail booms, and a visual crack inspection (at 10-times magnification) of the weld seams of the tail rotor drive shaft as specified in the relevant Maintenance Manual. It was also ordered that such maintenance items should be carried out annually or after 100 hours of flight on the SA 318 C helicopters operated by the Organisation.

The Organisation withdrew that instruction on 13 May 2021, with regard to the experience of the 3 years past and because the 400-hour/annual maintenance programme includes the above inspections.

Weather and visibility

The event took place at daytime, in good visibility conditions. The speed of the northwest wind was 3 to 4 m/s. The weather had no effect on the occurrence.

Organisation

According to documents (CAME, MOE)¹ obtained from the supervisory authority and to the records of the authority, the Organisation operates 21 aircraft which represent 8 aircraft types.

The IC reviewed the Organisation's air safety reports from 2017 to the end of December 2020. Those quarterly and annual air safety reports contain no flight data relating to the aircraft (flying time, number of take-offs); the phrase most often used to refer to flying time is "*performed moderate amount of flying activity*".

Between January 2017 and December 2020, the Organisation did not issue any report (neither mandatory nor voluntary) specified in Regulation (EU) № 376/2014 of the European Parliament and of the Council on the reporting, analysis and follow-up of occurrences in civil aviation other than the one related to the occurrence concerned.

According to information available, the supervisory authority conducted no full audit of the Organisation in the period between 2016 and 2020, although Commission Regulation (EU) № 1321/2014 provides that "*each organisation shall be completely audited at periods not exceeding 24 months.*" It should be noted here that the number of the technical surveyors in the technical area at the supervisory authority decreased from 20 to 5 gradually from 2018 to the end of 2019. In order to stop that negative trend, TSB issued a safety recommendation (№ BA2016-200-4-1) on 3 June 2020 in connection with another occurrence.² The safety recommendation was accepted, and its implementation began in 2020. Human resource shortages in the technical area of the supervisory authority seem to have improved recently.

EASA³ audited the Organisation in 2019 and found several non-compliances including, among others, that the Organisation's occurrence reporting system did not work.

Additional information

No investigation of the scene could be carried out due to late reporting of the event.

The IC only had the opportunity to view the dismantled and cleaned tail boom structure which had probably been stored outdoors and which showed the signs of superficial corrosion in some areas.

Despite several repeated requests from the IC during the investigation, the Organisation was not able to submit the aircraft log book and the engine log book of the helicopter involved in the occurrence. The IC managed to obtain the documents supporting the Airworthiness Review Certificate, the Continuing Airworthiness Management Exposition (CAME) and the Maintenance Organization Exposition (MOE) from the supervisory authority.

¹ CAME: Continuing Airworthiness Management Exposition

MOE: Maintenance Organization Exposition

² <http://www.kbsz.hu/j25/hu/legi-kozlekedes/kbsz-altal-vizsgalt-esemenyek-2014/22-legi-kozlekedes/legi-kozlekedes/2162-20160527>

³ EASA: European Union Aviation Safety Agency

Analysis

Fracture of the tail boom

The fact that at the beginning of the working day the pilot checked the pressure in the tail boom filled with inert gas and found no difference means that the tail boom was not fractured at that time.

The IC's position is that the fracture could not have occurred during the flights preceding the last landing either, because it would have caused very intensive vibration which would possibly have resulted in loss of control of the aircraft.

The starting of a well-functioning helicopter engine will not generate a force of such intensity and direction which can cause fracture of a tail boom lattice element. Accordingly, the IC does not find it plausible that vibration generated after the start of the clutching caused fracture of the tail boom.

In the IC's opinion, the affected tube of the tail boom split in two along an existing crack prior to the engine start.

Therefore, it is very likely that the fracture took place between the last landing and the engine start preceding the occurrence. The IC cannot unambiguously determine the direct cause of the final outcome of the suspected crack on the basis of information available, but finds any of the following causes likely:

- touch-down with a possible lateral skid during the preceding landing, or
- a ground-service device had hit the tail boom.

Maintenance

According to the documents reviewed, the 400-hour/annual maintenance preceding the occurrence was carried out in line with the maintenance programme, regarding both timing and contents. In the absence of flight logs, the IC was only able to rely on the Certificates of Release to Service (CRS) issued after the maintenance of 09 November 2017 and the tail boom replacement of 10 August 2018. The calculated flying time for the said period was 7 hours and 39 minutes. On this basis it can be stated that no maintenance of the aircraft was omitted prior to the occurrence.

Organisation

Because the occurrence was reported two days later only, and the survey committee of TSB had the chance to view a dismantled and cleaned tail boom, the possibility to clearly identify the process of the fracture was excluded.

From the aspect of flight safety, the organisation culture ought to include recognition of the importance of reporting occurrences in a timely manner.

The IC's experience shows that an organisation operating over 20 aircraft of 8 types sooner or later will almost inevitably be involved in an occurrence which reaches the level where reporting is mandatory.

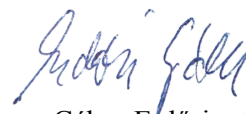
Weakness of the aforementioned organisational culture is supported also by the shortcomings of the Organisation's quarterly and yearly air safety reports, in terms of quantity as well as contents.

The IC's position is that, due to shortage of human resources on the part of the supervisory authority, the full scope audit of the Organisation by the authority which should mandatorily be performed biennially could not be carried out in the periods preceding and following the occurrence.

In the IC's opinion, the slackening of the system of supervision originating in the aforementioned causes may lead to gradual increase in the number of non-compliances and shortcomings in the supervised organisations. Simultaneously, the organisational culture will also change unfavourably at a rate and to an extent depending on the length of time between the audits and on the depth of such audits.



Gábor Torvaji
Investigator-in-Charge



Gábor Erdósi
IC Member

The sole objective of the safety investigation is to reveal the causes and circumstances of aviation accidents or incidents and to initiate the necessary technical measures and make recommendations in order to prevent similar cases in the future. It is not the purpose of this activity to investigate or apportion blame or liability.

General information

This investigation is being carried out by Transportation Safety Bureau on the basis of

- Regulation (EU) No 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and repealing Directive 94/56/EC,
- Act XCVII of 1995 on aviation,
- Annex 13 identified in the Appendix of Act XLVI. of 2007 on the declaration of the annexes to the Convention on International Civil Aviation signed in Chicago on 7th December 1944,
- Act CLXXXIV of 2005 on the safety investigation of aviation, railway and marine accidents and incidents (hereinafter referred to as Kbt.),
- NFM Regulation 70/2015 (XII.1) on safety investigation of aviation accidents and incidents, as well as on detailed investigation for operators,
- In the absence of other relevant regulation in the Kbt., in accordance with Act CL of 2016 on General Public Administration Procedures.

The competence of the Transportation Safety Bureau of Hungary is based on Government Regulation № 230/2016. (VII.29.) on the assignment of a transportation safety body and on the dissolution of Transportation Safety Bureau with legal succession.

Pursuant to the aforesaid laws,

- Transportation Safety Bureau Hungary shall investigate aviation accidents and serious incidents.
- Transportation Safety Bureau Hungary may investigate aviation and incidents which – in its judgement – could have led to an accident in other circumstances.
- Transportation Safety Bureau Hungary is independent of any person or entity which may have interests conflicting with the tasks of the investigating body.
- In addition to the aforementioned laws, the ICAO Doc 9756 and the ICAO DOC 6920 Manual of Aircraft Accident Investigation are also applicable.
- This Report shall not be binding, nor shall an appeal be lodged against it.
- The original of this report was written in the Hungarian language.

Incompatibility did not stand against the members of the IC. The persons participating in the safety investigation did not act as experts in other procedures concerning the same case and shall not do so in the future.

The IC shall retain the data having come to their knowledge in the course of the safety investigation. Furthermore, the IC shall not be obliged to make the data – regarding which the owner of the data could have refused its disclosure pursuant to the relevant act – available for other authorities.