



Final report RL 2016:10e

**Accident at LövnäsvalLEN, Dalarna county,
on 06/02/2016 involving the helicopter
SE-JLZ of the model EC 120B, operated
by Jämtlandsflyg**

File no. L-17/16

30/11/2016

SHK investigates accidents and incidents from a safety perspective. Its investigations are aimed at preventing a similar event from occurring in the future, or limiting the effects of such an event. The investigations do not deal with issues of guilt, blame or liability for damages.

The report is also available on SHK´s web site: www.havkom.se

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General observations

The Swedish Accident Investigation Authority (Statens haverikommission – SHK) is a state authority with the task of investigating accidents and incidents with the aim of improving safety. SHK accident investigations are intended to clarify, as far as possible, the sequence of events and their causes, as well as damages and other consequences. The results of an investigation shall provide the basis for decisions aiming at preventing a similar event from occurring in the future, or limiting the effects of such an event. The investigation shall also provide a basis for assessment of the performance of rescue services and, when appropriate, for improvements to these rescue services.

SHK accident investigations thus aim at answering three questions: *What happened? Why did it happen? How can a similar event be avoided in the future?*

SHK does not have any supervisory role and its investigations do not deal with issues of guilt, blame or liability for damages. Therefore, accidents and incidents are neither investigated nor described in the report from any such perspective. These issues are, when appropriate, dealt with by judicial authorities or e.g. by insurance companies.

The task of SHK also does not include investigating how persons affected by an accident or incident have been cared for by hospital services, once an emergency operation has been concluded. Measures in support of such individuals by the social services, for example in the form of post crisis management, also are not the subject of the investigation.

Investigations of aviation incidents are governed mainly by Regulation (EU) No 996/2010 on the investigation and prevention of accidents and incidents in civil aviation and by the Accident Investigation Act (1990:712). The investigation is carried out in accordance with Annex 13 of the Chicago Convention.

The investigation

SHK was informed on 18/02/2016 that an accident involving a helicopter with the registration SE-JLZ had occurred at LövnäsvalLEN, about 35 km east of Särna, Dalarna county, on 6 February at 14.45 hrs.

The accident has been investigated by SHK represented by Mrs Helene Arango Magnusson, Chairperson, Mr Stefan Carneros, Investigator in Charge and Operations Investigator and Mr Ola Olsson, Technical Investigator.

Mr Adrien Vidal from the French accident investigation authority, BEA¹, has participated as an accredited representative for France.

Mr Magnus Axelsson has participated as an advisor for the Swedish Transport Agency.

¹ BEA - Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation civile.

Mrs Raluca-Maria Negoescu has participated as an advisor for The European Aviation Safety Agency (EASA).

The following organisations have been notified: The European Aviation Safety Agency (EASA), the European Commission, the Swedish Transport Agency and France's accident investigation authority, BEA.

Investigation material

Interviews have been conducted with the pilot, the assistant, the Flight Operations Manager and the CEO of the operator. The accident site was visited, and SHK has performed measurements of distances to obstacles.

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Aircraft:

Registration, type	SE-JLZ, EC 120
Model	EC 120B
Class, Airworthiness	Normal, Certificate of Airworthiness and Valid Airworthiness Review Certificate (ARC)
Serial number	1213
Operator	Jämtlands Flyg AB
Time of occurrence	02/02/2016, at 14.45 in daylight. All times are given in Swedish standard time (UTC ² + 1 hr).
Place	LövnäsvalLEN, 35 km east of Särna, Dalarnas county, (position 61° 40' 1" N 013° 27' 4"E, 594 metres above sea level)
Type of flight	Aerial work
Weather	According to SMHI's analysis: Wind between south and south-west/5-10 knots. Visibility and weather generally more than 10 km but at times around 5 km in sleet. Cloud: 5-8/8 base 600 – 1 500 feet Temp: plus 2 degrees Dewpoint: zero degrees QNH 990 hPa
Persons on board:	2
Crew including cabin	2
Passengers	0
Injuries to persons	None
Damage to aircraft	Substantially damaged rotor blades
Other damage	None
The Pilot:	
Age, licence	44 years, CPL-H ³
Total flying hours	3,300 hours, of which 850 hours on type
Flying hours previous 90 days	83 hours, of which 82 hours on type
Number of landings previous 90 days	Around 100, of which 100 on type

² UTC (Coordinated Universal Time).

³ CPL-H – (Commercial Pilot Licence - Helicopter).

Factual information

History of the flight

In connection with landing with a helicopter on a minor, snow-covered road in an area of dense forest, the helicopter's rotor blades came into contact with two tree tops on the right side of the helicopter, upon which all three rotor blades were damaged.

To increase the margin to the helicopters tail rotor, the pilot chose to manoeuvre so that the largest margins to fixed obstacles were around the rear of the helicopter. On the left side were a trench, and when the pilot was hovering over the site and maneuvered in the light of the trench, the pilot experienced a temporary light vibration in the cyclic pitch. With this exception, the pilot landed without experiencing any problems or signs of technical errors. The damage was discovered only after the pilot had shut down the engine. The extent of the damage meant that the operator assessed the helicopter as not being airworthy. No damage other than the damage to the helicopter and the trees arose in connection with the accident.

The helicopter's technical status is deemed not to have affected the sequence of events. SHK has consequently not carried out any deeper technical examinations of the helicopter's technical systems, and the investigation has been limited to the operational conditions during the event.



Figure 1. The helicopter after landing at the accident site. Note the damaged tree tops in the left of the picture. Photo: Jämtlandsflyg AB.

The assignment

Among other activities, the company conducts aerial work, and the flight assignment in question consisted of tracking and wildlife management. The crew consisted of one pilot and one assistant. In connection with this type of assignment, flight is performed at low speed and at low altitude. It is also common to land at sites that have not been the subject of reconnaissance in advance. Thus in connection with the landing, the pilot must make an assessment of whether the landing site is suitable. The landing was performed in the form of a direct landing, with reconnaissance of the landing site being made during the approach itself.

The landing site

The area in question does not offer many suitable landing sites (see Figure 2). The opportunities for landing on the open areas that exist are largely limited on account of the inclination or snow depth. The site chosen was considered suitable, even though it was assessed to be narrow. The landing was deemed necessary for carrying out the assignment. SHK’s examination shows that the distance from rotor centre to the two closest obstacles was at its shortest 5.3 metres (see Figure 3).



Figure 2. The landing site photographed in the direction of landing. At the time of the examination, the road was ploughed, which was not the case when the accident occurred.

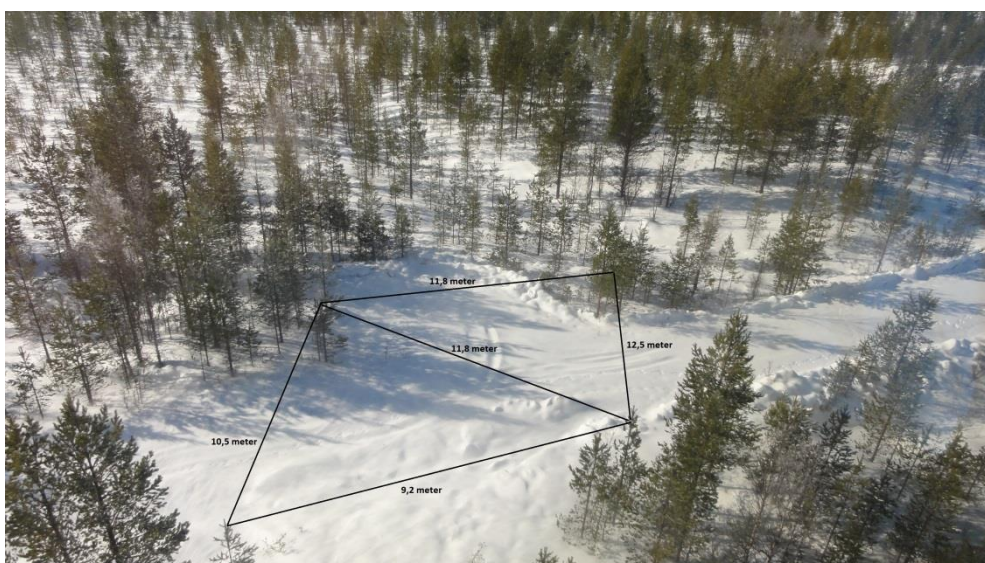


Figure 3. Distances between obstacles at the accident site.

Requirements for the landing site

The company's flight operations manual, OM, states that when landing at a site that has not been prepared in advance and that is used for occasional landings, the landing site is essentially to have at least the dimensions specified in A 8.1.2. According to A 8.1.2, the minimum distance from rotor tip to fixed obstacles may not be less than three metres at an occasional landing site.

The helicopter has a rotor diameter of 10 metres (see Figure 4). This means that the minimum distance from rotor centre to an obstacle may be $5+3 = 8$ metres.

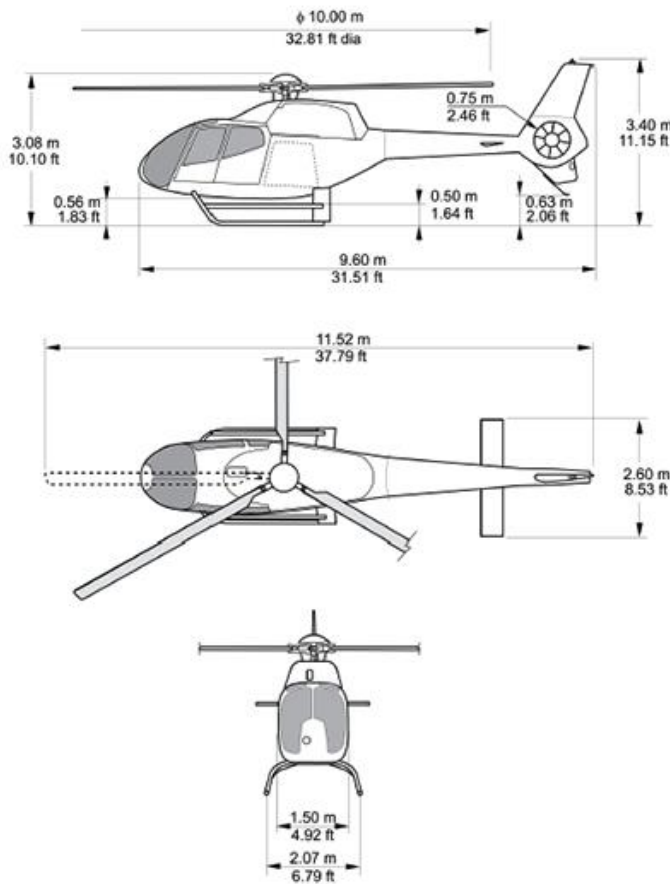


Figure 4. EC 120 Dimensions. Source: Airbus Helicopters, Inc.

The pilot's position

In order to facilitate cooperation within the crew in this type of flight assignment, the pilot and the assistant sit on the same side, with the assistant sitting in the rear seat. In this case, the assistant preferred to sit on the left side, and it was then most suitable for the pilot to also sit on the left side to be able to see the same view and be more able to follow tracks. However, flying from the left side differs somewhat from flying from the ordinary position on the right side. Special supplementary training is required for flying from the left side. The pilot had such training. The pilot has flown about half of its air time from the left side of the current helicopter type and feel after approximately 500 hours in the left seat in the last 5 years, familiar with the position.

Design of the blades

The rotor blades are designed with a robust metal-clad beam of glass fibre composite in the front part that is resilient to the effect of high-energy collisions. The beam is an important part of the rotor blades since it transfers all rotational force from the blade tip to the blade root. The beam is also protected by a blade front edge of metal that transfers the impact energy to surrounding areas of the beam. The rear part of the rotor blades are more susceptible to the effect as it is built up of a lighter composite material with a core of filler material in the form of a foam (see Figure 5).

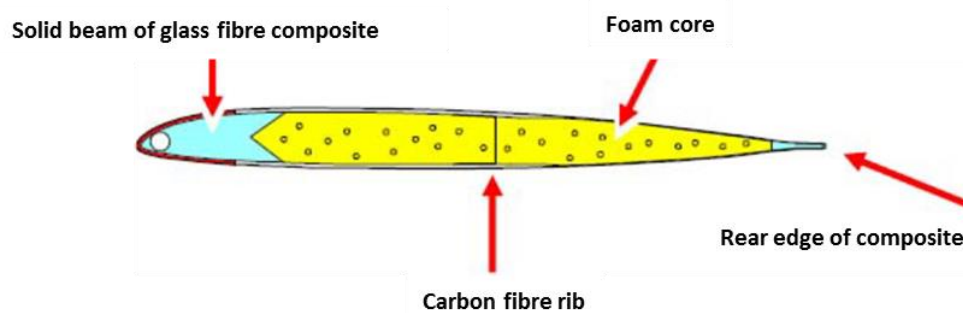


Figure 5. Design of a rotor blade. Source: Airbus Helicopters, Inc.

Extent of the damage

The damage to all rotor blades was substantial. The rotor blade with s/n 1099 (Figure 6) sustained the most damage, with a broken rear edge and delamination along the rear part of the blade's outer area. The two other blades sustained limited impact damage but exhibited substantial delamination in the blade's rear part. The damage was of such a nature that the blades were not possible to repair. The blade bolts and the blade dampers also had to be replaced on account of damage.

The damage to the tree tops is shown in Figure 7 and Figure 8.



Figure 6. The image shows the rotor blade that sustained the most damage. Source: Jämtlandsflyg AB.



Figure 7. The trees that damaged the rotor blades.



Figure 8. The tree tops' diameter max. 4 cm.

Previous incidents of a similar nature

According to a report from the helicopter manufacturer, experience from similar accidents shows that even if the damage to the rotor blades has been extensive, it has been possible to perform a safe landing with the helicopter.

Conclusions

The accident was caused by the landing site not undergoing sufficient reconnaissance before landing and touchdown.

SHK's examination of the accident site shows that the specified requirement of minimum distance to fixed obstacles could not be maintained in any position at the landing site in question. It cannot be ruled out that the fact that the pilot was flying from the left seat might have contributed to the impression that the distance to obstacles on the right side was sufficient to avoid contact with the rotor blades.

In this context it is worth noting that according to the new EASA rules⁴ for single pilot operations that entered into force on 1 October 2016 CRM training shall include, inter alia, situational awareness and decision making.

The damage to the rotor blades was localised to the rear parts of the blade tips, with delamination and material broken off as a consequence. The damage has probably been caused by means of lateral impacts on the tree tops through which the tree tops have been cut off by the front edge of the rotor blades.

The damage that arose upon this contact with the tree tops was not critical and did not affect the safe controlling of the helicopter.

Safety recommendations

None.

On behalf of the Swedish Accident Investigation Authority,

Helene Arango Magnusson

Stefan Carneros

⁴ EASA Annex II to Decision 2015/022/R. AMC2 ORO.FC.115 Crew resource management (CRM) training CRM TRAINING – SINGLE PILOT OPERATIONS.