



**Statens haverikommission**  
Swedish Accident Investigation Board

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## **Report RL 2005:08e**

**Helicopter accident to SE-HLK  
at Joesjö, Tärnafjällen, AC county, Sweden,  
on 7 July 2004**

Case L-22/04

SHK investigates accidents and incidents with regard to safety. The objective of the investigations is the prevention of similar occurrences in the future. It is not the purpose of this activity to apportion blame or liability.

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Translated by Tim Crosfield, M.A., from the original Swedish at the request of the Swedish Accident Investigation Board.

In case of discrepancies between the English and the Swedish texts, the Swedish text is to be considered the authoritative version.

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2005-03-03

L-22/04

Swedish Civil Aviation Authority

601 73 NORRKÖPING

### **Report RL 2005:08e**

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The Swedish Accident Investigation Board (Statens haverikommission, SHK) has investigated an aircraft accident that occurred on 7 July 2004 at Joesjö in Tärnafjällen, AC County, Sweden, involving a helicopter with registration SE-HLK.

In accordance with section 14 of the Ordinance on the Investigation of Accidents (1990:717) the Board herewith submits a report on its investigation.

The Board will be grateful to receive, by 1 September 2005 at the latest, particulars of how the recommendations included in this report are being followed up.

Åsa Kastman Heuman

Henrik Elinder

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## Report RL 2005:08e

L-22/04  
Report finalised 03-03-05

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<i>Aircraft: registration, type</i>	SE-HLK, Bell 206
<i>Class, airworthiness</i>	Normal, valid certificate of airworthiness
<i>Owner/operator</i>	Laplandsflyg LAP-AIR AB
<i>Time of event</i>	07-07-2004, 10.56 hrs in daylight <i>Note.:</i> All times are given in Swedish daylight saving time (UTC + 2 hours)
<i>Place</i>	Joesjö, Tärnafjällen, AC county, Sweden (pos. 6543N 01445E; 680 m above sea level)
<i>Type of flight</i>	Commercial
<i>Weather</i>	According to the pilot: Wind 260° 3 knots, visibility > 8 km in drizzle, cloud 8/8 with base approx. 500 ft., temp. +9°C, QNH 1010 hPa
<i>Persons on board:</i>	
<i>crew members</i>	1
<i>passengers</i>	3
<i>Injuries to persons</i>	None
<i>Damage to helicopter</i>	Extensive
<i>Other damage</i>	Radio mast stay wires severed, mast collapsed
<i>Commander:</i>	
<i>Sex, age, licence</i>	Male, 46 years, BH
<i>Total flying time</i>	3 472 hours, of which 3 215 on type
<i>Flying hours, latest 90 days</i>	42 hours, of which all on type
<i>Number of landings, previous 90 days</i>	124, of which all on type

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The Swedish Accident Investigation Board (SHK), was notified on 7 July 2004 that an accident involving a helicopter with registration SE-HLK had occurred at Joesjö in Tärnafjällen, AC county, Sweden, that day at 10.56 hrs.

The accident was investigated by SHK represented by Åsa Kastman Heuman, Chairperson, and Henrik Elinder, Investigator In Charge.

The investigation was followed during 2004 by the Civil Aviation Administration, and subsequently by the new Civil Aviation Authority, in the person of Magnus Axelsson.

### Summary

The pilot was to take off with three passengers in the helicopter from a radio station with a radio mast situated in a bare mountain region. When the helicopter had hovered up the pilot checked where the nearby stay wires were in relation to the helicopter and yawed left to obtain free space to fly from the site. He then started to accelerate forwards and while climbing turned to his right.

During this manoeuvre the main rotor struck two stay wires, which parted. The pilot aborted the flight and landed the helicopter with no major problems 80-90 m from where he had taken off. None of those on board

were injured and they were able to leave the helicopter unaided. They then saw that the radio mast had collapsed

The pilot had great experience of this type of flying. He did not check the spread of the stay wires or the positions of their anchor points before take-off. There are different arrangements for supporting masts and the stay wires can be hard to see from the air. There are no procedures for flying helicopters near radio masts and no requirements as to marking of stay wires.

The accident was caused by the pilot failing, before takeoff, to ascertain the spread of the stay wires and the positions of their anchor points in relation to where the helicopter was parked. Contributory causes were the lack of procedures for helicopter flight in the vicinity of radio masts, and the fact that stay wires are not marked.

### **Recommendations**

It is recommended that the Civil Aviation Authority draw up regulations for helicopter operation near radio masts and for the marking of radio mast stay wires in order to reduce the risk of collision. *(RL 2005:08e R1)*

## 1 FACTUAL INFORMATION

### 1.1 History of the flight

The pilot was to transport three service technicians and equipment from Hemavan to a radio station situated in a bare mountain region near Joeström, and then back. It was drizzling and visibility was limited. The flight to the site was without problems and the pilot landed the helicopter about 20 metres from the radio station, which consisted of a fairly small wooden building and a stayed radio mast. The pilot was well acquainted with the area and had landed at the site on many previous occasions during similar flights.

After about 20 minutes the technicians had finished their work and were to be flown back. They boarded the helicopter and the pilot started the engine. Visibility was still limited and when the engine was started the inside of the windscreens misted up somewhat. For this reason the pilot waited a few minutes before taking off, until the mist had disappeared.

When the helicopter had hovered up the pilot checked where the nearby stay wires were in relation to the helicopter and yawed left to gain free space to fly from the site. He then began to accelerate forwards, turning to the right during the climb. During this manoeuvre the main rotor collided with two stay wires, which parted. The helicopter was then about 10 metres above the ground. The pilot experienced the collision as a blow, after which the helicopter began to shake.

The pilot aborted the flight and landed the helicopter with no major problem 80-90 metres from the take-off point. None of those on board was injured and they left the helicopter unaided. They saw that the radio mast had collapsed.

The accident occurred in daylight at position 6543N 01445E; 650 m above sea level.

### 1.2 Injuries to persons

	<i>Crew members</i>	<i>Passengers</i>	<i>Others</i>	<i>Total</i>
Fatal	–	–	–	–
Serious	–	–	–	–
Minor	–	–	–	–
None	1	3	–	4
Total	1	3	–	4

### 1.3 Damage to helicopter

Extensive.

### 1.4 Other damage

One of the mast's pairs of stay wires in the outer circle (se 1.12.3) was severed by a rotor blade just over 10 metres above the ground. As a consequence of this damage the upper portion of the mast collapsed.

There was no other damage. The accident had no consequences for the environment.

## 1.5 Personnel information

### 1.5.1 *The pilot*

The pilot, male, was 46 years old and had a valid BH-certificate.

<i>Flying time (hours)</i>			
<i>Previous</i>	<i>24 hours</i>	<i>90 days</i>	<i>Total</i>
All types	0.2	42	3 472
This type	0.2	42	3 215

Number of landings this type previous 90 days: 124.

Flight training on type concluded 1990.

Latest periodic flight training, April 2004 on type Bell 206.

### 1.5.2 *The pilot's duty schedule*

The flight was the pilot's first for the day. He had slept well the previous night.

### 1.5.3 *Supplementary information concerning the pilot*

The pilot is experienced in flying in the fells and was at the time Chiefpilot at the company's base in Hemavan. He had carried out helicopter transports to and from various radio stations in mountainous terrain and was well aware of the risks of colliding with stay wires, which are often difficult to see, during such flights. He also knew that different types of mast staying can be used, depending partly on the height of the mast. The differing design of the masts and the need for great attention when flying in the vicinity of radio masts is also a subject he states he has stressed to many new pilots employed by the company over the years.

Concerning the flight in question the pilot has stated that, because of the low cloud base, he did not see the top of the mast. He therefore thought it was a low mast with all its stay wires anchored at only three points in the ground on one circle around the mast. It was this that caused him to turn right after takeoff when he judged that he had passed what he thought were the outer stay wires.

After the accident he is surprised by this since he had landed at the site on several previous occasions and should have remembered that the stay wires were anchored in two circles. He did not check the arrangement of the stay wires before takeoff.

When during the hover up he saw the nearby stay wires, anchored to the fixing points of the inner circle, he therefore thought his departure path was free.

## 1.6 The helicopter

### *THE HELICOPTER*

<i>Manufacturer</i>	Giovanni Agusta
<i>Type</i>	Agusta-Bell 206B
<i>Serial number</i>	8047
<i>Year of manufacture</i>	1968
<i>Gross mass</i>	Max takeoff mass 1 452 kg, actual 1 253 kg
<i>Centre of mass</i>	Within permitted limits
<i>Total flying time</i>	7 880 hours

<i>Flying time since latest inspection</i>	5 hours
<i>Fuel loaded before event</i>	Jet A-1

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**ENGINES**

<i>Engine manufacture</i>	Allison
<i>Model</i>	250 C20B
<i>Number of engines</i>	1
<i>Total operating time, hours</i>	4 590
<i>Operating time since overhaul</i>	5 hours

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**ROTOR**

<i>Rotor manufacturer</i>	Bell
<i>Rotor operating time since overhaul</i>	
<i>Main rotor</i>	552 hours
<i>Tail rotor</i>	1 283 hours

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The helicopter had a valid certificate of airworthiness.

## 1.7 Meteorological information

According to the pilot: Wind 260° 3 knots, visibility > 8 km in drizzle, cloud 8/8 with base approx. 500 ft., temp. +9 °C and QNH 1010 hPa.

According to SMHI analysis: the area at the time of the accident was one of extensive low pressure with complete cloud cover and persistent rain.

A report at 12.05 hrs from an automatic station, situated at a altitude of 800 meters in the vicinity of Hemavan and just over 20 km from the accident site reported: wind 280°/14 knots, visibility 5-10 km in rain under cloud base; cloud low stratus, possibly to ground level, temp./dew point +8/+8 °C and QNH 1006 hPa.

## 1.8 Navigational aids

Not applicable.

## 1.9 Radio communication

Not applicable.

## 1.10 Aerodrome information

Not applicable.

## 1.11 Flight recorders

None on board. Not required.



## 1.12 Accident site

### 1.12.1 *The accident site*

The accident took place on bare mountain in a relatively flat area. The surface consists of rock and stone at the time clad with low grass and bushy undergrowth.



*The site of the accident*

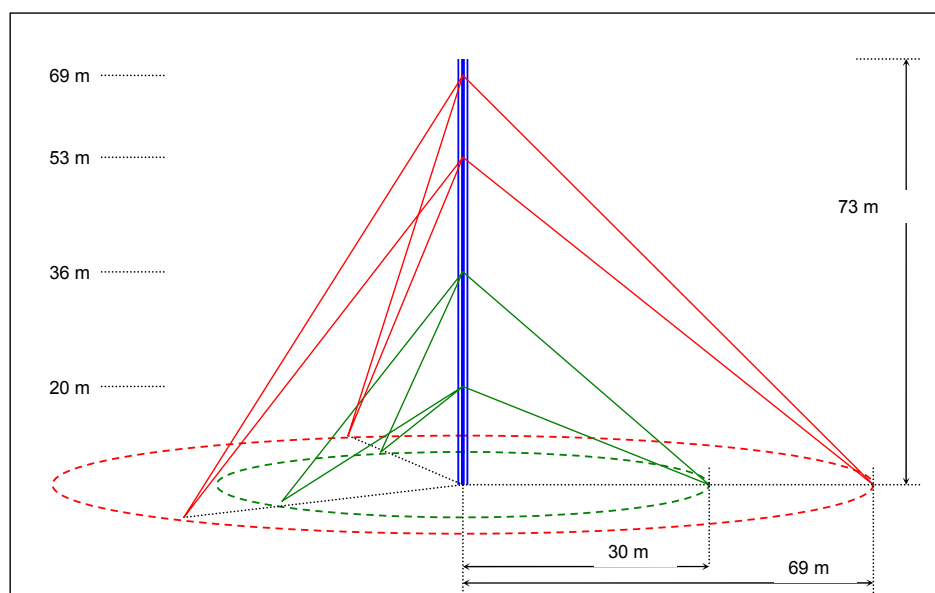
### 1.12.2 *Helicopter wreckage*

The leading edges of both rotor blades suffered extensive damage. The transmission mounting in the helicopter was damaged. Damage had arisen in the hydraulic system.

### 1.12.3 *Radio station*

The radio station consists of a fairly small wooden station building with associated radio mast. The building contains technical radio and communications equipment and some space for service personnel. The radio mast is a 70-m-tall triangular latticework construction in galvanised steel. The mast is supported with three stay wires at each of four 'support levels' at 20 m, 36 m, 53 m and 69 m above ground level. The diameter of the stay wires is approximately 13 mm.

The stay wires from the two lower levels are coupled in three pairs symmetrically anchored on a circle with a radius of 30 m. The stay wires from the two upper levels are coupled in three pairs anchored in the ground around the mast in a circle with a radius of 69 m and in the same vertical plane as the lower pairs. (See sketch on following page.)



*Arrangement of mast stay wires*

#### 1.12.4 Helicopter parking position

Prior to the flight in question the helicopter was parked about 20 metres south-east of the station building and between two stay wire pairs in the inner circle.

#### 1.13 Medical information

Nothing has emerged to indicate that the pilot's physical or mental condition was impaired before or during the flight.

#### 1.14 Fire

No fire broke out.

#### 1.15 Survival aspects

The landing was a controlled one. Apart from the risk to which those on board in connection with the helicopter's collision with the stay wires were subjected they were exposed to no abnormal loads. The Ack Technologies Inc. Model E-01 emergency transmitter was not activated.

#### 1.16 Tests and research

Neither the pilot's view of the course of events nor any other circumstance suggests that the accident can have been influenced by a technical fault on the helicopter. For this reason, SHK did not undertake a technical examination of the helicopter after the event.

#### 1.17 Organisational and management information

The airline company conducts professional aviation with helicopters. Its head office is in Umeå with outstations in Kvikkjokk and Hemavan. At the

time of the accident there were seven fully employed staff and seven helicopters of types Bell 206 and Bell 407 were being operated.

In the company's operation certain types of commission, termed "special operation", have been identified that require special attention from the viewpoint of flight safety. The company's operational handbook contains operative instructions for such commissions.

The type of commission in question was not considered as "special operation", but ordinary taxi flying.

## 1.18 Additional information

### 1.18.1 *Design of radio masts*

For the category of mast considered here, the staying is designed mainly in two ways. Either all stay wires are symmetrically anchored on the ground in a circle with the mast in the centre; or the stay wires are anchored around the mast in two circles as in the present case.

BCL-F 4.1 includes provisions on the marking of various types of obstacle to aviation. The Accident Investigation Board has not found in these provisions any regulation concerning marking of stay wires; nor does it appear that there are any requirements for special procedures for helicopter flight near radio masts.

### 1.18.2 *Measures taken by the helicopter company*

Following the accident, the aviation company has determined to consider all flights involving landing or taking off nearer than 300 metres to radio masts as "Special operations", and has produced special operative rules for such work.

### 1.18.3 *Measures taken by the mast operator*

Following the accident the mast operators have decided, on their own initiative and on a trial basis to mark the anchor points in the outer circle of the mast in question with "road sign" type warning signs (see below).

The possibility of increasing flight safety in this type of activity by marking the anchor points of the outer stay wires was discussed at the Board's accident meeting. Even the trial marking on the mast in question was judged by the helicopter operator to be a significant improvement.



*Marking of mast stays*

## **2 ANALYSIS**

### **2.1 The accident**

The flight to the radio station was probably a purely routine job for the pilot. While the weather situation was less than good, with drizzle and a low cloud base, he had much experience of flying in mountainous terrain. He had done many flights to and from the station in question and was fully aware of the difficulty of seeing mast stays and the danger of colliding with them.

It may therefore seem strange that, despite this, he took off without first ascertaining the spread of the mast stay wires and the siting of the anchor points in relation to where the helicopter was parked. He himself finds this difficult to understand, especially since it is his wont to stress, to less experienced colleagues, the importance of always doing this.

One explanation may be that the flight was a routine one and the pilot felt 'too safe' in this situation. He may in thus have lost a little of his concentration and unconsciously overlooked an important item in connection with the flight: a type of human behaviour that is not entirely uncommon.

The Board notes that the regulations in force contain no requirement for marking of mast stay wires and their anchor points for the purpose of reducing the risk of operational errors while helicopters are flying near radio stations.

### **2.2 Flight safety in the vicinity of radio installations**

Collisions with stay wires, power lines, antennae etc are always serious from the point of view of flight safety and have over the years caused many aviation accidents, several with fatal outcome. It is fortunate that the damage to the helicopter in this case was not greater than it was; and that the pilot succeeded in landing without injury to persons.

There are already a large number of radio stations with stayed masts in Sweden, and their number is increasing rapidly. These installations must be maintained regularly by service technicians who often need to have heavy equipment with them. Since at certain times of year service teams can be transported to many of these installations only by helicopter it is probable that the need for helicopter transport to and from such installations will increase in the future.

The present accident shows that even professional operators can make operational errors when landing and taking off near radio masts. There is therefore reason for the Civil Aviation Authority to take measures that will reduce the risk of helicopter collisions with stay wires and hence increase flight safety for this type of helicopter work.

Procedures should be introduced for flying near radio masts, with for example the use of information sheets containing details of mast height, stay wire arrangement, visual markings, etc, for those radio stations that are regularly visited by helicopters.

In addition, the anchor points that are sited furthest out from the centre of the mast should be marked in a suitable manner. Helicopter pilots would then get both a reminder of the spread of the mast stay wires and clear reference points when manoeuvring at low altitude near masts. Even the trial marking set up by the mast operators on their own initiative appears to represent a substantial improvement in this respect.

### **3 CONCLUSIONS**

#### **3.1 Findings**

- a) The pilot was authorised to perform the flight.
- b) The helicopter had a valid certificate of airworthiness.
- c) The pilot's experience of the type of flight in question was great.
- d) The pilot did not check the spread of the mast stay wires and the positions of the anchor points before takeoff.
- e) Arrangements for mast support differ and stay wires can be difficult to see from the air.
- f) There are no procedures for helicopter flight near radio masts nor are there requirements for the marking of the stay wires.

#### **3.2 Causes of the accident**

The accident was caused by the pilot failing, before takeoff, to ascertain the spread of the stay wires and the positions of their anchor points in relation to where the helicopter was parked. Contributory causes were that there are no procedures for helicopter flight in the vicinity of radio masts and that stay wires are not marked.

### **4 RECOMMENDATIONS**

It is recommended that the Civil Aviation Authority draw up regulations for helicopter operation near radio masts and for the marking of radio mast stay lines in order to reduce the risk of collision. *(RL 2005:08e R1)*