aibn Accident Investigation Board Norway

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REPORT ON AIR ACCIDENT NEAR VANGSNES IN SOGN OG FJORDANE COUNTY ON 14 JUNE 2016 INVOLVING A ROBINSON HELICOPTER COMPANY R22 BETA D-HTIK

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This report has been translated into English and published by the AIBN to facilitate access by international readers.
As accurate as the translation might be, the original Norwegian text takes precedence as the report of reference.

Photos: AIBN and Trond Isaksen/OSL

REPORT ON AIR ACCIDENT NEAR VANGSNES IN SOGN OG FJORDANE COUNTY ON 14 JUNE 2016 INVOLVING A ROBINSON HELICOPTER COMPANY R22 BETA D-HTIK

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This investigation is limited in scope. For this reason, AIBN has chosen to use a simplified report format. The report format stipulated by the guidelines in ICAO Annex 13 is only used when warranted by the scope of the investigation.

All times given in this report are local time (UTC + 2 hours), unless otherwise stated.

Aircraft:	
- Type and reg.:	Robinson Helicopter Company R-22 Beta, D-HTIK
- Year of manuf.:	1992
- Engine:	Textron Lycoming O-320-B2C
Operator:	Private
Date and time:	Tuesday, 14 June 2016 at 13:20
Incident site:	East of Arnafjorden, Sogn og Fjordane county (GPS 69°02` N 06°28` E)
ATS airspace:	Uncontrolled airspace class G
Type of incident:	Air accident, loss of engine power with subsequent hard landing, capsize and damage to helicopter
Type of flight:	Private
Weather conditions:	No clouds, QNH 1 004 hPa, wind direction 260°, wind speed 5 kt, temperature 12 °C
Light conditions:	Daylight
Flying conditions:	VMC
Flight plan:	None
Persons on board:	1 commander and 1 passenger
Injuries to persons:	None
Damage to the aircraft:	Broken left landing gear, broken main rotor mast, bent main rotor blades, damage to the main frame, tail boom and tail rotor.
Other damage:	None
Commander:	
- Age:	58 years old
- License:	PPL (H)
- Pilot experience:	About 525 hours, all on R22 Beta. Last 90 days: 10.2 hours, last 24 hours: 2.1 hours.
Sources of information:	NF 2007 "Reporting of accidents and incidents in civil aviation", police documents in the case and AIBN's own investigations.

FACTUAL INFORMATION

A group of five helicopters, three R44 and two R22, were used for a vacation in Sweden and Norway. On this particular day, the group had set out from Øye Hotell in Nordangsdalen at Sunnmøre, intending to fly to Sognefjorden Hotell in Leikanger in Sogn og Fjordane county.

They made an intermediate stop at Førde Airport Bringeland ENBL to refuel, so that they would be able to fly directly from Sognefjorden Hotell to Geilo the next day. After taking off from Førde Airport, they flew south towards Arnafjorden on the south side of Sognefjorden, at an altitude of about 3 000 ft. Over this area the helicopters were heading in a south-easterly direction and climbed to fly over a mountain range. The two R22 helicopters were lagging behind the R44 helicopters due to their differences in performance. At an altitude of about 3 800 ft., D-HTIK levelled off. In this area the elevation of the terrain is about 3 700 ft. (about 1 130 m) above sea level. Once the helicopter had levelled off, the engine gradually lost power, and low rotor speed warning was activated. The commander decided to make an emergency landing, see Figure 1.

Figure 1: Map showing the accident site. Source: © Norwegian Mapping Authority

The local terrain sloped slightly towards the north with some flat areas. One of these areas was chosen for the landing. Due to the reduced engine power, the landing was hard. The left landing gear broke, and the helicopter capsized towards the left. The rotor hit the ground, and the helicopter sustained major damage.

Figure 2: The accident site. This picture was taken after the helicopter had been straightened up. Photo: AIBN

The commander stopped the engine and switched off the fuel supply. The commander and his passenger then evacuated the helicopter. The emergency locator transmitter was not activated, but the commander used the helicopter's VHF radio to call up his friends in the helicopters that were flying ahead of him. They turned back and landed near the damaged helicopter. To prevent petrol from spilling out of the tanks, the helicopter was straightened up, see Figure 2. The passenger and commander were both flown to the hotel in Leikanger by one of the three R44 helicopters in the group.

Representatives from AIBN arrived at the accident site the following day. The helicopter had landed on a small area of wet ground between large snowy surfaces. It was observed that the Carb Heat handle had not been engaged. The commander confirmed that he had chosen not to use carburetor heat.

A weather report received from the Norwegian Meteorological Institute for the area on the day in question, states the following:

> *Low pressure in the North Sea creates a weather situation with a weak easterly wind field across Southern Norway. In Sogn og Fjordane county, the air masses are dry with a 13-15 °C range in temperature and dew point observed. This fits well with the forecast vertical profile for this area. The cloud development will go from clear weather to light clouds, with the cloud base at 4000-5000 ft. This fits well with the vertical profile. Ground observations show temperatures of 12-13°C at an altitude of 900-1000 m, near the 900 hPa level. This also fits well with the vertical profile. The dew point temperature at this level was probably 0-+3 °C. Locally, the temperature may have been slightly higher near the ground due to significant snow melting/evaporation. Upon saturation, clouds would have been observed in the accident area. All mountain stations in the area observed relatively dry air at the time.*

The Federal Aviation Administration (FAA) has issued a Special Airworthiness Information Bulletin (SAIB) CE-09-35 “Carburetor Icing Prevention”. This bulletin contains a diagram which shows the connection between temperature, air humidity and dew point. When the values stated by the Norwegian Meteorological Institute are plotted in, and the considerations regarding local variations due to evaporation from snowy surfaces are included, the following result emerges, see Figure 3:

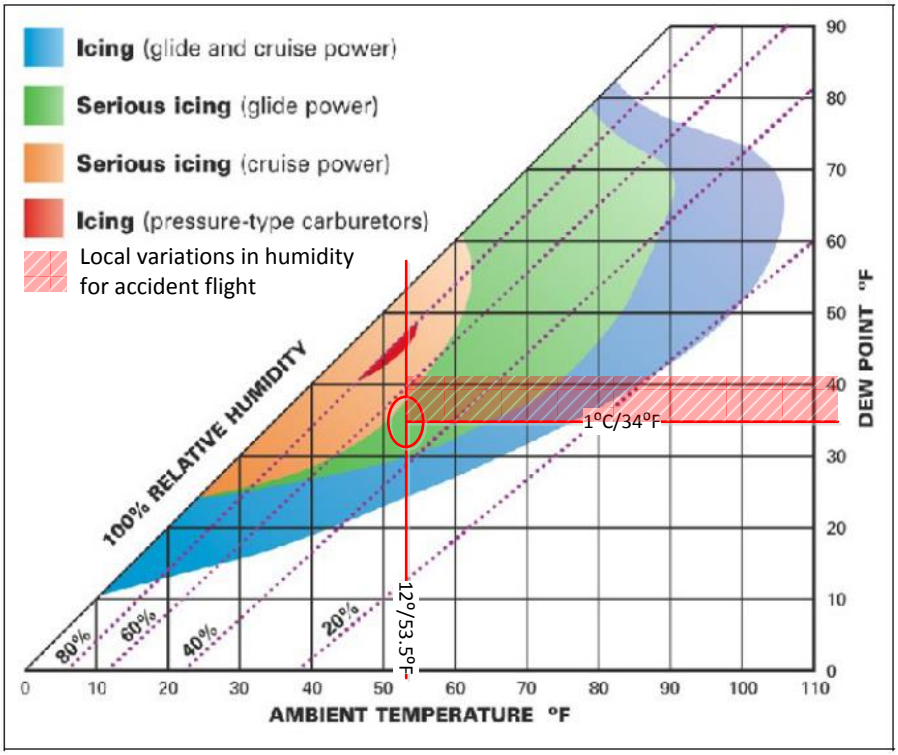

Figure 3: Diagram for air humidity and risk of carburetor ice. The prevailing local conditions at the time of the accident have been entered as red markings and a shaded field. Source: FAA

The R22 Pilot’s Operating Handbook (POH) section 10 “Safety Tips and Notices” includes Safety Notice SN-25 which deals with carburetor ice. It begins as follows:

> *Avoidable accidents have been attributed to engine stoppage due to carburetor ice. When used properly, the carburetor heat and carb heat assist systems on the R22 and R44 will prevent carburetor ice.*
> *Pressure drops and fuel evaporation inside the carburetor cause significant cooling. Therefore, carburetor ice can occur at OAT’s as high as 30°C (86°F). Even in generally dry air, local conditions such as a nearby body of water can be conclusive to carburetor ice. When in doubt, assume conditions are conductive to carburetor ice and apply carb heat as required.*

Vigilance regarding carburetor icing on piston engines in helicopters is also highlighted in EASA Safety Information Bulletin 201-13 "Carburetor Icing Prevention". It states the following:

> *For rotorcraft, it should be considered that piston engine helicopters equipped with carburetors are as vulnerable as aeroplanes to carburetor icing in the critical conditions of temperature and relative humidity. However, the consequences of icing are potentially much more severe.*

> *In a helicopter, icing can develop quite insidiously and the effect on the engine is less obvious. Furthermore, should the engine stop, an immediate entry to autorotation is necessary to prevent catastrophic reduction of rotor RPM, and the descent rate, usually around 2 000 feet per minute, is such that there is rarely time to attempt a restart.*
> *Many helicopters operate with a de-rated engine in order to improve reliability and overhaul lives. For example, the Lycoming O-320 engine used in the Robinson R22 helicopter is nominally a 160 horse power (hp) engine, but is limited to a maximum of 124 hp continuous by a manifold pressure limitation. The consequence of this is that, unlike an aeroplane, the helicopter is rarely operated at full throttle. Even at "maximum power", the throttle is only partly open. The possibility of carburetor icing at wide throttle openings is unlikely, but partial throttle openings increase the potential for icing due to the increased venturi effect.*

AIBN has had a test conducted on the engine to identify any other problems that might lead to reduced engine performance. The test was conducted by running the engine in a test bench with a propeller attached. The engine was run at different speeds and loads. This test provided no indication of any fault in either the engine or the ignition system.

THE ACCIDENT INVESTIGATION BOARD'S ASSESSMENT

By plotting in the air temperature and dew point temperature stated in the Meteorological Institute report in a diagram included in FAA's Special Airworthiness Information Bulletin (SAIB) CE-09-35 "Carburetor Icing Prevention", we find that the risk of carburetor icing was present, see Figure 3. The engine's lack of response to increased input from the collective after a period of flying at the same altitude without carburetor heating supports the theory that carburetor icing caused this accident.

This accident was caused by several factors.

- Carburetor heating was not used.
- AIBN is of the opinion that the observed loss of engine power most probably was caused by carburetor icing. No faults have been found in either the engine or the ignition system.
- The altitude selected above the terrain exposed the helicopter to water evaporation from snow patches that increased the risk of carburetor icing.
- In this case, it may also appear that the intended flightpath gave the commander very few options but to perform an emergency landing before the loss of rotor speed led to control problems.

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Lillestrøm, 30. January 2017