



Helicopter Strikes Trees During Emergency Climb Into Clouds

The New Zealand Transport Accident Investigation Commission said that the pilot of the emergency medical services Kawasaki BK 117B-2 was flying the helicopter on a company visual flight rules route at an altitude that did not provide a sufficient safety margin above terrain for night operations.

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FSF Editorial Staff

About 2220 local time Jan. 14, 2003, a Kawasaki¹ BK 117B-2 helicopter struck trees during a flight to pick up a patient from a hospital in New Zealand. The pilot conducted an emergency landing at a nearby airport. The helicopter received substantial damage. The pilot received a serious hand injury; the other crewmember and two passengers were not injured.

The New Zealand Transport Accident Investigation Commission (TAIC) included the following findings in its final report on the accident:

- “The helicopter was being flown on a company route not normally used at night, at an altitude which provided an insufficient safety margin above terrain for night VFR [visual flight rules] operations;
- “A small navigational error resulted in the pilot making an appropriate emergency climb through cloud, during which the helicopter collided with trees but continued flying; ... ”
- “The operator did not provide additional relevant guidance for its pilot on night VFR operations;
- “CAA [the Civil Aviation Authority of New Zealand] could do more to ensure that air operators providing night VFR flights set and apply appropriate operational standards; [and,]
- “There was a lack of guidance material for private cross-country operations under night VFR.”



Other findings were that the pilot was “appropriately licensed, experienced and fit to conduct the flight,” that the pilot’s actions after the collision were appropriate and that the helicopter had a valid airworthiness certificate and had been maintained properly.

The pilot of the helicopter, operated by Helilink and leased to Wellington Life Flight Trust, received the request for an emergency medical transfer of a patient about 2115, while she was at home in Wellington. She reviewed the weather forecast and determined that the flight — from Wellington Airport to Wellington Hospital to pick up medical personnel and then to Masterton Hospital, 109 kilometers (59 nautical miles) northeast, to pick up the patient and transport the patient to Wellington Hospital — could be conducted in the helicopter.

“She considered the alternative, which was for the ambulance airplane, operating under instrument flight rules (IFR), to do the transfer, but this would take more time,” the report said.

The pilot filed a VFR flight plan, met a flight crewmember at Wellington Airport and flew the helicopter to Wellington Hospital, where a physician and nurse boarded the helicopter. The helicopter departed from the hospital at 2157.

The pilot flew the helicopter at 2,500 feet, navigating visually. She used the helicopter’s global positioning system (GPS) as a supplementary navigation aid on one of the operator’s standard navigation plans for flights from Wellington Hospital to Masterton Hospital, following the Hutt Valley north from

Wellington. The flight plan included seven preprogrammed GPS waypoints.

The pilot and crew said that, immediately after departing from Wellington, the skies were clear, with intermittent moonlight. The surrounding low mountain ridges were visible, as were ground lights in the valley and other lights to the east. After the helicopter was flown over an area of bush-covered hills and valleys, there were no ground lights, and the pilot began to rely more on the GPS for navigation.

The report said that, as the flight continued, the pilot “experienced some difficulty reading the GPS presentation of track and distance to the next waypoint. This was because of some vibration on the display and because her attention was split between increased scanning of her flight instruments, visual scanning of the terrain, and the GPS display, which was located to the left and below the other instruments.

“Because of this difficulty, she asked her crew, seated in the copilot seat, to assist by reading out the GPS tracks and distances. This resulted in the pilot turning onto a northerly heading toward the Tauherenikau River waypoint, but also in some misunderstanding about the distance to run. The pilot heard the crew read out the distance as ‘three,’ but it was probably 0.3 [nautical miles; 0.6 kilometer].”

When the pilot observed that the GPS indicated a new easterly track, she recognized that the helicopter had flown beyond the Tauherenikau River waypoint, and she turned the helicopter to the east.

“Shortly after that, she advised her crew that she would climb the helicopter into instrument meteorological conditions (IMC),” the report said. “This was because they had overflowed the waypoint by an unknown distance in an area of higher terrain, and she was unwilling to ‘fiddle with the GPS’ to reestablish their navigation.”

The helicopter was in clouds at 2,700 feet when the radio altimeter alert illuminated. (The alarm was set at 250 feet.) The pilot pulled back on the cyclic control, which increased the helicopter’s nose-up pitch, and the helicopter struck trees near the top of a mountain.

Despite substantial damage to the helicopter’s fuselage and empennage and the presence of “tree debris” in the cabin that temporarily obscured the pilot’s vision, the pilot recovered the helicopter from a steep nose-down attitude and continued the climb on a northerly heading. The pilot then observed that, although the helicopter instruments and gauges provided normal indications (except for an absence of airspeed indication), several warning lights on the instrument panel had illuminated, and a large amount of cyclic trim was required for straight-and-level flight; in addition, the helicopter’s intercom and radio had failed.

At 3,500 feet, the helicopter was clear of clouds, and the lights of Masterton were visible. The pilot decided to land at the Masterton airport instead of at the hospital. Because of damage to the landing skids, she hovered the helicopter for about 90 minutes while the others disembarked and communicated with authorities, who arranged to have discarded vehicle tires delivered to the airport and arranged into a “suitably shaped bed” upon which the pilot landed the damaged helicopter, the report said.

The 41-year-old pilot had accumulated 6,151 flight hours, all in helicopters, including 196 flight hours in BK 117s. Her total helicopter flight hours included 2,030 flight hours in multi-engine helicopters, 193 flight hours at night and 98 flight hours in instrument conditions. She also had accumulated about 200 flight hours in airplanes and about 1,000 flight hours in gliders. She held a New Zealand commercial pilot license (helicopter), airline transport pilot licenses (helicopter) from South Africa and the United States, instrument ratings, instructor ratings, various type ratings and a Class 1 medical certificate.

She began flying in New Zealand in October 2001. Her most recent flight crew competency check and biennial flight review were conducted Oct. 24, 2002, in the accident helicopter. In addition to her initial training with the company, she received

subsequent training on the use of the helicopter’s winch, a water bucket and a floodlight. She received no specific route training for night VFR flights. IFR practice typically was conducted for one flight hour every three months.

The report said that the pilot had flown a helicopter between Wellington Hospital and Masterton Hospital “a moderate number of times, including 10 flights in the previous four months.” Those flights were conducted in daylight and usually on the same route that was flown on the accident flight. Her night flights to Masterton had been conducted on other routes: either on a direct route at a higher altitude or an alternative low-level route.

During the 30 days before the accident, she had accumulated 17.9 flight hours, including 17.1 flight hours in the accident helicopter, 1.5 flight hours at night and one flight hour of IFR practice.

The report said that, on the day of the accident, the pilot was “rostered on first call,” which meant that she was required to be “at readiness from 0800 to 1800, then on emergency call back from 1800 to 0800 the next morning.” She had been rostered on first call on Jan. 10, Jan. 11 and Jan. 12 and had been off duty on Jan. 13. The accident flight was her first flight on Jan. 14, and she said that she was well rested for the flight. She also said that she did not feel pressured to fly in adverse weather.

The accident helicopter, manufactured in 1991 and imported into New Zealand in 1993, was a twin-engine helicopter approved for use as an air ambulance and equipped with a stretcher, medical equipment and two rear-facing seats for

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medical attendants, and with flight instruments, radios and navigation aids for IFR flight with two pilots. The report said that “additional automatic flight equipment would have been required for single-pilot IFR operations.”

The helicopter had accumulated 3,761 flight hours and had a standard category airworthiness certificate and a certificate of maintenance review that was valid until March 8, 2003; the next scheduled maintenance was due at 3,800 flight hours. The engine trend-monitoring-system computer had been removed for maintenance, but this did not affect the helicopter’s airworthiness. The GPS receiver was on the instrument panel above the radio transceivers and, in addition to the GPS display, provided data for a moving-map display on a laptop computer between the flight crew seats. The GPS did not store track data, but the moving map computer memory contained data on the helicopter’s track.

The report said, “The pilot reported that the [moving-map] display was too bright for use by the pilot at night and was not in use on the accident flight.” The display was used primarily to aid the flight crew with navigation, to monitor search patterns and to perform similar tasks. The computer memory contained data on the route of the accident flight.

The operator, Helilink, was a subsidiary of Airwork (NZ) Limited, and operations were conducted under the Airwork air operator’s certificate, in accordance with Civil Aviation Rules (CARs) Part 135 (*Air Operations — Helicopters and Small Aeroplanes*) and Part 91 (*General Operating and Flight Rules*).

The CARs required that, for VFR flight in uncontrolled airspace at or below 3,000 feet above mean sea level or 1,000 feet above ground level (whichever is higher), aircraft must be operated clear of clouds and in sight of the surface, with visibility of at least five kilometers [three statute miles] — although helicopters flown at “suitable speed” may be operated with lower visibility. Part 135 said that the ceiling for a night VFR air transport flight outside controlled airspace must be at least 2,000 feet above ground level and visibility must be at least five kilometers.

The report said, “The *Airwork Operations Manual* did not expand on these basic rules, either in general or in relation to frequently used routes. No other Airwork document provided guidance information for pilots on night VFR operations.”

The *New Zealand Aeronautic Information Publication*, published by the CAA, also included no information about en route night VFR operations.

Before departure from Wellington, the pilot had obtained the general aviation weather forecast issued at 1335 and valid until 2400 for the area including Wellington and Masterton; the forecast included “rain showers, isolated rain and hail showers, with areas of broken stratus at 1,200 feet and isolated cumulonimbus at 2,500 feet, tops above 10,000 feet. Areas of broken cumulus and stratocumulus at 2,500 feet, tops 9,000 feet.

“Visibility: 30 [kilometers; 19 statute miles], reducing to 10 [kilometers; six statute miles] in light rain showers, 4,000 [meters; 2.5 statute miles] in rain and hail showers.”

The pilot also obtained forecasts and routine weather reports for Wellington Airport, which said that visibility could be as low as 6,000 meters (3.7 statute miles) during periods of rain showers and that there were broken clouds — and “a few” towering cumulus clouds — at 3,500 feet. No routine weather report was available for Masterton. The pilot said that, because she had no information about the amount of cloud cover at Masterton, she decided not to fly the helicopter at 5,000 feet, direct to Masterton.

The Meteorological Service of New Zealand said in an “aftercast” that weather conditions at the time of the accident probably included a high pressure system south of New Zealand and a low pressure system to the east, with “a relatively strong, unstable and moist southerly flow across the area.” Low visibility probably occurred at times along or near parts of the route.

“The pilot’s preflight assessment of the weather information and her flight planning in relation to it were significant factors in the accident,” the report said. “The [general aviation weather forecast] did not specifically predict lower cloud, with poor visibility, on the eastern side of the [mountain] ranges, compared with Hutt Valley and Wellington, but some appreciation of orographic weather with the southerly airflow might have alerted her to that probability. If she had been able to anticipate the weather deterioration across the ranges, she may well have decided that

the low-level southerly route was a preferred option. While the majority of her flying experience was overseas, in countries of large land mass with fewer local small-scale weather variations, she had been flying from Wellington for over a year and should have gained some appreciation of the local weather in different wind directions.”

The report said that her choice of the Hutt Valley route “appeared to accommodate her expectation of the limitations the cloud would place on the flight.” The 2,500-foot cruising altitude was 500 feet higher than the altitude she had used when flying the same route in daylight and 1,000 feet higher than the highest point on the route.

Nevertheless, the report said that the selection of the 2,500-foot cruising altitude did not take into account the clearance required to keep the helicopter above the higher terrain near the route. The minimum safe altitude for the route under night VFR probably was about 5,000 feet, the report said.

The report said that operators — not individual pilots — should determine minimum safe altitudes on frequently used night VFR routes. That Airwork had not made such determinations “represented a shortcoming in operational management,” the report said.

The minimum safe altitude probably was about 5,000 feet.

The report said that data from the moving map showed that the pilot had flown the helicopter about 20 seconds — or about 0.4 nautical mile (0.7 kilometer) — beyond the missed waypoint.

“This small navigational overshoot effectively put the flight into danger,” the report said. “Such a small margin may be acceptable by day, with good light and visibility, but was insufficient on this night, with the prevailing low illumination and decreased visibility. ...

“The pilot’s action, in deciding to climb as soon as she realized that they were [in] danger after overflying the waypoint, was appropriate and, along with her reaction to the radio altimeter alert of pitching the helicopter nose-up, was fortuitous in allowing the helicopter to avoid a major impact with the ground.”

Nevertheless, moving-map data showed that the helicopter did not develop a high rate of climb and its airspeed did not slow to the optimum climb speed. Therefore, the report said, the climb “may not have been as positively started as possible.”

The pilot’s actions after the collision were “appropriate and successful,” the report said.

After the accident, the Aviation Industry Association of New Zealand began developing standards and requirements for night VFR operations for emergency medical services flights and search-and-rescue flights.

Also after the accident, Airwork said that a Wellington base operations guide had been developed to describe standard operating procedures for a number of tasks, including hospital transfers; paramedic pick-up points; a tasking checklist, especially for night tasks; route planning and GPS flight plans; and determining minimum sector altitude.

As a result of the accident investigation, the TAIC recommended on June 3, 2003, that the director of civil aviation “ensure that operators include in their expositions relevant operational material for night VFR flights” and “publish guidance material for all night VFR flying.”

On Aug. 18, 2003, the director accepted both recommendations. He also said that a *Good Aviation Practice* booklet would be published in 2004 containing guidance material for night VFR flights.♦

[FSF editorial note: This article, except where specifically noted, is based on New Zealand Transport Accident Investigation Commission aviation occurrence report 03-001, *Kawasaki BK 117 helicopter ZK-111, collision with treetops at night, Tararua Range, 14 January 2003*. The 11-page report contains an illustration.]

Note

1. The BK 117, described in the report as a Kawasaki helicopter, was developed jointly by Messerschmitt-Bolkow-Blohm (MBB) and Kawasaki, and is now manufactured by Eurocopter.

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