FLIGHT SAFETY FOUNDATION
HELICOPTER SAFETY
Vol. 16 No. 3 *For Everyone Concerned with the Safety of Flight* May/June 1990

Helicopter Ditchings: Canada Studies the Impact

Judicious carriage and use of life-support equipment for all overwater flights — no matter how far from land — can prevent needless loss of life.

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Ditchings, intentional or inadvertent, are counted each year among the listings of helicopter accidents and incidents. Frequently, life-saving equipment was not used by passengers and crew members during these occurrences, despite government regulations encouraging or requiring it.

In a recent special study, the Canadian Aviation Safety Board (CASB) examined the use of life-support equipment such as rafts, flotation gear and lifejackets aboard aircraft. The study sought to determine if regulations governing the carriage, storage and use of this equipment adequately addressed the issue, based on fixed-wing and helicopter overwater accidents.

In developing a database, CASB researched Canadian and International Civil Aviation Organization (ICAO) files for accident/incident reports on "ditchings" and "inadvertent water contact" when the crew or passengers had no time to prepare for the event.

Helicopter Ditchings Examined

Between 1976 and 1987, 25 helicopter ditchings were recorded in Canada (Table 1). Surprisingly, no fatalities resulted from these ditchings, and researchers associate this fortuitous outcome to the relatively slow and gentle water entry of helicopter autorotations and to the close proximity of land in many mishaps.

CASB researchers also examined ICAO data on twin-engine helicopters. Excluding the Canadian mishaps, ICAO's reports provided CASB an additional 54 twin-engine-helicopter ditching events, occurring between 1976 and 1986.

Perhaps somewhat surprisingly, only 20 percent of these 54 international ditchings involved engine failure, compared to 50 percent of the Canadian multiengine helicopter accidents. The remaining 43 mishaps were almost equally divided between mechanical failures and loss of control or collision in flight (Table 2).

CASB researchers determined that helicopters accounted for 40 percent of all Canadian ditchings, although helicopters represent only five percent of the total registration of single and twin-engine private aircraft and 20 percent of the commercial category.

Examining the ditchings further, CASB identified most occurrences as involving single-engine helicopters that were required to carry lifejackets, although CASB "records indicated that lifejackets were rarely carried or used in these accidents."

In examining multiengine helicopter ditchings, the CASB expressed a greater safety concern, that the mechanical

reliability of large twin-engine helicopters may be somewhat lower than comparable fixed-wing aircraft. The board's concern was further heightened by these aircrafts' frequent overwater operations.

Inadvertent Impacts Present A Survival Challenge

The CASB study reported that the Canadian accident/incident database listed 101 "inadvertent water impact" accidents between 1976 and 1986, which resulted in 102 fatalities. However, there is no breakout by category of aircraft, so CASB did not specifically discuss helicopters in this context.

Table 1
Canadian Rotary-Wing Ditching Accidents
1976-1987

Type	Total	Fatalities	Engine Failure	Mechanical Failure	Wire Strike	Loss of Control
Single Engine	22	0	12	2	2	6
Twin Engine	3	0	1	1	0	1
Total	25	0	13	3	2	7

But CASB researchers did comment on floatplane and amphibious airplane occurrences. Here, they noted that occupants sometimes drowned while attempting to reach lifejackets stowed in the cabin's aft section or under passenger seats, or when attempting to dive back to the aircraft to retrieve a lifejacket from an inverted aircraft suspended by floats.

Most noteworthy, the CASB found that "accident data failed to identify a single instance in which the occupants donned lifejackets after the [inadvertent water impact] accident and prior to evacuating the aircraft."

Improvements Proposed

The study produced a broad range of conclusions. Foremost, most Canadian water-contact accidents involved small aircraft not routinely engaged in overwater flights, and which are not required to carry lifejackets. In fact, about 50 percent of ditchings involve single-engine land planes, whose pilots elected to land in water, rather than on the inhospitable surrounding terrain.

Other conclusions were:

- The probabilities between a single-engine or twin-engine aircraft being involved in a ditching accident are not significantly different.
- Most water-contact accidents involving transport-category aircraft occur during the approach and landing, or the takeoff phase of flight.
- The use of 50 nm from shore as the determining factor in the carriage of lifejackets is inappropriate, since virtually all water-contact accidents in Canada occurred within 50 nm from shore.
- Flotation seat cushions, which are currently only provided to transport-category aircraft, can provide a relatively low-cost alternative or supplement to lifejackets.
- The carriage of infant-sized lifejackets when children are on board is presently not required by regulation.
- There is no regulatory mechanism for ensuring that technology improvements in slides/liferafts be incorporated into equipment on Canadian aircraft.

Since floatplanes/amphibious aircraft are involved in

Table 2
Worldwide Causes of Twin-Engine Helicopter Ditchings
1976-1986

Cause	Number
Collision (Ground or Air)	12
Engine Failure	11
Tail-Rotor Failure	8
Main-Rotor Failure	7
Loss of Control	6
Flight Control Failure	2
Engine Disintegration	2
Airframe Failure	1
Injuries in Flight	1
Missing	1
Other/Unknown	3
Total	54

Source ICAO

23 percent of all aviation fatalities in Canada, CASB addressed this specific area, finding:

- The regulation that addressed passenger briefings on overwater survival equipment does not specifically require such a briefing prior to takeoff in a floatplane.

- Since floatplane occupants rarely have time to retrieve and don lifejackets in the event of an upset on takeoff or landing, current regulations for the stowing and the wearing of lifejackets on floatplanes are inadequate.

Better Preparation Recommended

In the area of helicopter safety, the CASB found evidence of sufficient differences between fixed-and rotary-wing aircraft in terms of reliability and operating environment — particularly the "extremely unforgiving" offshore operating environment.

Although Transport Canada has addressed these differences through limitations in Company Operating Certificates, the possibility does exist that the ad hoc nature of these provisions may allow inadequately equipped helicopters to be operated over water.

The CASB, therefore, recommended that the Department of Transport develop and publish helicopter-specific regulations regarding the carriage and use of overwater life-support equipment. ♦

[This article is reprinted from Rotor & Wing International *in the interest of sharing safety information with the worldwide aviation community. — Ed.]*

Mountaintop Disaster

Even the most experienced helicopter pilot can be trapped when weather conditions limit visibility with little notice.

Of all the operations a pilot may encounter, certainly mountain flying ranks as one of the most difficult. High density altitudes and heavy loads, limited power, turbulence and rapidly shifting weather conditions can prove difficult for even the most experienced pilot.

Mountain pilots are only too familiar with the frustration of sitting in a valley on a beautiful summer day waiting for the clouds to dissipate at the very apex of the mountain where the day's work is to take place. However, when the summit does clear and the pilot has moved the crew to the top, there is no guarantee the ridge will stay open. It is not unusual to find the fog forming again as temperatures and wind conditions change, and a scramble into the air may be the only way to avoid a night at the top.

Some pilots have found themselves climbing or descending with only the dim outline of a rock face for reference. It is a technique not many admit to. The pilot involved in the following accident may have had something like that in mind, but unfortunately time, ideas and options all ran out at the same time.

History of the Flight

The pilot and three passengers departed the base camp for several mountaintop radio repeater sites. Two passengers were deplaned, and the third was dropped at a second site located on a high pass. The helicopter returned to the base camp, picked up two more passengers and flew them to the second site as well. The passengers would form crews to clear snow from the sites and erect a radio antenna.

Because the pass was blanketed with fog earlier in the day, the operation had been delayed. Later, although some fog was still present, the aircraft was able to land.

The helicopter did not return to the base at the end of the day. A ground search party located the wreckage a short distance from one of the sites, on a snow-covered slope. The pilot and front seat passenger had not survived; both rear seat passengers were alive but one died the next day.

The Pilot

The pilot was properly licensed and qualified to undertake the flight. He had been checked out on the Hughes 500D several weeks earlier, and his experience in type was limited. However, he had more than 6,800 hours total helicopter time, and had flown a Bell 206 in the same general area several seasons earlier.

The Weather

The weather was generally clear with unlimited visibility. At the accident site, however, dense fog was generated by a light breeze lifting moist air over the mountain pass. This moisture was produced by the sun melting the glacial snow. Since the wind was light and variable, fog would have formed near the top and then dissipated as the air subsided on the far side. The fog was limited to several hundred feet and was intermittent. Visibility was probably severely restricted for unpredictable periods of time.

The Helicopter

There was no evidence of failure or malfunction of the engine, airframe or controls. The main rotor blades showed severe bending and twisting, which is consistent with substantial power being developed at impact. It was apparent the left skid made contact with the snow first, and the helicopter than somersaulted, coming to rest facing about 180 degrees to the direction of flight. The driveshaft between the engine and transmission couplings was found to have failed under a shearing load.

The emergency locator transmitter was serviceable with the switch in the armed position, but the antenna was broken off. No signal was transmitted.

Analysis: Factors Contributing to the Accident

A dense localized fog had been forming intermittently at the site, and attempts to reach the area were delayed. The fog gradually decreased during the morning so that the pilot was able to place the crews at the sites shortly after noon. The helicopter remained at the second site while the crew worked. At 1730 hours, the pilot radioed the first site crew and advised they were delayed by the work in progress. He would call back when ready for takeoff. Later attempts to contact the helicopter between 1800 and 1830 were unsuccessful. Based on this information, the time of the accident was estimated to be between 1730 and 1800.

The first site crew could see the general area of the pass and reported that billowing fog was visible at the time of the accident. It is likely the pilot took off in reduced visibility and was climbing toward the mountain peak where bare rocks provided some visual reference. During this phase of flight, the helicopter must have struck the snow-covered mountainside about 200 feet above the repeater site. It could not be determined why the pilot departed at this particular time since the work was not finished; the pilot may have decided to leave when he saw an opening rather than risk spending a night on the mountain.

The work site was left in disarray, supporting the assumption that the decision to depart was made quickly. Since the density of the fog could have changed from minute to minute, it may have cleared and then become thicker while the helicopter was being boarded and started. The fog conditions and snow-covered mountain may have obscured the pilot's visual reference points, causing him to become disoriented after takeoff and inadvertently fly into the mountainside. ♦

[This article is reprinted from Transport Canada's Aviation Safety Vortex *in the interest of sharing safety information with the worldwide aviation community.–Ed.]*

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