



NO. 93-002

AEROSPATIALE AS 350B

ZK-HNH

MT FYFFE

1 FEBRUARY 1993

A B S T R A C T

This report relates to the severe “sink” experienced during an approach to a high level landing site which resulted in a collision with terrain of Aerospatiale AS 350B helicopter ZK-HNH near the summit of Mt Fyffe, 12 km north-west of Kaikoura on 1 February 1993. The safety issues discussed in the report are: the ineffectiveness of the local wind indicators, the inaccessibility of the mountain survival gear carried in the aircraft, and the need to develop local contingency plans for aviation emergencies in the Kaikoura area.

TRANSPORT ACCIDENT INVESTIGATION COMMISSION

AIRCRAFT ACCIDENT REPORT NO. 93-002

Aircraft Type, Serial Number And Registration:	Aerospatiale AS 350B, 1285, ZK-HNH
Number And Type Of Engines:	1 Turbomeca Arriel 1B
Year Of Manufacture:	1980
Date And Time:	1 February 1993, 1240 hours *
Location:	Mt Fyffe, 12 km north-west of Kaikoura Latitude: 42°19' S Longitude: 173°37' E
Type Of Flight:	Air Transport - Scenic Flight
Persons On Board:	Crew: 1 Passengers: 5
Injuries:	Crew: 1 Serious Passengers: 1 Serious, 2 Minor
Nature Of Damage:	Substantial
Pilot In Command's Licence:	Commercial Pilot Licence (Helicopter)
Pilot In Command's Age:	40
Pilot In Command's Total Flying Experience:	1133 Hours 21 on type
Information Sources:	Transport Accident Investigation Commission field investigation
Investigator In Charge:	Mr D G Graham

* All times in this report are NZDT (UTC+13 hours)

1. NARRATIVE

1.1 ZK-HNH was operated by Kaikoura Helicopters Ltd on local scenic flying and charter work. One of the flights which was popular with visitors to Kaikoura combined a landing on the summit of Mt Fyffe, 5256 feet amsl, approximately 12 km inland, and usually snow covered, with a subsequent whale watch flight out to sea. The whole flight was normally of about 45 minutes duration.

1.2 The first flight on the day of the accident had been a whale watch sortie. The pilot had flown ZK-HNH from the coastal landing pad directly out to sea and back for an uneventful 21 minute flight. The helicopter had performed satisfactorily throughout the flight. On return it had been refuelled with 200 litres of Jet A1 turbine fuel from a sealed drum to bring the total quantity of fuel on board to approximately 80% of the tank capacity.

1.3 At 1230 hours the pilot departed from Kaikoura for a combined "snow landing/whale watch" flight, with five overseas visitors on board. Two passengers occupied the bench type double front seat on the left of the helicopter. A low metal bulkhead with a reinforced capping was positioned between this seat and the pilot's seat on the right to protect the helicopter's engine controls and collective lever from being inadvertently obstructed or moved by a passenger. One passenger in the rear was seated at the far left side while the two other passengers occupied the centre right and far right, respectively, of the four place seating which extended across the width of the cabin.

1.4 The passengers were all wearing life-jackets, donned before take-off. Each passenger was restrained by a "tongue and buckle" type lap-belt. The pilot was restrained by an inertia-reel type shoulder harness, associated with a high-back seat, and wore a safety helmet equipped with integral earphones and a boom microphone.

1.5 The departure and climb to Mt Fyffe proceeded normally. During the climb the pilot observed snow being blown off the top of Mt Manakau (8562 feet) indicating that strong west to south-westerly winds prevailed across the seaward Kaikoura range. This was in contrast to the fresh north/north-easterly sea breeze which existed along the Kaikoura coast during the morning and at the time of take-off. A change to southerly conditions was expected

later in the day.

1.6 Helicopter landings on Mt Fyffe were normally carried out onto a patch of level ground at the summit, 10 to 20 m north of the trig structure, and marginally below it. Two one metre high stakes were located at the eastern edge of the area. A strip of heavy canvas attached to the top of one stake, and a ribbon of plasticised material attached to the other served as indicators of wind strength and direction.

1.7 The pilot of ZK-HNH approached Mt Fyffe from the south-east and flew over the summit area at a height of about 50 feet to observe surface conditions prior to landing. Both wind indicators were hanging limp. In view of the apparent lack of significant wind the pilot decided to make an approach and landing from the west, in accordance with his usual practice, which enabled a subsequent take-off and departure direct to the coast.

1.8 After passing over the summit, the pilot continued towards the north-west, then flew ZK-HNH in a wide arc to the left to position for a final approach to the landing area from the south-west. A passenger's photograph confirmed that at this time the helicopter was established at a suitable height and distance from the summit for a normal approach.

1.9 The pilot maintained a steady rate of descent towards the summit, and slowly reduced forward speed. The approach appeared to be progressing normally. On short final, however, as the pilot flared the helicopter, very close to the landing area, it encountered a severe downdraught or tailwind gust and rapidly lost height. Despite the pilot's attempts to retrieve the situation by raising the collective, the helicopter descended below summit level, and the pilot was obliged to lower collective and initiate a turn to the left in an endeavour to follow a curving flight path through north and north-west to avoid the terrain immediately ahead.

1.10 The helicopter continued to sink during the turn as the pilot attempted to follow the contour of the mountain slope and fly out to the west. The pilot reported that the forward speed had reduced to about walking pace, with the helicopter in a nose-down attitude, when it struck

the ground heavily. Resulting damage showed that initial impact forces were severe enough to fracture both the left and right skid supports, and cause the tail rotor to be destroyed by ground impact. The mountain side sloped downwards to the left, and after impact the helicopter nosed over and rolled onto its right side. It came to rest a few metres from the edge of the slope which dropped away steeply to the valley below. The accident site was at an elevation of about 5200 feet amsl. The helicopter was lying in drifted snow.

1.11 After releasing themselves from their seatbelts and vacating the cabin, the two male passengers and one of the front seat female passengers were able to assist the remaining front seat passenger from the helicopter. The female passenger seated in the right rear, who sustained serious pelvic and internal injuries had managed to crawl out, and was made as comfortable as possible on the snow using the removable seat squabs as padding and to form a shield against the wind. A large rock had penetrated the front cockpit and trapped the pilot, who had received obvious neck and other injuries, but the passengers were able to raise the helicopter sufficiently to release him.

1.12 The emergency locator transmitter activated on impact and at 1240 hours the crew of an airliner en route to Wellington advised Christchurch Area Control that an emergency transmission was being received. The Rescue Coordination Centre was alerted and preparations commenced for a search and rescue operation in the vicinity of Kaikoura.

1.13 Shortly after the accident a mountain safety instructor, who happened to be nearing the summit of Mt Fyffe on foot, observed the tail assembly of ZK-HNH in the distance. On reaching the scene some 30 minutes after the occurrence he was able to render valuable assistance to the occupants and later, under the injured pilot's guidance, operate the helicopter's radio. The pilot initially encountered some difficulty in getting the radio to function but found that the plug connections for the helmet mounted microphone and headphones were not made correctly. He then succeeded in transmitting a number of Mayday calls. Radio contact on 119.1 MHz was eventually established with the pilot of a whale watch aircraft, and details concerning the accident were advised. The pilot of ZK-HNH was informed that search and rescue action was in hand.

1.14 A local helicopter was used to transport a

doctor from Kaikoura to the site at approximately 1430 hours, and a second flight was made bringing a nurse and blankets. The Rescue Helicopter in Christchurch had been alerted and arrived at the scene at about 1520 hours. Following the on-site medical attention, the pilot and seriously injured passenger were transferred by the Rescue Helicopter to Christchurch. The remaining passengers were flown to Kaikoura Hospital for treatment. The pilot, whose major injuries included compression of some vertebrae, was discharged from Christchurch Hospital after 8 days. The passenger's injuries obliged her to remain in hospital for 38 days. The severe injuries to the passenger in the right rear seat resulted from the vertical impact forces on the right side of the helicopter when it first struck the ground. The front seat passengers sustained leg and hand injuries, general bruising and laceration. In addition, the passenger seated in the front central position received severe bruising to her right side from contact against the metal divider bulkhead.

1.15 The New Zealand Meteorological Service provided an aftercast of the weather relating to the circumstances of the accident. A strong westerly airstream flowed over New Zealand and a cold front lay over the south of South Island. The Director reported as follows:

"Wind: The undisturbed wind flow at about 5000 feet is estimated to have been westerly about 20 knots. However near the mountain top speeds would have been stronger due to the acceleration of the air as it flowed across it. From the tephigram at Paraparaumu the air was unstable in the lower layers of the atmosphere. There was however an inversion at about 7000 feet which would act as a lid to air which was forced to rise to cross the South Island mountains. The pressure at Kaikoura fell steeply during the morning indicating increasing amplitude in the lee trough on the east coast of the South Island. These factors could have resulted in winds two to three times stronger than the undisturbed flow.

Turbulence: The wind flowing across the top of Mount Fyffe would have crossed mountainous terrain for some distance and the flow therefore would have been severely turbulent at times. The pilot may have expected rising air on the western (windward) side of the mountain but in this case it is possible he encountered a downdraught in the lee of the terrain upstream."

1.16 A consensus of passenger reports indicated

that there was little evidence of wind as the helicopter flew over the summit of Mt Fyffe. During the final stages of the landing approach, however, passengers felt the tail of ZK-HNH suddenly lifted by “an enormous gust”, and confirmed that the helicopter’s rate of descent began to increase rapidly “in a swirl of wind”. After the accident passengers reported intervals of calm interspersed with gusts from the west, indicative of the variable and localised conditions prevailing in the area. The pilot commented that the wind was cold, unlike a normal Nor’wester, and had a southerly component, probably associated with the expected frontal change.

1.17 ZK-HNH was equipped with pop-out floats, and a Petrel life-raft was carried for survival at sea. The life-raft contained additional equipment including thermal blankets and flares. The sealed, but easily opened, life-raft pack was stowed in the left side compartment of ZK-HNH located to the rear of the passenger cabin. A mountain survival pack was also carried on board ZK-HNH which included a tent and groundsheet, and sufficient thermal blankets, woollen vests and longjohns, socks, gloves, balaclavas, and other items to cater for the needs of six persons in mountainous terrain or cold conditions. This survival pack was stowed in the compartment on the right side of the helicopter rearward of the cabin. In addition to the mechanical clamps holding the hinged doors closed, each compartment was kept locked as a safety precaution against inadvertent opening in flight. The key for these compartments was hung in a convenient location in the cockpit.

1.18 Following the accident, the passengers made use of bandages from the first aid kit to treat minor wounds. However, lack of adequate warm clothing or covering in the snowy surroundings was a matter of concern, particularly in relation to those who had received serious injury. The mountain survival pack was not readily accessible as the helicopter was lying on its right side. While it would have been feasible to make use of the life-raft contents, there was initial doubt as to the security of the helicopter in the precarious position in which it had come to rest on the slope, and the pilot considered that, given the probability of prompt rescue, the risk involved in retrieving the life-raft pack at an early stage was not justified. In the event, although efforts were made to minimise delay in rescue operations once the location of the accident had been established, some three and a half hours elapsed from the occurrence of the accident before all of the passengers and

the pilot were lifted off the mountain.

1.19 The pilot had flown various helicopters in the Kaikoura region over a period of about two and a half years. This experience had included mountain flying and landings at high altitude. He had flown mainly the Bell 206, Hughes 369 and Robinson R22 types in these operations. In January 1993 he had completed a conversion to type course on the Aerospatiale AS 350B Squirrel helicopter. Flying during the conversion course had covered mountain flying consolidation and the techniques involved in approaches and landings up to 5000 feet amsl.

1.20 At the time of the accident ZK-HNH had flown 25.6 hours since major airframe overhaul. Total airframe time was 5981.5 hours. Turbomeca Arriel 1B engine, serial number 950, had been installed on 18 January 1993. The numbers 2 and 3 Modules fitted to the engine at this time had run 75 hours since complete overhaul. The engine had a total of approximately 2230 hours time in service when the accident occurred.

1.21 A full operational check was carried out following the engine replacement. This included a Power Assistance check and a Ng (Gas Generator rpm) topping check in accordance with Arriel Maintenance Manual Chapter 73-20-01. The results indicated that engine operation was satisfactory in all respects, including fuel control response to normal power demand at altitude. At the time of the accident the engine had accumulated about 19 hours since installation. The pilot had landed on Mt Fyffe in ZK-HNH a number of times during this period.

1.22 The helicopter was close to its maximum gross weight at the time of the accident. This factor, combined with some compressor bleed off at the governed Ng limit in response to a sudden substantial power demand (characteristic of the engine’s operation), and the elevation of the landing site, was likely to have compounded the pilot’s difficulty in recovering ZK-HNH from the effect of the unexpected and severe downdraught or tailwind gust which was encountered. In addition, the location, and physical characteristics of the wind indicators at the landing site may have prevented them from representing to the pilot accurately the fluctuating wind conditions which existed at the time of the accident.

1.23 A condition, described in general terms as power settling, might have occurred with the helicopter descending, in a tailwind situation, with a low forward speed. The condition, technically known as vortex ring

state, could have resulted in the helicopter continuing to descend despite the use of maximum engine power. If the condition developed with the helicopter sinking into the air mass it had just displaced, descent would have continued unless the forward speed was increased sufficiently to fly

out of the descending air mass, or the collective lowered to initiate auto-rotation. Due to the descent rates encountered and the altitude required for recovery from a power settling situation subsequent ground contact would have been inevitable.

2. FINDINGS

2.1 The pilot was licensed appropriately for the flight but had converted to the aircraft type only recently.

2.2 The aircraft had a valid Certificate of Airworthiness and Maintenance Release.

2.3 The aircraft was close to maximum all-up weight.

2.4 In the final stages of a landing approach to the summit of Mt Fyffe, the helicopter encountered a severe downdraught or tailwind gust.

2.5 The strong westerly/south-westerly flow prevailing over the adjacent high mountain range contributed to the likelihood of downdraughts and gusts in the region.

2.6 The pilot was unable to complete a turn away from high ground and arrest the helicopter's descent before it struck the mountain slope.

2.7 The wind indicators at the landing site may

not have represented accurately the existing fluctuating wind conditions.

2.8 The wind indicators did not alert the pilot to the possibility of tailwind gusts in an approach from the west.

2.9 The low forward speed of the helicopter, the rate of descent which developed, and the increase in collective pitch in an attempt to arrest the rate of descent to avoid ground contact, were conducive to power settling.

2.10 The principal factor in the accident was an unexpected severe downdraught or tailwind gust encountered just prior to landing. Additional factors included the high all-up weight of the helicopter, the elevation of the landing site, the ineffectiveness of the wind indicators, and the high contours of the surrounding terrain along the available "escape route". The effect of power settling was likely to have contributed to the accident.

3. SAFETY RECOMMENDATIONS

3.1 It was recommended to The Manager of Kaikoura Helicopters that:

"The effectiveness of the Department of Conservation wind indicator installation should be monitored, (018/93) and,

He consider the use of conventional windsocks at more than one position about the landing site, (019/93) and,

Consideration be given to dividing the basic mountain survival equipment so that some items are stowed on each side of the helicopter, if side locker stowage is used, since in most land-based accidents the helicopter is likely to come to rest rolled on one side or the other, (020/93) and,

The detail concerning the location of survival equipment and how access may be obtained to it be included in the pre-flight passenger briefing, (021/93); and

The necessary steps be taken to convene a meeting or meetings to include representatives of local aviation operators, the Police, and local medical authorities and any other appropriate persons, in order to discuss and develop suitable contingency plans in the event of an aviation accident or emergency in the Kaikoura area, (022/93)."



9 August 1993

M F Dunphy
Chief Commissioner