



AIRCRAFT ACCIDENT REPORT
OCCURRENCE NUMBER 99/3174
PIPER PA-28-140
ZK-DUU
5 KM EAST OF AMBERLEY
21 NOVEMBER 1999

Glossary of abbreviations used in this report:

ACNZ	Airways Corporation of New Zealand Limited
ATS	air traffic services
Avgas	aviation gasoline
CAA	Civil Aviation Authority
CPL(A)	Commercial Pilot Licence (Aeroplane)
E	east
ETA	estimated time of arrival
ETD	estimated time of departure
G/S	groundspeed
km	kilometre(s)
kt	knot(s)
m	metre(s)
MHz	megahertz
nm	nautical miles
NRCC	National Rescue Coordination Centre
NZDT	New Zealand Daylight Time
O/H	overhead
PPL(A)	Private Pilot Licence (Aeroplane)
rpm	revolutions per minute
TBO	time between overhauls
US	United States (of America)
UTC	Coordinated Universal Time
VFR	visual flight rules
VHF	very high frequency

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Aircraft type, serial number and registration:	Piper PA-28-140, 28-7525018, ZK-DUU
Number and type of engines:	One Lycoming O-320-E3D
Year of manufacture:	1974
Date and time:	21 November 1999, 1705 hours*
Location:	In the sea, 1nm east of Amberley Beach Latitude: S 43° 09.7' Longitude: E 172° 51.4'
Type of flight:	Private
Persons on board:	Crew: 1 Passengers: 1
Injuries:	Crew: fatal Passenger: fatal
Nature of damage:	Aircraft destroyed
Pilot-in-command's licence	Private Pilot Licence (Aeroplane)
Pilot-in-command's age	26 years
Pilot-in-command's total flying experience:	229 hours, 164 on type
Information sources:	Civil Aviation Authority field investigation
Investigator in Charge:	Mr S J Walker

* Times are NZDT (UTC + 13 hours)

Synopsis

The National Rescue Coordination Centre was notified of the accident at 1708 hours on Sunday 21 November 1999. The Transport Accident Investigation Commission was in turn notified shortly thereafter, but declined to investigate. A CAA investigation was commenced next day.

The aeroplane was on the return leg of a Christchurch - Nelson - Christchurch cross-country flight. At least one significant diversion was carried out en route, extending the flight beyond its planned duration. The engine failed after a total flight time approximating the expected fuel endurance. At the time of the failure, the aeroplane was over the sea, beyond gliding distance from land. The pilot carried out a successful ditching, but he and his passenger drowned after vacating the aeroplane.

1. Factual information

1.1 History of the flight

- 1.1.1 On Sunday 21 November 1999, the pilot hired DUU from the training organisation at which he was a student, for a flight from Christchurch to Nelson and return. He had originally intended to carry out the flight the previous day, but postponed it because of unsuitable weather. His passenger was a fellow student of about the same experience as himself.
- 1.1.2 The planned route was coastal via Kaikoura and Cape Campbell thence inland to Nelson, returning to Christchurch by the same route. Flight preparations included filling the fuel tanks to capacity and filing a SARWATCH with ATS. The fuel endurance notified as part of the SARWATCH was five hours.
- 1.1.3 DUU took off from Christchurch at 0909 hours, the pilot making a routine call to Christchurch Information at 0918 hours with an ETA for Kaikoura of 0955. He reported again overhead Kaikoura at 0959 hours, estimating Nelson at 1100, and landed at Nelson at 1103 hours.
- 1.1.4 At Nelson, the pilot left the airport to visit a friend, his passenger remaining at the airport with DUU. The aeroplane was not refuelled while it was on the ground at Nelson. The pilot's ETD from Nelson was intended to allow him sufficient time to arrive back in Christchurch to start work at 1730 hours.
- 1.1.5 Take-off from Nelson was at 1410 hours, and the pilot vacated the Nelson control zone to the south, reporting an ETA for Christchurch of 1613 hours. About this time, considerable convective cloud was present on the ranges to the east and south-east of Nelson, and an inbound Metroliner on a scheduled commuter flight was obliged to climb to 16 000 feet to clear the tops of these clouds.
- 1.1.6 Nothing was heard of DUU until 1514 hours, when the pilot reported his position to Christchurch Information as 15 nm east of Lake Station, 5500 feet, with an ETA Christchurch and revised SARTIME of 1705 hours. This reported position was only 21 nm in a direct line from Nelson.

- 1.1.7 It could not be established by what route the aeroplane arrived in this area, although a radar plot obtained subsequently showed an aircraft target entering radar coverage from the upper Wairau Valley. The target, which was confirmed as DUU, followed the Wairau Valley towards Blenheim, tracked south of the Woodbourne control zone and reached the coast some 12 nm south-west of Cape Campbell at 1547 hours.
- 1.1.8 The pilot's navigation log contained an entry: "C River G/S 98 kts 0300". The radar plot showed the position of DUU at 1602 (0302 UTC) as the Clarence River mouth.
- 1.1.9 At 1629 hours, the pilot reported 15 nm south of Kaikoura at 3000 feet, revising his ETA and SARTIME to 1720 hours. At this point DUU had been airborne for a total of four hours and 25 minutes on a declared endurance of five hours.
- 1.1.10 At 1704 hours, the duty Flight Information Officer (FIO) at Christchurch Centre received a series of calls (see also 1.9 Communications) from DUU, from which it was inferred that the aircraft was making a forced landing somewhere north of the Ashley River. The NRCC was notified at 1708, but it took some time to establish that DUU had ditched.
- 1.1.11 Search and rescue action that evening was unsuccessful in locating either the aeroplane or its occupants, although two flight bags were found. The pilot's flight bag was found floating in the sea 200-300 m offshore at 1845 hours and the passenger's flight bag was found on the beach at 1915. In the pilot's bag were all his flight documents for the trip as well as the aeroplane document satchel containing the ignition key and fuel card.
- 1.1.12 It was not until 23 November that the body of the passenger was found on Amberley Beach. On 25 November the body of the pilot was found in the same general area, and the aeroplane itself was found the same day about two nautical miles off the Waipara River mouth.
- 1.1.13 The accident occurred in daylight at 1705 hours NZDT in the sea 1nm east of Amberley Beach. Latitude S 43° 09.7', longitude E 172° 51.4'.

1.2 Injuries to persons

<i>Injuries</i>	<i>Crew</i>	<i>Passengers</i>	<i>Other</i>
Fatal	1	1	0
Serious	0	0	0
Minor/None	0	0	

1.3 Damage to aircraft

- 1.3.1 The aeroplane suffered only minor superficial damage in the ditching and descent to the seabed, but after recovery, was deemed non-repairable because of salt-water

immersion. After completion of the investigation, the aeroplane was destroyed by crushing.

1.4 Other damage

1.4.1 Nil.

1.5 Personnel information

1.5.1 The pilot was a foreign national who was training in New Zealand for his CPL(A). At the time of the accident he held a PPL(A) but had completed the theory and practical syllabi for the CPL, including having passed the issue flight test. He held a current Class 1 medical certificate endorsed with requirements that he wear contact lenses and have a spare pair of spectacles readily available.

1.5.2 His total flight time was 229 hours, including the accident flight. He had flown 80.25 hours in the 90 days preceding the accident, and had a total of 163.85 hours on the PA-28 series.

1.5.3 The passenger held a PPL(A) issued on 8 September 1999, as well as a US Private Pilot Certificate obtained before he came to New Zealand. He was also training for his CPL(A) at the same organisation as the pilot, and had recently passed his cross-country flight test for this licence.

1.5.4 There was no apparent provision for sharing the flying between the pilot and passenger: the pilot had made the aircraft reservation in his name only, and was the pilot-in-command nominated on the flight authorisation and in the ATS SARWATCH.

1.6 Aircraft information

1.6.1 Piper PA-28-140, serial number 28-7525018, ZK-DUU had accrued a total of 9491.65 hours in service up to the last logbook entry on 20 November 1999. The last 100-hour inspection was carried out on 20 October 1999, at 9396.9 airframe hours.

1.6.2 The aeroplane had a non-terminating Airworthiness Certificate issued on 24 February 1998, and the last Annual Review of Airworthiness was carried out on 26 February 1999.

1.6.3 The Lycoming 0-320-E3D engine had run 1462.2 hours time in service up to the last logbook entry 10 November 1999.

1.6.4 The total fuel capacity of DUU was 189 litres, carried in two tanks of equal capacity, one in each wing. Of the total, 181 litres was useable fuel. The fuel selector arrangement on the PA-28 type is such that only one tank can be selected at a time.

1.6.5 The grade of fuel used was 100/130 octane Avgas. Fuel consumption figures quoted by the Lycoming engine operator's manual were 33.3 litres per hour at 2350 rpm and 37.8 litres per hour at 2450 rpm. Full throttle fuel flows (such as on take-off) ranged from 45 to 55 litres per hour.

- 1.6.6 DUU was fitted with a recording tachometer, which logged engine hours run to two decimal places, and a hobbs meter, a timing device which records taxi and flight time. The tachometer time recorded from departure Christchurch to the time of ditching was 4.81 hours, against the actual flight time of 4 hours 49 minutes (4.82 hours). The time recorded by the hobbs meter was 5.35 hours.
- 1.6.7 A load sheet for DUU was prepared by the pilot before departure from Christchurch. His figures showed that the weight and centre of gravity were within the limits specified in the Flight Manual.

1.7 Meteorological information

- 1.7.1 On 21 November 1999 an intense, slow moving, low pressure system was located near the Chatham Islands, with high pressure building off the Otago coast. This resulted in a cool, southerly wind flow over much of the South Island, including the Canterbury coast.
- 1.7.2 The forecast available to the pilot indicated that for 21 November 1999 he could expect in the Canterbury/Marlborough area: occasional rain showers becoming confined to the coast during the afternoon; areas broken cumulus/stratocumulus bases 2000 (feet) tops to 7000, becoming scattered inland in the afternoon; broken altocumulus at times above 7000.
- 1.7.3 Forecast winds for 1300 hours were: Christchurch 195/24 (degrees true/knots) at 3000 feet, 190/25 at 5000 feet; Nelson 185/19 at 3000 and 190/19 at 5000. Visibility was forecast as 30 km, reducing to 5-10 km in showers.
- 1.7.4 MetService¹ reported that about the time of the accident there was scattered broken cloud cover over the area, with towering cumulus and cumulonimbus (CB) clouds embedded within this cover. Satellite imagery showed isolated CBs on the Richmond Range south-east of Nelson and possibly on the Kaikoura Ranges, with considerable clear air between the cells.
- 1.7.5 Additionally, the winds were likely to have been from about 200° true, 20 to 25 knots. The Kaikoura automatic weather station reported the 1600 wind as 240/21 gusting 39, and the 1700 wind as 230/21 with maximum gusts to 46 kt.

1.8 Aids to navigation

- 1.8.1 The pilot did not utilise any ground-based aids to navigation as the aircraft was not required to be equipped with the appropriate instrumentation and the flight was conducted under VFR.
- 1.8.2 DUU was equipped with a radar transponder and altitude encoder, and the transponder was selected to altitude reporting, displaying the standard VFR code of 1200 throughout both flights. Although the pilot did not utilise a radar service at any stage, the radar data was recorded routinely and was retrieved and played back, initially to aid the SAR effort and later to recreate as much of the flight path

¹ Trading name of the Meteorological Service of New Zealand Limited

as possible. The initial playback placed the ditching position about one nautical mile offshore, the last transponder return being received at 1705:28 hours. The last return containing Mode C information was at 1705:08 hours; the indicated altitude was zero feet.

- 1.8.3 No evidence of the emergency transponder code 7700 was found on the radar data plots. Selection of this code would cause an emergency alert to activate on all air traffic control radar plan view displays and would prompt ATS personnel to activated emergency and search and rescue procedures immediately
- 1.8.4 On the later replay, to avoid confusion with other aircraft, the radar plot was worked backwards from the ditching position. As indicated in 1.1.7, DUU came into coverage at 1506 hours after apparently tracking from the upper Wairau Valley. The track followed the Wairau Valley towards Blenheim, tracked to the south of the Woodbourne control zone and intercepted the coast about 13 nm south-west of Cape Campbell at 1547 hours.
- 1.8.5 According to the plot, the aeroplane passed the Clarence River mouth at 1602 hours and the Hurunui River mouth at 1645 hours. The time interval over this distance of 54 nm gives a groundspeed made good of about 75 knots.

1.9 Communications

- 1.9.1 ZK-DUU was equipped with an aeronautical VHF transceiver with which the pilot made routine contact with Air Traffic Control and Flight Information during the course of his flights.
- 1.9.2 The pilot did not submit a VFR flight plan to the ACNZ National Briefing Office, but registered a SARWATCH instead. This was in accordance with the current practice of the training organisation. Air traffic services provide a flight following service to aircraft operating on a VFR flight plan; SARWATCH is only an alerting service. Search and rescue action will be initiated at the nominated SARTIME unless the pilot has terminated the SARWATCH.
- 1.9.3 The Christchurch Flight Information Centre (FIC) received position reports from DUU at 1514 hours and 1629 hours. These were the positions 15 nm east of Lake Station and 15 nm south of Kaikoura respectively (as referred to in 1.1.6 and 1.1.9). The Flight Information Officer (FIO) entered these on the FIC position log, which is a sequential log of all radio calls received by the FIC. The FIC monitors 13 radio frequencies from all over New Zealand.
- 1.9.4 With both position reports, the pilot amended his SARTIME to coincide with his amended ETA at Christchurch. In each case the FIO updated the SARWATCH database, which is a computer-based system accessed via a terminal located behind the FIO position.
- 1.9.5 At 1638 hours the duty FIO's shift finished and the position was handed over to the rostered replacement FIO.
- 1.9.6 The new FIO received a radio transmission from ZK-DUU at 1704:12 hours. This was the first call that this FIO had received from the aircraft, and the transmission

was not heard clearly because of background noise and difficulty in understanding the pilot's accent. During this transmission another aircraft operating at Great Barrier Island transmitted over part of the message from DUU.

- 1.9.7 The pilot made four radio transmissions to Christchurch Flight Information between 1704:12 hours and 1705:16 hours. The FIO was unable to discern all the information contained in these transmissions but did understand that the aircraft was making a forced landing. There appeared to be no obvious sense of urgency in the radio transmissions, which were made in a routine manner. The FIO stated that the impression gained was that the aircraft was operating over land. The pilot's pronunciation of some words was not in accordance with international phonetic convention for aeronautical communications.
- 1.9.8 No standard distress call was received from the aircraft. The transmission made at 1704:12 hours commenced with one word "mayday" but this was very indistinct and the FIO did not hear it. A standard distress call commences with the word "MAYDAY" spoken three times. This methodology is designed to instantly alert ATS personnel to the distressed nature of a flight and initiate immediate emergency and search and rescue procedures.
- 1.9.9 At 1708:17 hours the Christchurch Centre Supervisor contacted the National Rescue Coordination Centre (NRCC) and advised the SAR Coordinator that the FIO had received a call from DUU stating that the aircraft was making a forced landing. The Supervisor explained that ATS staff were unsure of the position and intentions transmitted by the aircraft and were listening to an audio tape recording of the transmissions to try to verify this information.
- 1.9.10 At 1719:56 hours the Supervisor contacted the SAR Coordinator and confirmed that the position report received from DUU was three miles offshore, 10 miles north of the Ashley River and that there was a suspicion that the aircraft could be in the water.
- 1.9.11 An ELT transmission on 121.5 MHz was detected briefly at 1708 hours by a Boeing 767 some 35 nm south-west of Christchurch, on climb to flight level 150. However, it was not determined if this ELT signal originated from DUU.

1.10 Aerodrome information

- 1.10.1 Not applicable.

1.11 Flight recorders

- 1.11.1 Not applicable.

1.12 Wreckage and impact information

- 1.12.1 The Royal New Zealand Navy patrol vessel HMNZS *Kiwi* located a sonar target believed to be DUU on 24 November, and buoyed the position. On 25 November divers confirmed that the target was DUU, and made an underwater video of the aeroplane in situ.

- 1.12.2 The aeroplane was sitting upright on the seabed in a water depth of about 20 m, about two nautical miles offshore. The only damage evident was to the engine cowls and propeller spinner, and video images of the cabin showed that the magnetos were selected to “off” and the key removed, the battery master switch was on, and the transponder set to code 7700.
- 1.12.3 On 27 November, the aircraft was raised using airbags and towed, partially submerged, to the nearby beach where it was towed ashore on its own undercarriage.
- 1.12.4 DUU was transported as a helicopter sling load to a suitable area for inspection. The carburettor bowl and filter bowl was checked for signs of fuel. None was found. An inspection of the aeroplane revealed no pre-accident abnormalities.
- 1.12.5 The engine was removed and transported to an engine overhaul shop, mounted in a test stand, and after replacement of accessories damaged beyond use by seawater immersion, was started and run successfully. The engine ran normally throughout its power range. Checks of the original carburettor and magnetos found no pre-accident defects.

1.13 Medical and pathological information

- 1.13.1 Post-mortem examination of the pilot and passenger determined that they had both died of drowning.

1.14 Fire

- 1.14.1 Not applicable.

1.15 Survival aspects

- 1.15.1 No lifejackets were carried on the flight, although they were available on request from the training establishment. The available evidence suggests that the pilot made a successful ditching and that the aeroplane remained on the surface long enough for him to place his flight documentation and the ignition key into his flight bag.
- 1.15.2 However, the sea surface conditions were rough, and the water temperature was 14-15° C (as measured by the Sumner lifeboat crew). Only one of the aircraft occupants was reputed to be a proficient swimmer. Expected survival time in the prevailing conditions was limited to about 80 minutes.
- 1.15.3 It is possible that the ELT activated during the ditching, as the time the signal was received by the airliner to the south-west of Christchurch is roughly coincident with the time of ditching. The signal would cease however as soon as the aircraft sank, so its limited duration would have been of use only had there been a direction finder equipped aircraft or vessel in the immediate area.
- 1.15.4 The transponder was found set to code 7700, but as all returns were on code 1200, it was inferred that the pilot had set the emergency code only after the ditching. Had the pilot made a proper distress call and set his transponder to the emergency

code at the same time, both the position of the aircraft and the nature of the distress would have been immediately apparent, and SAR action would not have been delayed by the need to replay the audio and the radar recordings.

1.16 Tests and research

1.16.1 Not applicable.

1.17 Organisational and management information

1.17.1 Not applicable.

1.18 Additional information

- 1.18.1 Prior to departure from Christchurch, the pilot had completed a detailed flight log. His estimated time intervals for the outbound flight were (expressed as hours: minutes) Christchurch - Kaikoura 00:45, Kaikoura – Cape Campbell 00:21, and Cape Campbell - Nelson 00:38, totalling 01:44. However there appeared to be an error in measurement which resulted in the entry of the Kaikoura – Cape Campbell distance as 38 nm when it was actually 52. The same distance was entered for the return flight.
- 1.18.2 To determine how this apparent error occurred, a distance of 38 nm was plotted from Kaikoura aerodrome. The geographical location obtained was an unnamed point where the main road and railway turn away from the coast. The direct distance from this point to Nelson was 54 nm. The pilot had entered the Cape Campbell – Nelson distance as 57 nm on his log.
- 1.18.3 Using the pilot’s calculated groundspeeds, the planned times for the Kaikoura – Cape Campbell leg should have been increased by 8 minutes on the northbound flight and 11 on the southbound flight. Northbound, the corrected planned total for the complete flight was 01:52, which is very close to the 01:54 actual time achieved.
- 1.18.4 The planned elapsed time for the southbound flight was 02:16, and the corrected planned time 02:27. The corrected planned times totalled 04:19, and with the declared fuel endurance of 05:00 left a reserve of some 40 minutes, as against 60 minutes on the pilot’s reckoning. The minimum fuel reserve required by Civil Aviation Rules for a VFR flight of this nature is 30 minutes.
- 1.18.5 On his flight log, the pilot had compiled a fuel log with the apparent intention of changing tanks every 30 minutes. He had drawn up two columns, one for each tank, showing the expected fuel endurance in each at 30-minute intervals, and indicating the tank in use by placing a tick through the relevant endurance figure. At each tank change he logged the engine hours from the tachometer.
- 1.18.6 The first four tank changes, according to the engine hour figures, appear to have been made as planned intervals of about 30 minutes. The fifth change was made after an interval of 0.91 hours but the pilot did not adjust the endurance figure accordingly. At that point his log showed a remaining endurance of 02:30, but in

reality was close to 02:00. The geographic location at this time was calculated to be about the reported “15 nm east of Lake Station” position.

- 1.18.7 That position report was made at 1514 hours, but the flight log recorded a position of overhead Lake Station at 1510 hours. On the preceding line of his log the pilot had entered a position “O/H H Springs G/S 98 kts” but this entry had been crossed out.
- 1.18.8 On the assumption that the pilot had intended to track via Hanmer Springs after finding his planned route to Cape Campbell blocked by weather on the Richmond Range, calculations were made to see how far south he could have travelled. This gave a position about the junction of the Wairau and Rainbow Rivers, or about 15 nm south of the position where DUU entered radar coverage at 1506 hours. There were no corroboratory markings on the pilot’s map, although there were some figures that appeared to relate to a flight on an earlier date. The pilot had flown solo from Christchurch to Nelson and return via Hanmer Springs on 5 September 1999.
- 1.18.9 The next tank change was logged after a further 0.64 hours, or about 39 minutes. This corresponds with an aircraft position (at 1553 hours) about 10 nm north of the Clarence River. The pilot’s log indicated that there was one hour’s fuel in each tank at this point. Later fuel figures were illegible because of water damage to the log.

1.19 Useful or effective investigation techniques

- 1.19.1 Nil.

2. Analysis

- 2.1 The probability of a mechanical failure of the engine of DUU was eliminated as far as possible during the investigation. Subsequent investigation focussed on the pilot’s flight planning and in-flight decision-making.
- 2.2 The pilot’s planning was meticulous and reflected the standards to which he had been trained. The flight as planned should have been achievable with remaining legal fuel reserves.
- 2.3 The pilot did not exercise the option of refuelling at Nelson. It could not be determined why he chose not to refuel, in spite of ample time and opportunity being available. The passenger, himself a PPL(A) holder well on the way to obtaining his CPL(A) could have refuelled the aeroplane had the pilot requested it.
- 2.4 With the large cloud build-ups on the ranges to the east and south-east of Nelson, the pilot apparently thought better of attempting to track back the way he had come, departing the Nelson control zone to the south. His movements from there until 1506 hours are unknown, but his log entry anticipating overheading Hanmer Springs suggests that he intended tracking to Christchurch via the inland route.

- 2.5 The emergence of a radar target identified as DUU from the upper Wairau Valley suggested that he attempted this option and turned back at some point before reaching Hanmer Springs. Calculations showed that he may have reached the junction of the Wairau and Rainbow rivers, some 30 nm north of Hanmer Springs before turning back, although this was not confirmed by any markings on his map.
- 2.6 The apparent error in measuring the Kaikoura – Cape Campbell distance may not necessarily have been an actual error. The pilot could have intended to leave the coast at the point 38 nm from Kaikoura, and this would have been a more logical plan than tracking to and rounding Cape Campbell. The distance from either point to Nelson was almost the same. He may well have chosen to call this turning point Cape Campbell in the absence of a name on the map for that location.
- 2.7 From his reported position 15 nm east of Lake Station at 1516 hours, the pilot continued towards Blenheim, tracking to the south of the Woodbourne control zone before intercepting the coast about the point referred to in 2.6, about 38 nm from Kaikoura aerodrome.
- 2.8 Had the pilot been able to track to this point direct from Nelson as planned, he would have arrived overhead about 1448 hours, but in the event, he arrived at 1547 hours. The total airborne time, including the northbound sector, was by this time 3 hours 31 minutes. Flight planned time for the 38 nm leg to Kaikoura and thence to Christchurch was 1 hour 38 minutes.
- 2.9 However, the fuel endurance remaining out of the declared 5 hours was at this point nominally 1 hour 29 minutes. It is obvious in retrospect that the flight was not going to reach Christchurch, and also obvious that the pilot had not realised this fact. By this time he had forgone two opportunities to refuel, one at Nelson and the other at Omaka. A third and final opportunity lay ahead, at Kaikoura.
- 2.10 The intended 30-minute tank changes appeared to have been made as planned for the first four times, but the fifth was made after an interval of 0.91 hours, or about 55 minutes. No adjustment was made to the endurance figures at this time. The scheduled tank change was due about the time the pilot was presumed to have turned back towards the lower Wairau Valley; it is possible that there was some stress associated with the decision, causing him to forget the tank change for the time being. It is likely that he realised the omission when he made his routine position report checks.
- 2.11 The 1410 departure from Nelson, with the planned 2 hours 16 minutes flight time to Christchurch would have given the pilot about an hour to meet his work deadline of 1730 hours. However, it would have been evident to him by the time he made his 1516 position report that he was going to be late. This would be an additional stressor, and probably a very strong motivation for returning to Christchurch with no delay.
- 2.12 Even at Kaikoura the pilot does not appear to have realised that the remaining fuel endurance was less than his estimated time interval to Christchurch. At 15 nm

south of Kaikoura he amended his ETA to 1720, giving no indication of his low fuel state or any intention other than continuing to Christchurch.

- 2.13 When the first tank became exhausted of fuel the pilot would have been suddenly made fully aware of a problem with the fuel state. He would have been faced with the decision of continuing to Christchurch or returning to Kaikoura to refuel. A powerful consideration could have been the unacceptability of being late for work. This may have influenced his decision to rely upon calculated fuel quantity in the remaining tank and avoid the time penalty of returning to Kaikoura to refuel.
- 2.14 The passenger would likely have been also concerned by the fuel state, however the possibility exists that he may have not have felt comfortable with contributing to the decisions made by the more experienced pilot. This may also explain why he did not refuel the aircraft in Nelson whilst the pilot was with friends.
- 2.15 Although the flight generally followed the coast, there were points where it was expedient to maintain a straight course across bays and headlands rather than follow the coast exactly. To the north of the Waipara River mouth there is a marked “notch” in the coast, which could lead a southbound pilot to be over the sea briefly unless he deliberately chose to make a right heading change of about 45° to stay close to land. It was on this short over-water leg that the engine failed, while the aeroplane was still 2-3 nm offshore. The pilot had been trained to fly within gliding distance from land at all times so this direct track across Pegasus Bay suggests the possibility of a “short cut”. However, there may have been weather on the coast to cause the pilot to fly slightly further out than he intended.
- 2.16 At the point of engine failure, the aeroplane was beyond gliding distance from shore; had it been closer to shore there was up to 20 nm of beach suitable for a forced landing.
- 2.17 The pilot’s initial radio call contained the expression “MAYDAY” but it was only after several replays of the ATC tape that this became apparent. The rest of the call and those made subsequently were made in a routine, matter-of-fact tone that conveyed no sense of urgency to the FIO. The selection of the emergency transponder code also appears to have been delayed until the aeroplane had ditched and was out of radar coverage.
- 2.18 The topic of adequate distress calls has been featured in at least two New Zealand accident reports in recent years (see TAIC reports 95-004 and 98-008). Following a 1995 accident, an article on the subject of distress and urgency calls was published in “Vector”, the CAA’s flight safety magazine, and a similar article was published in 1999.
- 2.19 The TAIC report on the 1995 accident contained a quote on the subject from a British air accident report (AAIB Report 3/95):

“This is a frequent aspect of emergency situations in which there is a reluctance to use the specified pro-words, perhaps in the belief that the emergency does not warrant it or the hope that the situation might improve. This is a generally false

optimism which is likely to prejudice appropriate responses by those able to assist.”

- 2.20 The transmission of a proper distress message as well as the selection of the emergency transponder code would have made the nature and position of the emergency known immediately, particularly the fact that the aeroplane was ditching. This fact was not established immediately, resulting in the loss of valuable time in tasking the appropriate SAR assets. In the sea conditions prevailing, time was a major priority.
- 2.21 The ELT may have functioned on landing, but given the limited transmission time available before the aeroplane sank, would not have been of significant use.
- 2.22 In the event, the pilot made a successful ditching, and he and his passenger appear to have had time to vacate the aeroplane complete with flight bags in which all the pilot's documents and even the aircraft ignition key had been stowed. The area where these flight bags were found just over two hours later suggests that the actual ditching position was reasonably close to shore, certainly closer than the point where the aeroplane was later found on the seabed.
- 2.23 With lifejackets, the pilot and passenger should have had a reasonable chance of survival. The pilot had evidently not planned to fly over water beyond gliding distance from land, so the carriage of lifejackets was not a legal requirement. It should be pointed out here, however, that on the route flown by DUU between the Waipara River and Cape Campbell, there are very few areas along the coast that could be considered suitable for making a forced landing. A ditching may have been the only choice in the event of an engine failure.

3. Conclusions

- 3.1 The pilot was appropriately licensed, experienced and fit to make the planned flights.
- 3.2 The aeroplane was airworthy and had been maintained in accordance with the relevant requirements.
- 3.3 The pilot's flight plan indicated that the planned flights could have been made with the fuel on board at departure, leaving adequate reserves.
- 3.4 A substantial diversion on the return flight consumed the available fuel reserves.
- 3.5 Stress associated with the major diversion and a deadline at the destination probably adversely affected the pilot's information processing and decision-making causing him to make an en-route planning error.
- 3.6 The pilot did not appear to have realised that the remaining fuel was insufficient to reach his destination.
- 3.7 Two opportunities to land and refuel were not taken.

- 3.8 The aircraft engine failed at a time consistent with the exhaustion of all available fuel on board.
- 3.9 At the time of the engine failure the aeroplane was beyond gliding distance from shore.
- 3.10 Carriage of lifejackets for the flights as planned was not a legal requirement.
- 3.11 The lack of a standard distress call and the failure to set the emergency transponder code confused and delayed the search and rescue activity.

4. Safety recommendations

- 4.1 It was recommended that the Airways Corporation of New Zealand Ltd ATS Manager establish a procedure whereby ATS when in receipt of a distress or emergency message for an aircraft not on a flight plan shall, if required, interrogate the SARWATCH database to obtain information on the disposition of the flight.
- 4.3 The Airways Corporation of New Zealand Ltd ATS Manager has accepted the above recommendation and will action accordingly.

5. Safety actions

- 5.1 The CAA will issue safety information regarding the importance of using correct notification procedures in an emergency situation.
- 5.2 The CAA will carry out a comprehensive review of the rules relating to the use of lifejackets in aircraft.

Max B Stevens
Deputy Director of Civil Aviation

Date