Report 01-011

Cessna A185E Skywagon

ZK-JGI

forced landing following power loss after take-off

near Motueka Aerodrome

29 November 2001

Abstract

On Thursday 29 November 2001, at about 0930, Cessna A185E Skywagon ZK-JGI took off from Motueka Aerodrome on a local parachuting flight. Shortly after take-off, at about 100 feet, ZK-JGI had a sudden and total power loss. Unable to re-establish power, the pilot guided the aircraft to a nearby kiwifruit orchard. After clipping trees the aircraft struck the ground heavily, resulting in the pilot and 4 parachutists receiving serious injuries and 1 parachutist sustaining minor injuries.

The power loss was due to the pilot inadvertently selecting the fuel Off before the flight.

The safety issues identified were the certification of the aircraft with a modified fuel selector, pilot actions for a sudden power loss after take-off, and the non-fitment and wearing of safety restraints by parachutists. Safety recommendations were made to the Director of Civil Aviation to address these issues.

The Transport Accident Investigation Commission is an independent Crown entity established to determine the circumstances and causes of accidents and incidents with a view to avoiding similar occurrences in the future. Accordingly it is inappropriate that reports should be used to assign fault or blame or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.

The Commission may make recommendations to improve transport safety. The cost of implementing any recommendation must always be balanced against its benefits. Such analysis is a matter for the regulator and the industry.

Figure 1
Cessna A185E ZK-JGI after the accident

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Abbreviations

ARA	Annual Review of Airworthiness
CAA	Civil Aviation Authority of New Zealand
CAR	Civil Aviation Rule
m	metre(s)

Glossary

Tandem master	A suitably experienced parachutist responsible for the direct control of a tandem parachute descent.
Tandem pair	A tandem rider attached to a tandem master by a harness.
Tandem rider	A person participating in a tandem parachute descent using the secondary harness of a tandem harness system.

Data Summary

Aircraft registration:	ZK-JGI
Type and serial number:	Cessna A185E Skywagon, 18501989
Number, type and serial number of engines:	one Teledyne Continental IO-520-D, 554689
Year of manufacture:	reported as 1972
Operator:	Skydive Nelson Limited
Date and time:	29 November 2001, 0930[1]
Location:	1 kilometre southwest of Motueka Aerodrome latitude: 41° 07.514′ south longitude: 172° 59.089′ east
Type of flight:	private, commercial parachuting
Persons on board:	crew: 1 passengers: 5
Injuries:	crew: 1 serious passengers: 4 serious 1 minor
Nature of damage:	aircraft destroyed
Pilot's licence:	Commercial Pilot Licence (Aeroplane)
Pilot's age:	32
Pilot's total flying experience:	1594 hours (169 on type)
Investigator-in-charge:	I R M^{c}Clelland

[1] Times in this report are New Zealand Daylight Time (UTC + 13 hours) and are expressed in the 24-hour mode.

1 Factual Information

1.1 History of the flight

1.1.1 At about 0800 on Thursday 29 November 2001, the pilot of Cessna A185E Skywagon ZK-JGI arrived at the operator's base on Motueka Aerodrome to prepare for the day's parachuting operations. Two initial flights were programmed, the first consisting of 2 tandem pairs accompanied by a camera operator. The flights would entail a climb to about 12 000 feet overhead the aerodrome, from where the parachutists would freefall before deploying their parachutes to land back on the aerodrome. The weather was reported as calm with little or no cloud.

1.1.2 Bad weather had precluded flying and parachuting operations on the previous day with ZK-JGI last being flown by another pilot on Tuesday 27 November. After checking the aircraft and warming the engine the pilot taxied to the front of the operator's base and shut down. During the pre-flight inspection of the aircraft the pilot noted that the fuel tank selector handle was selected to the right tank. The pilot rotated the handle clockwise through 90° intending to select both tanks. With Both selected, fuel would flow from the 2 wing tanks at the same time.

1.1.3 After the 2 tandem masters had briefed their riders, the 5 parachutists and pilot boarded the aircraft. ZK-JGI was fitted with a pilot's seat at the front left side of the cabin. The 5 parachutists sat on a mat that covered the floor of the aircraft. The camera operator was seated in the rear right of the cabin and the 2 tandem pairs were positioned with one pair behind the pilot and the second pair to his right next to the large exit door. Civil Aviation Rules (CARs)[2] exempted persons carrying out parachute operations from having to occupy a seat and wear a safety or restraint belt when flying. The door was closed for the taxi and take-off.

1.1.4 At about 0925 the pilot started the aircraft and taxied to the threshold of runway 20. After lining-up the pilot commenced the take-off roll using a reduced power setting to limit the noise for local residents. Shortly after take-off, at about 100 feet and passing the end of the runway, there was a sudden and total loss of engine power. The pilot established a glide and manoeuvred the aircraft away from some buildings towards a clearer area. During this time the pilot checked the engine controls in an attempt to restore power, which was unsuccessful.

1.1.5 The occupants were instructed to prepare for the landing. The aircraft initially clipped a row of trees surrounding a kiwifruit orchard before striking the ground heavily. The aircraft slid a short distance and rotated to the left before coming to rest.

1.1.6 The 3 parachutists on the right side of the aircraft, one tandem pair and the camera operator, were ejected through the parachuting exit door as the aircraft spun around to the left. They ended up on the ground next to the right side of the aircraft. The second tandem pair and the pilot remained inside the aircraft. The pilot was retained in the seat by his harness but the seat had broken free of its floor mounting tracks.

1.1.7 The tandem master seated behind the pilot was able to assist his rider clear of the aircraft before giving initial first aid to the pilot and checking the remaining 3 parachutists. An off-duty ambulance worker arrived on the scene within 3 to 5 minutes and also provided emergency first aid to the casualties. Full emergency services arrived within another 5 minutes and the most serious of the casualties were evacuated to Nelson Hospital by helicopter.

1.1.8 The aeroplane was destroyed and some minor damage to the orchard occurred. There was no fire.

[2] CAR 91.207 (d), effective 15 July 1999.

1.2 Injuries to persons

Injuries	Crew	Passengers	Others
Fatal	-	-	-
Serious	1	4	-
Minor/None	-	1	-

1.3 Personnel information

1.3.1 Pilot: aged 32 years

Licence: Commercial Pilot Licence (Aeroplane)

Ratings: parachute drop rating, issued 7 September 2001

Aeroplane type ratings: Cessna 152, 172, 172RG, 180/185, 206 and 207, Piper PA34-200T

Medical certificate: Class 1, valid to 10 December 2001

Last biennial review: 1 July 2000

Flying experience: 1594 hours total
169 hours on type

1.3.2 The pilot completed a type conversion on the Cessna 185 with another operator on 24 August 2001. He joined the operator on about 3 September 2001 and gained his parachute drop rating on 7 September 2001.

1.4 Aircraft information

1.4.1 ZK-JGI was recorded as being a Cessna A185E Skywagon, serial number 18501989, manufactured in 1972 for the United States Army. The military description for this model of aircraft was U17. The aircraft was a single-engine high wing, tail wheeled aeroplane of metal construction. It was imported to New Zealand from Vietnam in about November 1995. The aircraft was fitted with a Teledyne Continental IO-520-D engine, serial number 554689, initially driving a 2-bladed propeller.

1.4.2 In processing the application for a Certificate of Airworthiness, the Civil Aviation Authority (CAA) had concerns about the history and state of the aircraft. The maintenance company that reassembled ZK-JGI first completed an airworthiness inspection on the aircraft. This was followed with a second inspection by a CAA airworthiness engineer, after which ZK-JGI was issued a Certificate of Airworthiness in the special-experimental category on 4 April 1996.

1.4.3 On 23 April 1996, an aircraft maintenance support company that was familiar with Cessna aircraft completed a type conformity inspection[3] on ZK-JGI. The aircraft was "inspected against type certificate data sheet 3A24, the applicable Cessna 185 Illustrated Parts Manual, and additional information supplied by Cessna Aircraft Company giving details of additional equipment fitted at manufacture." The company determined that ZK-JGI complied with the available data, except for about 6 non-standard items that were either to be rectified or later approved. The CAA accepted the inspection and soon thereafter issued a standard category airworthiness certificate.

[3] An inspection to ensure that ZK-JGI conformed to the specifications of a Cessna 185, produced under type certificate number 3A24.

1.4.1 In August 1996, an engineering company that had assumed responsibility for maintaining ZK-JGI declined to issue a maintenance release for the aircraft when completing some work on it. The new maintainer determined that the aircraft did not comply with CAA certification requirements. The engineer responsible contended that ZK-JGI was an amalgam of several aircraft and had numerous unapproved modifications and unsatisfactory repairs. The CAA agreed to a programme of rectification, and in January 1997 the aircraft was considered airworthy. The engineer and several others involved at the time also recalled that the moulding that surrounded the fuel tank selector handle, titled a "cover fuel tank selector" (selector cover), was not fitted. The absence of the selector cover did not restrict the operation of the "3-position valve" selector handle but required it to be labelled to identify the 3 selection positions.

1.4.2 In June 1999, a Hartzell 3-bladed constant-speed propeller, serial number EC 1305A, was installed on the aircraft, and in early 2000 a second engineering organisation assumed responsibility for the maintenance of ZK-JGI. This coincided with the purchase of ZK-JGI by the operator, who had previously leased the aircraft. ZK-JGI was used primarily for parachuting operations with the passenger seats removed and a large exit door and step fitted on the right side. The door could be opened and closed in flight.

1.4.3 In February 2001, the maintainer, at the request of the operator, installed a hinged Perspex cover over the fuel tank selector handle. The operator had become concerned about the handle being exposed and the possibility of it being snagged by a parachutist. The 3 tank selection labels, Left, Both and Right, had also required regular replacement due to parachutists moving around in the cabin and dislodging the labels.

1.4.4 Records indicated ZK-JGI had been maintained in accordance with the approved Cessna maintenance schedule. A 200-hour check was completed on 5 July 2001 at 3085.9 hours and an Annual Review of Airworthiness (ARA) was completed on 3 September 2001. The next inspection was recorded as being due at 3185.9 hours or 10 September 2002, whichever came first. The aircraft was recorded as having accumulated 3180.5 hours at the time of the accident.

1.4.5 On 25 January 2001, the original fuel control unit was reinstalled having been previously removed for repair by a sub-contractor. On 10 September 2001 new seat tracks were installed for the pilot's seat and the right wing fuel bladder was replaced.

Fuel system

1.4.6 The Cessna 185 model of aircraft was fitted with 2 wing tanks that supplied fuel to a fuel control unit and manifold on the engine via an accumulator tank, a shut-off valve, a fuel strainer, an electric auxiliary pump and an engine-driven fuel pump. In addition to the fuel shut-off valve some Cessna 185 aircraft, including ZK-JGI, were fitted with a 3-position rotary fuel selector that enabled fuel to flow from the left, right or both tanks to the fuel accumulator tank. The fuel shut-off and tank selection controls were located immediately to the right of the pilot on a central pedestal beside the seat (see Figure 2).

1.4.7 Normally the fuel selector handle was able to be rotated only through a 180° forward arc, with the Left and Right tank selections pointing to their respective tank. The Both option was achieved with the handle pointing centrally forward. The selector cover normally prevented rearwards rotation of the handle. The absence of the selector cover on ZK-JGI meant that with the Perspex cover lifted the handle could be rotated through 360°. Though not labelled, by positioning the selector handle to the rear the fuel flow from the wing tanks to the accumulator tank could be shut off.

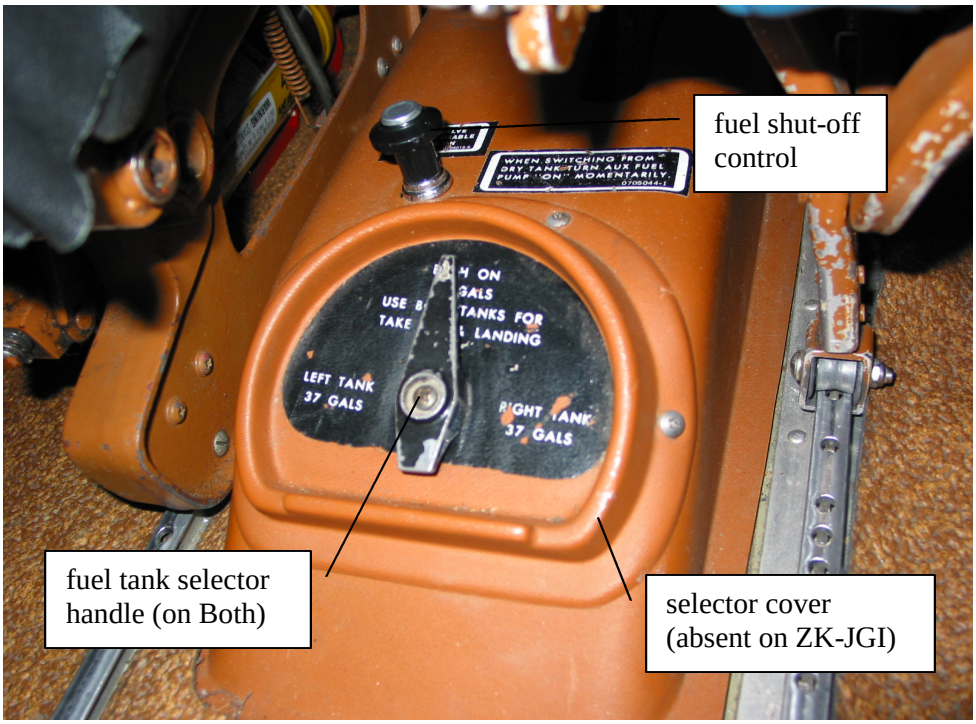

Figure 2
Cessna 185 fuel management controls similar to ZK-JGI pre-modification

1.5 Aerodrome information

1.5.1 Motueka Aerodrome had an elevation of 38 feet above mean sea level and consisted of parallel grass and bitumen runways orientated 020 and 200° magnetic. The runways were about 690 m in length.

1.5.2 The aerodrome, located adjacent to the township of Motueka, was surrounded by intensive horticulture.

1.6 Wreckage and impact information

1.6.1 The accident site was about 250 m from the end of runway 20 and slightly to the right of the runway centreline. ZK-JGI had initially clipped a row of 16 m high trees on a heading of about 210° magnetic. This was reported to have pitched the nose down, causing the glide angle to increase significantly and the aircraft to strike the ground heavily in a left wing and nose low attitude some 15 m past the trees. The aircraft slid for about 10 m before coming to rest. As the aircraft slid along the ground the left wing struck some kiwifruit vines and a post, spinning it around to the left through about 120°.

1.6.2 The aircraft was destroyed. The left main wheel and outer wing section had separated after the aircraft had struck the ground. The aircraft was resting on its belly and right wing tip. Both fuel tanks were intact and contained fuel. Fuel was dripping from the vent for the right tank, which was also partially blocked by a light reddish substance.

1.6.3 The propeller was still attached to the engine. One propeller blade was bent backwards underneath the engine, while the other 2 blades had sustained little or no damage. The type of damage was indicative of slow or no rotation of the engine as the aircraft struck the ground. The cabin structure remained intact; however, the engine mounting and rear fuselage were both bent upwards.

1.6.4 The position of the flap control lever and the flaps were consistent with full or near full flap being selected before impact. The throttle, propeller and mixture control levers were in positions consistent with the application of full power. The battery/master, auxiliary fuel pump, anti-collision beacon and landing light switches were confirmed as having been switched off by rescue personnel after the accident. The aircraft battery and emergency locator transmitter had also been disconnected and turned off shortly after arrival of emergency services at the scene.

1.6.5 The magneto switch was selected to Both and the engine cowl flap control was selected to partially open. The fuel shut-off valve was in the fully on position and the fuel tank selector handle was pointing towards the rear. The Perspex cover for the handle had broken and only the Left label was present. The remaining 2 labels, Right and Both, were absent. The fuel tank selector handle rotated freely, and fuel was observed to flow unrestricted through the line past the selector.

1.6.6 The engine was removed for further examination. Refer to section 1.9 for comment.

1.7 Survival aspects

1.7.1 The pilot sustained serious facial and chest injuries. The 2 parachutists seated on the left side received minor to moderate injuries ranging from severe bruising to cuts and a broken bone. The 3 parachutists seated on the right side of the aircraft received serious injuries, including broken limbs and a serious head injury. The occupants were hospitalised from one day to 2 weeks depending on the seriousness of their injuries.

1.7.2 With the exception of the pilot, the injuries sustained by the parachutists were significantly worse for those seated on the right side of the aircraft.

1.7.3 The forces encountered during the accident were calculated to be above the design criteria for the pilot's seat.

1.8 Tests and research

1.8.1 The engine was sent to an approved overhaul facility and inspected under the supervision of the Commission. Engine accessories were removed and the engine dismantled to determine any possible cause for the power loss.

1.8.2 The examination showed normal component wear patterns. There was no evidence of any mechanical failure or blockages that could have caused an engine failure or power loss. However, the fuel control unit displayed significant fuel staining and a broken fuel line leading from the engine-driven fuel pump to the fuel control unit. The break was at an elbow joint that attached the fuel line to the control unit.

1.8.3 Closer examination of the fuel control unit indicated that the elbow joint had initially been weakened by fatigue cracking and then finally failed in overload. The fatigued area covered about ½ of the diameter of the line. It was determined that the line would still function but a small amount of fuel would be lost through the break before the line totally failed.

2 Analysis

2.1 The flight was to be a routine parachute drop. The weather was suitable, and the pilot and tandem masters were well rested and prepared for the flight. The pilot had flown for the operator for 3 months and was familiar with the aircraft and parachuting operation.

2.2 The reason why the fuel tank selector handle was on the right tank when the pilot performed the pre-flight inspection on the aircraft was not established. The reddish substance found in the right fuel vent was probably sealant that was applied when the new fuel bladder was installed in

September. The substance may have slowly become lodged in the vent over the preceding 2 or so months. This could have restricted fuel flowing from the right tank. A pilot may, therefore, have needed to select the right tank in an attempt to re-establish a balance between the 2 tanks. Alternatively, the heavy impact during the accident sequence may have dislodged the substance, which then partially blocked the vent.

2.3 The separation of the fuel line to the fuel control unit probably occurred as the aircraft struck the ground and did not contribute to the accident. The initial fatiguing of the elbow joint was probably due to the joint being stressed when the part was reinstalled on the aircraft in January 2001. The vibrating of the engine caused the fatigue crack to grow. If left unchecked the line would have eventually failed, causing a total loss of fuel to the engine.

2.4 The presence of fuel staining on the fuel control unit should have alerted the maintainer to a potential problem in this area. Records confirm that there were 5 scheduled inspections on the engine since the control unit was reinstalled. Had there been any obvious fuel staining this should have been detected during any one of these inspections. However, the staining may not have become obvious until nearer the time of the accident.

2.5 By rotating the fuel selector handle to the rearwards position, the pilot inadvertently shut off the fuel flow to the accumulator tank, which had a capacity of 3.28 litres. The manufacturer estimated this would provide sufficient fuel for the aircraft to taxi and get airborne before the tank ran dry.

2.6 The pilot was convinced that by rotating the selector handle to point rearwards fuel would flow from both tanks. This was an incorrect assumption but one the pilot may have formed over the time he had flown with the operator.

2.7 Relevant documentation for the fuel system only made reference to a 3-position fuel valve, with Both being the centrally forward position. The labelling of the 3 fuel selection options and the presence of the selector cover around the handle was designed to prevent unintentional rotation of the handle to the rear. Normally fuel shut-off could only be achieved by pulling up the shut-off control. This action would have resulted in an immediate stopping of the engine because the shut-off valve was downstream of the accumulator tank.

2.8 The operator owned another Cessna 185 aircraft, which was an “A” model. The second aircraft had the same fuel shut-off control system as ZK-JGI, but no tank selection capability. ZK-JGI was normally operated with the fuel selector handle on Both. The aircraft flight manual stated that the handle should be on Both for take-off and landing. The pilot would, therefore, have been most familiar with the handle being aligned fore and aft, but may not have noticed in which fore and aft direction the handle was normally selected.

2.9 The pilot’s previous experience included flying the Cessna 206 and 207 models of aircraft. These aircraft had a 3-position fuel selector with Left, Right and Off options available, but no Both capability. The Off position was centrally to the rear, so it is unlikely the pilot mistook what type of aircraft he was operating.

2.10 The 2 fuel selection labels had been absent for some time – probably from not long after the last inspection, the ARA completed on 3 September 2001. With the pilot joining the operator at about this time, he may not have benefited from a visual reminder of the various tank selections.

2.11 In summary: without the selector cover that restricted the rotation of the handle, the absence of some labelling confirming the selections available, knowing that it was supposed to be a 3-position selector with a separate fuel shut-off control and given his previous experience, the pilot assumed that he could select Both by rotating the fuel selector handle to a rearwards position.

Certification

2.12 The selector cover, which included a placard detailing tank information, was probably not present when ZK-JGI was imported to New Zealand. The selector cover, part number 0716114-3, was part of the fuel system installation for the Cessna 185, identified as item –60 in Figure 105 of the Cessna 180-185 parts manual. It was therefore a required part unless there was another approval – which for ZK-JGI there was not. The absence of the selector cover and the possible ramifications were probably not recognised during the initial certification and operation of the aircraft.

2.13 The absence of the selector cover changed the function of the selector handle, from a 3-position operation to a 4-position operation that included an Off capability. There was no reminder to alert a pilot to this additional capability or hazard.

2.14 Airworthiness engineers and companies involved in the certification of ZK-JGI agreed that in 1996, when ZK-JGI was being certified, there was confusion surrounding certification requirements for aircraft, in particular ex-military aircraft or others with an unknown history. In late 1995, CAA introduced CAR Part 21, Certification of Products and Parts. In 1997, amendments to Part 21 and the introduction of additional subparts clarified the certification and airworthiness requirements for these aircraft. Since 1996, CAA has also developed additional internal procedures to assist in the certification process.

Survivability

2.15 The pilot's injuries were consistent with the pilot's seat coming free and the pilot impacting the control column and instrument panel. The pilot was restrained in the seat by his lap belt during this time. Many of the parachutists' injuries included flailing type injuries, for example broken limbs and cuts. Despite the level of injuries sustained, several of which were life-threatening, the immediate first aid given by the tandem master and off-duty ambulance worker, and shortly thereafter the rescue services, was prompt, coordinated and effective.

2.16 The benefit of wearing some form of safety harness or restraint was difficult to determine. The pilot's seat may have reduced the impact forces on the 2 occupants seated behind it – accounting for the lesser injuries sustained by them. Had the parachutists been wearing restraints the occupants on the right side would probably not have been thrown clear of the aircraft.

2.17 The wearing of restraints was compulsory in most other countries where sport parachuting is undertaken, for example Australia and the United States of America. Generally the restraints were required to be worn while the aircraft was below a set height. Anecdotal evidence provided by the regulatory authorities for these countries indicated that there was reluctance by many parachutists to wear the restraints. Parachutists were concerned about the increased likelihood of being caught or becoming tangled with any restraint harness or its attachment while moving about in the cabin. Further, should an emergency occur in the air parachutists would prefer to jump clear of the aircraft if there was sufficient height available. Wearing a restraint harness would hinder such action.

2.18 International experience indicated that safety restraints were most effective in larger aircraft where injuries were compounded by the concertina effect of having a larger number of unrestrained parachutists moving about during an accident. The same benefit perhaps did not apply to small aircraft, for example the Cessna 185. To be effective in this accident, any safety restraints would have needed to be capable of withstanding loads greater than what the pilot's seat was designed to withstand.

Operating technique

2.19 The practice of taking off using less than full power was done to minimise the noise disturbance to residents around the aerodrome. The Cessna 185, especially when fitted with a 2-bladed propeller, produced a large amount of noise. The operator was being considerate to the nearby residents by fitting the 3-blade propeller and then requesting pilots to use a reduced power setting whenever practicable.

2.20 By using less than full power the aircraft would, however, take longer to climb to a safe height from where a successful forced landing could be better guaranteed should a power loss occur. It would have been safer for the pilot to use maximum power available to climb to a safe height and then reduce power to lower the noise levels.

2.21 The pilot correctly continued to "fly" the aircraft after the power loss, guiding it to a safer area for landing. Had the pilot moved the fuel selector handle in his initial actions he may have been able to restore power before striking the ground, although in this accident there was probably not sufficient time to perform this action.

2.22 A sudden and total power loss was normally caused by a catastrophic mechanical failure, a major ignition fault or lack of fuel. A mechanical failure would normally be associated with a range of other indications, including mechanical type noises or rough running. An ignition failure, for example, a failure of both magnetos, was rare. A sudden engine stoppage without any precursor could, therefore, probably be regarded as a fuel supply problem. The inclusion of "checking the fuel selection" in a pilot's initial actions, while still continuing to "fly" the aircraft, could greatly increase the possibility of a successful power recovery.

3 Findings

3.1 The pilot was appropriately qualified for the flight.

3.2 The aircraft had a partially fractured fuel line, and was missing the correct fuel tank selector cover, but was capable of normal flight at the time of the accident.

3.3 The aircraft lost power after take-off due to the pilot inadvertently selecting the fuel Off before take-off.

3.4 The absence of the selector cover and labelling around the fuel selector handle removed 2 defences against a pilot inadvertently rotating the handle to an off position.

3.5 The lack of defences and the pilot's relative inexperience on type probably combined to cause the pilot's inadvertent shutting off of the fuel.

3.6 The change in function of the fuel tank selector should have been identified and corrected, as early as the initial certification of the aircraft in 1996, but initial certification instructions and checklists did not provide sufficient information for the omission to be detected.

3.7 Changes to CAA rules and procedures made since the importation of ZK-JGI should assist in the certification process.

3.8 The pilot's actions after the power loss were appropriate but did not include changing the fuel selection.

3.9 The seriousness of injuries sustained by the occupants may have been reduced had they been wearing some form of safety restraint.

3.10 The response of the emergency services was rapid and appropriate; the timely administering of first aid and evacuation to hospital prevented any loss of life.

4 Safety Recommendations

4.1 On 19 June 2002 the Commission recommended to the Director of Civil Aviation that he:

4.1.1 In conjunction with the New Zealand Parachuting Federation, complete a study into the utility of parachutists wearing safety restraints for take-off and landing, and include any resulting recommendations in the rule making process as a petition by March 2003. (018/02)

4.1.2 Remind pilots of the actions for an engine failure after take-off as contained in the Civil Aviation Authority's Flight Instructor's Guide, and the benefit, if time permits, of changing fuel tank selection should a sudden, total and unexplained power loss occur. (019/02)

4.2 On 27 June 2002 the Director of Civil Aviation replied in part:

4.2.1 Both recommendations are accepted as worded and will be implemented as follows:

018/02: The study into the utility of parachutists wearing safety restraints for take-off and landing which will include any resulting recommendations in the rule making process as a petition will be submitted by 1 March 2003.

019/02: I will publish an article in The Civil Aviation Authority's "Vector" magazine reminding pilots of their immediate actions following an engine failure after take-off. I expect this to be implemented by 31 December 2002.

Approved for publication 05 June 2002

Hon. W P Jeffries
Chief Commissioner