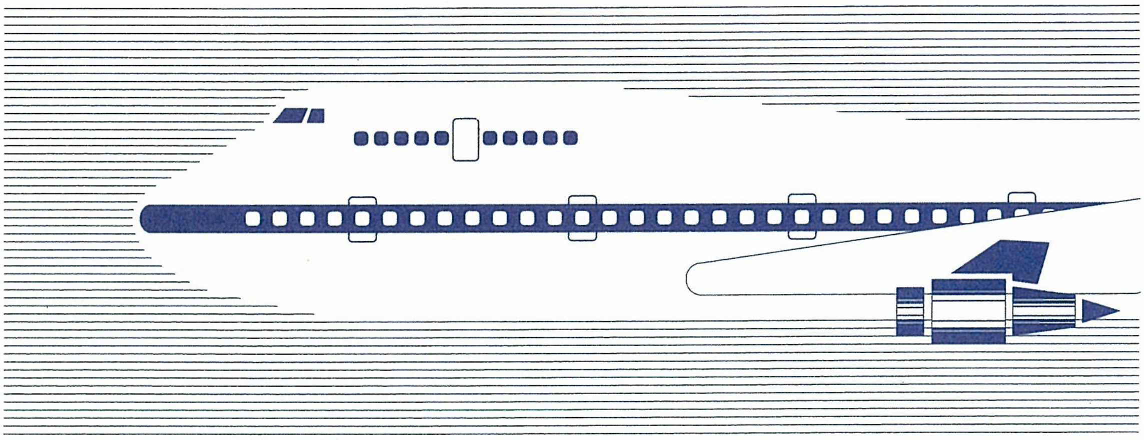

AVIATION OCCURRENCE REPORT

NO. 93-007

PIPER PA 28-140

ZK-DGU

WEST MELTON AERODROME

17 APRIL 1993

TRANSPORT ACCIDENT INVESTIGATION COMMISSION

WELLINGTON • NEW ZEALAND

The Transport Accident Investigation Commission is an independent Crown agency established under its own Act of Parliament. The Commission conducts transport accident and incident investigations with the principal purpose of determining their causes and contributing factors with a view to avoiding similar occurrences in the future. The Commission seeks to identify safety deficiencies in the course of its investigations and make recommendations designed to eliminate or reduce such safety deficiencies.

NO. 93-007

PIPER PA 28-140

ZK-DGU

WEST MELTON AERODROME

17 APRIL 1993

ABSTRACT

This report explains the collision with a tree of ZK-DGU, a PA 28 aeroplane on a dual training flight. Safety issues discussed are procedures for actual and simulated engine failures after take-off.

TRANSPORT ACCIDENT INVESTIGATION COMMISSION

AIRCRAFT ACCIDENT REPORT NO. 93-007

Aircraft Type, Serial Number and Registration:	Piper PA 28-140, 28-25748, ZK-DGU
Number and Type of Engines:	One Lycoming O-320 E3D
Year of Manufacture:	1969
Date and Time:	17 April 1993, 1234 hours *
Location:	2km north-east of West Melton Aerodrome Latitude: 43°28'S Longitude: 172°24'E
Type of Flight:	Aero Club
Persons on Board:	Crew: 2
Injuries:	Crew: 1 Fatal, 1 Serious
Nature of Damage:	Substantial
Pilot in Command's Licence:	Commercial Pilot Licence (Aeroplane) "B" Category Instructor Rating
Pilot in Command's Total Flying Experience:	1305 hours 1001 hours on type 922 hours instructing
Information Sources:	Transport Accident Investigation Commission field investigation
Investigator in Charge:	Mr J J Goddard

* All times in this report are NZST (UTC + 12 hours)

1. NARRATIVE

1.1 The flying instructor was employed on a part-time basis by the Canterbury Aero Club, in addition to his normal occupation as an air traffic control supervisor. On the morning of 17 April 1993 he was asked to instruct for the day, at the Aero Club's West Melton Aerodrome.

1.2 On arrival at the Aero Club at Christchurch Airport he carried out a pre-flight inspection on ZK-DGU, which had been refuelled to 75 litres in each tank, before the short ferry flight to West Melton.

1.3 The first student pilot was at West Melton when the instructor arrived in ZK-DGU at about 0920 hours. As he was at an early solo stage of his training he was to fly dual circuits with the instructor before flying solo. Before their first take-off an engine run-up check disclosed a drop of about 250 RPM when running on the left magneto. The instructor increased the RPM further and leaned the mixture for a short period in an attempt to rectify the problem, without any obvious improvement. After some discussion, he decided that it was acceptable.

1.4 They flew circuits for 0.7 hours, initially using Runway 22, then on Runway 04 as a light north-east wind had developed. The student then flew solo circuits for 0.5 hour. He reported that the engine had performed normally throughout.

1.5 The instructor then flew with the second student pilot, again on circuit training, without incident. This lesson occupied 0.75 hours, and finished at midday.

1.6 The next student pilot had arrived at West Melton during this time, not having made a booking to fly, to see if a lesson was possible. As the aircraft was available until the next booking at 1300 hours, the instructor agreed to fly with him.

1.7 The student had flown 13.9 hours, of which 3.45 hours was solo practice. As all of this flying had been on the PA 38 type, and he had last flown in September 1992, it was agreed that the lesson would be dual circuits, familiarising him with the PA 28 aircraft. He had not flown previously with this instructor, but reported that they got on well together.

1.8 Before flying ZK-DGU the student did a pre-flight inspection of the aircraft. He dipped the fuel tanks, and later recalled that the right tank contained 6 gallons while the left tank contained 13 gallons of fuel. He took care to select the fuller tank before starting the engine.

1.9 The student had only partial recollection of the flight, but he did remember the first two circuits, with touch-and-go landings, which had been satisfactory and without incident.

1.10 A few minutes later ZK-DGU collided with the top of a tree situated in line with the departure end of Runway 04, and fell to the ground in the next paddock. There were no witnesses, or RTF calls from the aircraft to alert anyone to the accident.

1.11 At 1245 hours an emergency location transmitter signal was reported to Christchurch Air Traffic Control by an airliner departing from Christchurch. A second report indicated that the ELT was to the north-west of Christchurch. Christchurch Tower established that all their local traffic was accounted for, and then telephoned local aircraft operators and aerodromes to enquire about a possible source of the ELT signal from non flight-planned aircraft. At 1317 hours a telephone conversation with a pilot at West Melton Aerodrome established that ZK-DGU had not returned for his booking at 1300 hours.

1.12 This information had been progressively relayed to the Rescue Coordination Centre in Wellington. When advised that an aircraft was overdue, the RCC authorised Christchurch Tower to task the local rescue helicopter to do an ELT search using its radio direction finding equipment. The helicopter departed at 1350 hours. In the meantime several light aircraft operating west of Christchurch were asked to look for the missing aircraft.

1.13 The rescue helicopter's electronic homing search was not successful, so the pilot reverted to a "null-aural" search for the ELT. The helicopter was approaching ZK-DGU when it was located visually by another aircraft at 1423 hours. The helicopter landed nearby at 1426 hours, and dropped personnel who found that the instructor had been killed and the student seriously injured. The student was subsequently evacuated to hospital by the helicopter.

1.14 Examination of the site showed that the right wing of the aircraft had first collided with the top of a pine tree at about 90 feet agl, located in line with runway 04 and 600 m from the aerodrome boundary. It was near the end of a shelter belt of trees oriented 170°/350° magnetic. The aircraft had collided approximately wings-level; the pitch attitude was not determined. The outer 1.8 m of the right wing and aileron were detached and lodged in the tree.

1.15 The aircraft had then descended to the ground 46 m east of the tree. Ground marks indicated that it had rolled some 270° to the right, so that it struck the ground semi-inverted with the left wing, cartwheeled, and came to rest inverted. The left wing separated during the impact sequence.

1.16 The aircraft was structurally complete at tree impact, and showed no evidence of a bird strike. The pre-impact integrity of each of the flight controls was established, and the elevator trim jack position corresponded with a setting just aft of neutral. The flap setting was at the "one-notch" position, but this could have resulted from cockpit disruption.

1.17 Little significant evidence was gained from the cockpit instruments. The transponder selector was set to "STANDBY". Engine controls were in normal positions, with full throttle selected. The magneto switch was on "BOTH". The fuel tank selector was displaced from the "left tank" detent, but subsequent tests showed that normal flow was available in this position.

1.18 The engine and propeller did not show evidence of power at ground impact. The engine induction and exhaust systems were unobstructed. Disruption of the fuel system precluded a fuel sample from the carburettor, but a sample from the right tank was normal Avgas. Substantial fuel staining on the grass showed that both tanks had contained appreciable quantities.

1.19 Both occupants had been restrained by lap/diagonal harnesses, but the collapse of the forward cockpit structure backwards and to the right during the ground impact made the accident unsurvivable for the instructor in the right seat. It was not possible to determine which person had been handling the controls when the accident occurred.

1.20 A subsequent strip and inspection of the engine and accessories did not disclose any potential cause of an engine failure. However a worn and fouled sparking plug would have caused the reported magneto drop, and a poorly seating exhaust valve would have caused some reduction in power.

1.21 The post-mortem examination of the instructor did not reveal any abnormality which might have affected his ability to conduct the flight.

1.22 A search of the Christchurch Radar recordings for the appropriate area and time period was made. These showed three aircraft in the West Melton circuit; two with secondary responses with Mode C altitude readout, and one with a primary response only. The secondary targets were identified subsequently, and their pilot's accounts confirmed that the primary target was probably ZK-DGU.

1.23 The recording first showed ZK-DGU at 1221 hours, on climbout from runway 04. The circuit was normal, with probably a touch-and-go landing. During this first circuit, one of the other aircraft joined the West Melton pattern, about 90 seconds behind ZK-DGU.

1.24 After a total of three similar circuits the recording showed ZK-DGU airborne again, at 1234:01 hours, proceeding on a normal climb-out path. At 1234:26 hours, however, the radar return ceased in the close vicinity of the accident site, not to reappear. This probably indicated the occurrence of the accident. At that time the second aircraft was shown in a late downwind position, and the third aircraft was inbound to West Melton prior to joining the circuit. Neither would have been in a position to observe the accident.

1.25 Both of the other aircraft flew over the site of the accident shortly after it occurred, but it would have been screened from their observation by the adjacent line of trees.

1.26 The recorded path of ZK-DGU suggested that some event occurred to cause it to descend during the climb after take-off. No altitude readouts were available as the radar return was primary only. However, this return was not recorded at low level at West Melton and only appeared as the aircraft climbed to some height above the aerodrome, then disappeared as it descended again, as shown on the previous circuits.

1.27 There were two potential explanations for the aircraft's descent after take-off; that the engine power had failed during the climb, or that the instructor had simulated an engine failure as a training exercise.

1.28 In either event the necessary initial response from a pilot was to lower the aircraft's nose promptly to a gliding attitude; select the best clear path ahead and turn as necessary in order to land in the space available. In the case of a take-off from Runway 04 at West Melton the presence of the line of tall pine trees which converged with the climb-out path would, in most cases, have required a prompt right turn through 30 to 40° to allow the aircraft to glide clear of them to the best advantage. Only in the event of an engine failure at low height would a straight ahead glide, to land before the trees, have been viable. A left turn was obstructed by a tree plantation.

1.29 A PA 28 aircraft, similarly laden to ZK-DGU, was flown from Runway 04, in similar light wind conditions, to assess the effect of the trees on the required actions. On a normal climb-out the trees were crossed at about 400 feet agl. An engine failure simulated at 300 feet agl did just permit a glide straight ahead over the trees, while one at 250 feet agl required the prompt right turn to cross them. A simulated failure below about 150 feet agl required a landing straight ahead before the trees were reached. It was evident that the presence of the trees did require precise decision-making in this eventuality.

1.30 The instructor was familiar with West Melton, having flown there on training flights on many occasions. It was thus probable that he was familiar with the trees and their consequent influence on a pilot's actions should an engine failure occur after take-off.

1.31 No evidence was found to indicate whether an actual or a simulated engine failure had initiated the events leading to this accident. If an actual failure had occurred, however, the probability was that the instructor would have taken control of the aircraft, whereas if he had simulated a failure, with a student at this stage of training, he would have expected the student to retain control and react appropriately.

1.32 If the instructor had been handling the aircraft after an actual engine failure, it was likely that either a decisive right turn to clear the trees or a positive descent ahead, perhaps with full flaps, would have been made, depending on the height of occurrence. The collision near the top of the tree straight ahead which actually occurred suggested that this hypothesis was the less likely.

1.33 If the instructor had simulated an engine failure, normally done by closing the throttle, the likelihood was that this would have been not just after take-off, but after climbing to between 200 and 300 feet, in order to give the student a reasonable opportunity to respond. The student had not done this exercise before in the PA 28 type, and not at all for 7 months. It would have been possible for the student to respond by lowering the nose of the aircraft to glide straight ahead without perceiving a need to turn right to clear the obstructing trees ahead. The instructor would then have needed to react by instructing the student to reapply engine power in order to resume the climb, but might have delayed briefly to allow him to observe the obstruction and the required action. The reapplication of power, by opening the throttle, could have become a critical operation in such a case. A too-rapid throttle movement, perhaps spurred by anxiety, could have caused a delayed response from the engine. It was possible that ZK-DGU was more susceptible than normal to such throttle mishandling because of the fouled sparking plug or the poor exhaust valve. The result of such a delay would have been an enforced descent, perhaps to a point where a collision was unavoidable.

1.34 In the less likely alternative of a simulated engine failure at a height which required a descent straight ahead before the trees were reached, the reapplication of power to climb away would have been even more critical because of the lower height, and more dependent upon good judgement by the instructor. Any delay in response could thus have placed the aircraft in a climb but unable to clear the trees ahead. The aircraft would also have been more vulnerable to any turbulence or downdraughts in the lee of the trees. Because of these factors, the risks posed by simulating engine failures at low heights before tall obstacles probably outweighed the risks of not practising such emergency procedures.

2. FINDINGS

2.1 Both crew were suitably qualified, and the instructor suitably experienced for the training flight undertaken.

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

2.3 The aircraft's engine had minor deficiencies which may have affected the events leading to the accident, but was probably capable of normal operation.

2.4 The aircraft was properly loaded and fuelled for the flight.

2.5 During the initial climb after take-off the aircraft descended and collided with a tree.

2.6 The tree did not infringe the published aerodrome take-off distance available, but was one of a row of trees which defined this distance.

2.7 The cause of the descent after take-off was not determined, but it resulted either from a loss of engine power or during part of a simulated engine failure training exercise.

2.8 Damage caused by the tree collision rendered the aircraft uncontrollable and led to a severe collision with the ground.

23 September 1993

M F Dunphy
Chief Commissioner

GLOSSARY OF ABBREVIATIONS USED IN THESE REPORTS

agl	Above Ground Level
Avgas	Aviation gasoline
ELT	Emergency Location Transmitter
E	East
km	kilometres
m	metre
NZST	New Zealand Standard Time
RPM	Revolutions per minute
S	South
UTC	Universal Coordinated Time

RECENT AIRCRAFT ACCIDENT REPORTS PUBLISHED BY THE TRANSPORT ACCIDENT INVESTIGATION COMMISSION

93-001	Aircraft accident involving Robinson R22 Beta ZK-HCT at Palmer Stream, Seaward Kaikoura Range 38 km West North-West of Kaikoura on 11 January 1993
93-002	Aircraft accident involving Aerospatiale AS 350B ZK-HNH at Mt Fyffe on 1 February 1993
93-003	Aircraft accident involving Hughes 369 HS ZK-HQE near Papakaio, 13 km North of Oamaru on 17 February 1993
93-006	Aircraft accident involving Britten-Norman BN-2A ZK-FVD at Great Barrier Aerodrome on 6 April 1993
93-008	Aircraft accident involving Piper PA 28-140 ZK-DBT at Carters Beach, Westport on 22 April 1993

P.O. Box 10-323, Wellington, New Zealand. Telephone (04) 473 3112

Price $13.50

ISSN 0112-6962