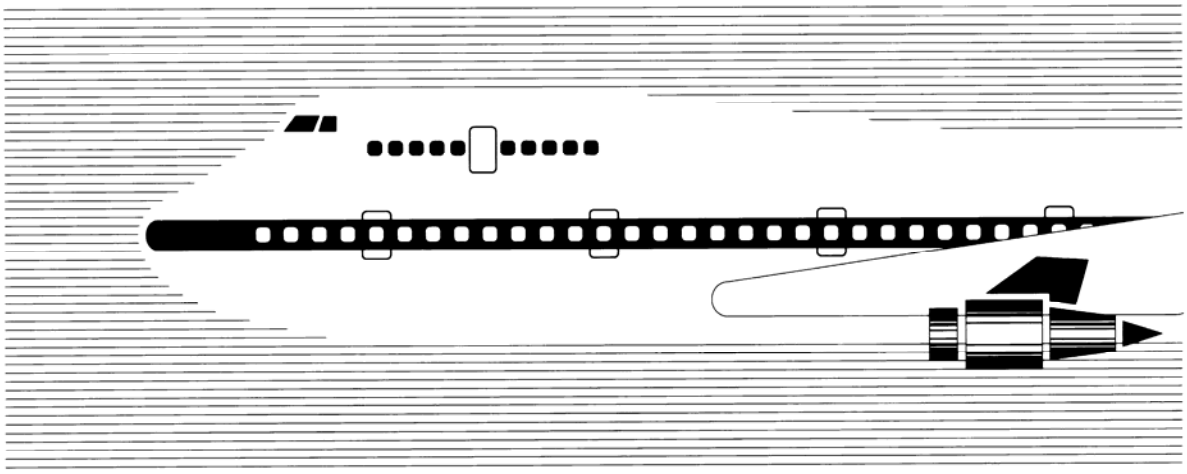
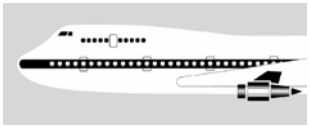
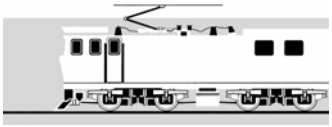


AVIATION OCCURRENCE REPORT

06-002 **Piper PA 23-250 Aztec, ZK-FMU, wheels-up landing, Napier Aerodrome** **13 April 2006**


TRANSPORT ACCIDENT INVESTIGATION COMMISSION
NEW ZEALAND

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.

Report 06-002

Piper PA 23-250 Aztec

ZK-FMU

wheels-up landing

Napier Aerodrome

13 April 2006

Abstract

On Thursday 13 April 2006 at about 1530, ZK-FMU, a Piper PA 23-250 Aztec, was landed intentionally at Napier Aerodrome with its landing gear retracted. On board were a student pilot and an instructor. Nobody was injured.

During a normal circuit, the landing gear selector lever broke when the student attempted to select the landing gear down. The instructor could not reach the remaining segment of the lever to select the landing gear down, and neither of the 2 emergency gear lowering systems would work without the gear being selected down.

A safety issue identified was the unreliability of visual inspections to detect landing gear selector lever cracking. A safety recommendation addressing this issue was made to the Director of Civil Aviation.

ZK-FMU after the wheels-up landing

Contents

Figures

Abbreviations

AD	Airworthiness Directive
SB	Service Bulletin
UTC	coordinated universal time

Data Summary

Aircraft registration:	ZK-FMU
Type and serial number:	Piper PA 23-250 Aztec, 27-2970
Number and type of engines:	2 Lycoming IO-540 C4B5
Year of manufacture:	1965
Operator:	New Zealand Aerial Mapping Limited
Date and time:	13 April 2006**,** 1530[1]
Location:	Napier Aerodrome latitude: 39° 27.9′ south longitude: 176° 51.8′ east
Type of flight:	training
Persons on board:	crew: 2 passengers: nil
Injuries:	nil
Nature of damage:	belly scraping and left propeller damage
Pilot in command's licence:	Commercial Pilot Licence (Aeroplane)
Pilot in command's age:	56
Pilot in command's total flying experience:	18 800 hours 500 hours on type
Investigator-in-charge:	K A Mathews

[1] Times in this report are New Zealand standard time (UTC +12 hours) and are expressed in the 24-hour mode.

1 Factual Information

1.1 History of the flight

1.1.1 On Thursday 13 April 2006 at about 1330, ZK-FMU, a Piper PA 23-250 Aztec, took off from Napier Aerodrome in fine weather on a local training flight for a pilot multi-engine aeroplane type conversion. The aeroplane had a reported fuel endurance of about 4 hours. On board were a student pilot and an instructor.

1.1.2 When the aeroplane was in the downwind position during the second circuit, the student attempted to select the landing gear down in preparation for landing. However, the handle of the landing gear selector lever broke off in his hand, and the gear remained selected up.

1.1.3 Because the landing gear had to be selected down before any gear lowering system would work, the pilots were unable to lower the landing gear using either of the 2 emergency lowering systems.

1.1.4 The instructor advised the aerodrome controller, and the student flew the aeroplane to a safe position east of the aerodrome where they attempted to resolve the problem.

1.1.5 The instructor contacted the operator's chief engineer at Hastings and discussed the situation with him, who in turn contacted his manager. Using the aeroplane crash axe, the instructor unsuccessfully attempted to reach the remaining section of the broken gear selector lever inside the control console in order to select the landing gear down.

1.1.6 Being unable to resolve the situation, the manager asked the instructor to fly ZK-FMU to Hastings and carry out a gear-up landing. However, the instructor decided to land the aeroplane at Napier because emergency services were available there.

1.1.7 The instructor advised the aerodrome controller of his intentions, and asked him to alert the emergency services.

1.1.8 The instructor later advised that the flight manual contained no instructions on how to land the aeroplane with its landing gear retracted.

1.1.9 After visually checking the aerodrome wind and surface conditions, and after the emergency services had checked runway 07 grass, the instructor decided to land ZK-FMU on the grass portion of runway 07 (see Figure 1).

1.1.10 During the circuit before landing, the instructor shut down the right engine and feathered its propeller, and the student turned off the fuel and magnetos. To prevent any propeller damage during the landing, the instructor had the student crank the engine until the stationary propeller was aligned approximately horizontal, after which the student turned off the master switch.

1.1.11 To help prevent any flap damage, the instructor opted to not use flap for the landing.

1.1.12 To reduce the potential of a fire and to help minimise any engine damage, the instructor shut down the left engine and had the student turn off the fuel, magnetos and master switch, just before the aeroplane touched down, at about 1530.

1.1.13 To prevent the aeroplane stalling on landing and thus pitching forward and damaging the forward section of the fuselage, the instructor landed the aeroplane at a higher than normal touch-down speed.

1.1.14 ZK-FMU touched down smoothly about two thirds of the way down the grass portion of the runway. The aeroplane remained straight until it contacted the start of the sealed portion of the runway, where it slewed about 90° to the right and came to rest. No fire occurred, but the pilots later remarked that there was a smell like burning rubber that probably came from the sidewalls of the tyres rubbing on the runway surface.

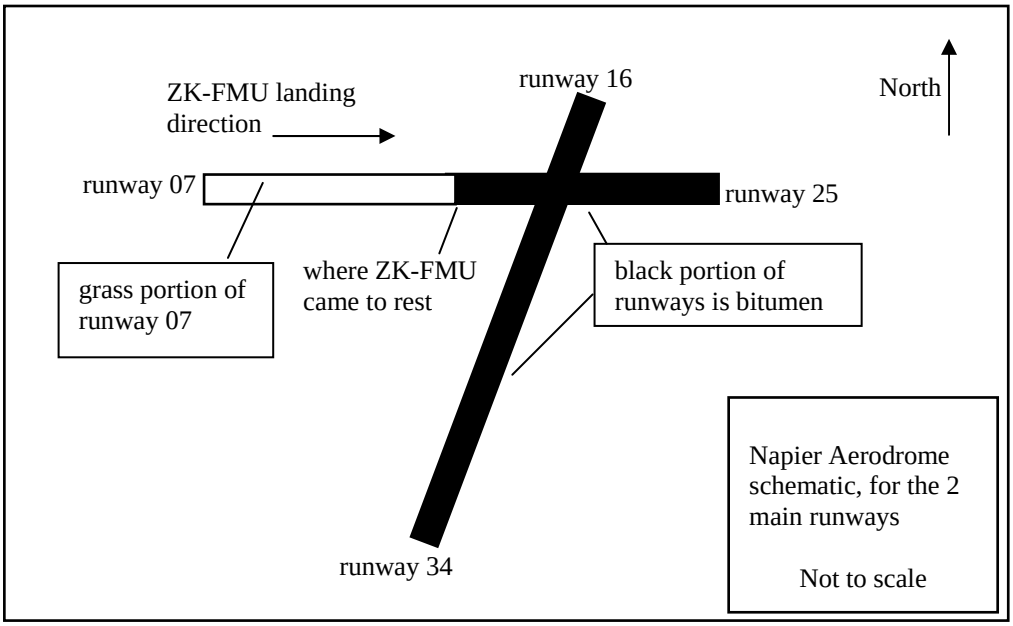


Figure 1
Napier Aerodrome schematic

1.1.15 Emergency services attended the landing, and checked that both pilots had escaped the aeroplane and that they were uninjured.

1.2 Injuries to persons

1.2.1 Nobody was injured.

1.3 Damage to aircraft

1.3.1 The left propeller was bent, and the belly of the aeroplane was scraped and some external antennae were broken.

1.4 Other damage

1.4.1 There was some surface scraping of the runway grass, and some scraping at the start of the sealed section.

1.5 Personnel information

1.5.1 The instructor was aged 56. He held a Commercial Pilot Licence (Aeroplane) and a valid Class 1 medical certificate. He held A and D category instructor ratings, and an instrument rating.

1.5.2 The instructor's total flying experience amounted to 18 800 hours, with 500 hours in the PA 23-250 Aztec. In the previous 90-day period he had flown 100 hours, including 5 hours in the Aztec.

1.5.3 The student was aged 26. He held a Commercial Pilot Licence (Aeroplane), and a valid Class 2 medical certificate.

1.5.4 The student's total flying experience amounted to 240 hours, with 6 hours in the PA 23-250 Aztec. In the previous 90-day period he had flown 7 hours, including 6 hours in the Aztec.

1.6 Aircraft information

1.6.1 ZK-FMU was a Piper Aircraft Corporation PA 23-250 Aztec, serial number 27-2970, 6-seat twin-engine aeroplane, manufactured in the United States in 1965.

1.6.2 The aeroplane had a non-terminating certificate of airworthiness in the standard category.

1.6.3 The aeroplane records showed that ZK-FMU had accumulated 7131 flying hours since new. The aeroplane was last inspected on 3 April 2006 during a 100-hour check, and was due for its next inspection at 7176 hours or 3 October 2006, whichever occurred first.

1.6.4 On 3 January 1979, the aeroplane manufacturer issued Service Bulletin (SB) number 635, Landing Gear Selector Lever Inspection and Replacement. The SB applied to ZK-FMU. The manufacturer issued the SB because there had been reports of several instances of landing gear selector levers breaking off because of cracks developing at the bend radii of the gear selector lever, part number 752303.

1.6.5 The SB called for a visual inspection for cracking in the bend radii of the gear selector lever by using a 10-power magnifying glass, within the next 100 hours of operation or at the next scheduled inspection, whichever occurred first. The inspection was to be repeated every 100 flying hours thereafter, unless a new improved landing gear selector lever, part number 761213, was installed. Installation of the improved selector lever relieved the requirement for the repetitive inspection. If any cracking was found, the selector lever had to be replaced with the improved version before further flight.

1.6.6 On 8 February 1980, the Civil Aviation Authority of New Zealand issued Airworthiness Directive (AD) DCA/PA-23/155A Landing Gear Selector Inspection, which applied to all model PA 23 aircraft that had landing gear selector lever part number 752303 installed. The AD required compliance with Piper SB 635 within the next 50 flying hours, and thereafter at intervals not exceeding 100 flying hours until the new improved selector lever, part number 761213, was installed.

1.6.7 The broken gear selector lever from ZK-FMU was the old version, part number 752303, and the AD had last been complied with on 3 April 2006 during the 100-hour check, 10 days before the accident. In that period, the aeroplane had flown approximately 5 hours. The operator's chief engineer did the check and the AD inspection, and had done so numerous times before. He commented that it was difficult to thoroughly inspect the lever, which he believed was the original part.

1.6.8 The instructor said that pilots would sometimes put side loads on the aeroplane landing gear selector lever with their hand during normal gear selection, and could bend it.

1.7 Tests and research

1.7.1 The broken gear selector lever from ZK-FMU had failed at its bend radius, and a visual examination showed that there was a substantial fatigue crack covering approximately 80% of the cross-sectional area of the lever. This was the area to which Piper SB 635, and AD DCA/PA-23/155A, referred.

1.7.2 Another New Zealand operator advised that he had experienced a similar incident about 3 weeks earlier with one of his 6 Aztecs, after the repetitive AD had been satisfied. In that instance, the pilot was able to use the blade of the aeroplane crash axe to push the remaining section of the gear selector lever into the gear-down position, after which he landed the aeroplane safely.

1.7.3 The other operator also said that he had experienced a similar incident about 5 years earlier in a different Aztec. He said that he had upgraded all but one Aztec in his fleet with the improved gear selector lever, and that he would soon upgrade his remaining aeroplane. He expressed concern about the effectiveness of the repetitive AD.

1.7.4 The other operator said that a pilot could catch their leg on the handle of the gear selector lever when either entering or exiting the aeroplane, and bend the lever. He said that he had issued his pilots with a notice advising them to avoid catching the handle.

1.7.5 The aeroplane manufacturer advised that it had sold 47 improved gear selector levers for the PA 23 aircraft during the previous 3.5 years, but did not know if the sales were because operators had decided to replace the levers to relieve the inspection requirement, or because of part breakage.

1.7.6 The aeroplane manufacturer said that because the improved gear selector lever had a retail price of less than $200, it was logical to assume that most operators would opt to replace the levers to eliminate the recurring cost of the repetitive inspection.

1.8 Other information

1.8.1 Visual inspections were an unreliable means of detecting all but the most prominent of material cracks.

1.8.2 Included among international initiatives for dealing with aging aircraft was the recognition that the best maintenance practice was to remove the need for any repetitive AD action where practicable, for example by component replacement.

2 Analysis

2.1 ZK-FMU was being operated normally when, during normal gear-down selection, its landing gear selector lever broke.

2.2 Because the remaining section of the gear selector lever was contained within the control console, the instructor was unable to reach it and select the gear down. This was so even though previously another pilot, when faced with a similar situation in a different aeroplane, had done so successfully with the blade of the crash axe.

2.3 Because neither of the 2 emergency landing gear lowering systems would operate until the gear was selected down, the instructor had no choice but to land ZK-FMU with its landing gear retracted.

2.4 Because the aeroplane flight manual contained no instructions on how to land the aeroplane with its landing gear retracted, the instructor applied his general aircraft knowledge and experience to land the aeroplane successfully and to keep the damage to a minimum.

2.5 The aeroplane landing gear selector lever was known to crack and fail in the area of its bend radii, and was subject to mandatory visual inspections every 100 flying hours to check for any cracking, in accordance with an SB and an AD. Even though the lever had been inspected only 10 days and 5 flying hours earlier, the inspection revealed no cracking.

2.6 An examination of the landing gear selector lever showed that it had broken because of fatigue cracking at a bend in the selector lever. The fatigue crack appeared to have been there for some time, and would almost certainly have been present during the last visual inspection of the lever.

2.7 A different operator had also experienced a similar failure in one of his Aztec aeroplanes about 3 weeks before the accident with ZK-FMU, and an earlier failure several years before. These 3 events occurring, despite regular visual inspections, suggested that such inspections were an unreliable means of detecting any cracking in the levers. Any dependence solely upon visual inspections to detect all but the most prominent of material cracks is imprudent.

2.8 The aeroplane manufacturer had made improved landing gear selector levers available to replace the ones that were susceptible to cracking. Therefore, the best maintenance practice was to remove the inferior component from the PA 23 series aeroplanes and fit the improved version. This action also removed the need for the mandatory visual inspections every 100 flying hours. The Commission recommended to the Director of Civil Aviation that he require all operators of the PA 23 series aircraft to replace the old gear selector levers with the improved version, as soon as practicable.

3 Findings

Findings are listed in order of development and not in order of priority.

3.1 The aeroplane had a valid certificate of airworthiness, and its records indicated that it had been maintained in accordance with its approved schedule.

3.2 A pre-existing fatigue crack at a bend radius in the landing gear selector lever had grown to a critical point, so that the selector lever broke during normal gear down selection.

3.3 Because the instructor could not reach the remaining segment of the landing gear selector lever he could not select the gear down.

3.4 Because neither of the 2 aeroplane emergency landing gear lowering systems could function until the landing gear was selected down, the instructor had to land the aeroplane with its landing gear retracted.

3.5 Although the landing gear selector lever was subject to mandatory repetitive visual inspections to check for any cracking at its bend radii, the last inspection approximately 5 flying hours previously did not reveal any cracking.

3.6 This accident and 2 similar separate incidents suggested that dependence upon an unreliable visual inspection to detect any cracking in the levers was imprudent.

3.7 Replacement of the landing gear selector levers with an improved version overcame the cracking problem, and removed the need for the repetitive inspections.

4 Safety Recommendation

4.1 On 5 May 2006 the Commission recommended to the Director of Civil Aviation that he:

4.1.1 require all operators of the Piper PA 23-250 Aztec aeroplanes that are subject to AD DCA/PA-23/155A to replace the gear selector lever with the new improved version, part number 761213, as soon as practicable. (020/06)

4.2 On 25 May 2006 the Civil Aviation Authority replied, in part:

> The Director will accept this recommendation and will amend AD DCA/PA-23/155A, to require owners of these aircraft [to] replace the gear selector lever with the new improved version, part number 761213, within 100 hours. This amendment to the AD will be published 1 June 2006.

Approved on 17 August 2006 for publication

Hon. W P Jeffries
Chief Commissioner

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04-008	Cessna 172, ZK-JES, ditching Cable Bay, Northland, 15 December 2004
04-003	Bell/Garlick UH1B Iroquois helicopter, ZK-HSF, in-flight break-up, near Mokoreta, Southland, 23 April 2004
04-006	Boeing 777, HL 7497, landed short of displaced threshold, Auckland International Airport, 16 November 2004
04-001	Piper PA23-250E Axtec, ZK-DGS, landing gear collapse during taxi, Paraparaumu Aerodrome, 9 January 2004
03-007	Hughes 369HS, ZK-HCC, in-flight power loss and emergency landing, Fox Glacier, 30 November 2003

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