Report 01-002

Fairchild SA227-AC Metro III

ZK-RCA

bird strike and loss of both engines

Tauranga Aerodrome

9 March 2001

Abstract

On Friday, 9 March 2001 at 0922, ZK-RCA, a Fairchild SA227-AC Metro III operating as NZ 2703 from Auckland, struck a flock of birds on landing at Tauranga Aerodrome. During the ground roll the left-hand engine failed and the aircraft was brought to a halt to complete the engine shutdown checklist. While taxiing to the terminal the right-hand engine spooled down. The 16 passengers were disembarked and the aircraft was towed to the terminal. ZK-RCA's left-hand engine was replaced and the aircraft returned to service after 3 days. There were no injuries.

The left-hand engine failed as a result of the damage caused by the bird strikes. The right-hand engine spooled down probably as a result of the crew selecting the fuel shutoff for the right-hand engine by mistake.

Safety issues identified were the use of the checklist by the crew, the ergonomics of some cockpit switches on the Metro III, and the bird hazard at Tauranga and nationally. The operator completed several safety actions and a safety recommendation was made 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.

Transport Accident Investigation Commission
P O Box 10-323, Wellington, New Zealand
Phone +64 4 473 3112 Fax +64 4 499 1510
E-mail: reports@taic.org.nz Web site: www.taic.org.nz

Contents

Figures

List of Abbreviations

ATIS	aerodrome terminal information service
CAA	Civil Aviation Authority
cm	centimetre(s)
CRM	Crew Resource Management
g	gram(s)
kg	kilogram(s)
km	kilometre(s)
m	metre(s)
QRH	Quick Reference Handbook
UTC	Coordinated Universal Time

Data Summary

Aircraft type, serial number and registration:	Fairchild SA227-AC Metro III, AC637, ZK-RCA
Number and type of engines:	2 Garrett TPE331-11U-611G
Year of manufacture:	1986
Date and time:	9 March 2001, 0922[1]
Location:	Tauranga Aerodrome latitude: 37° 40.32′ south longitude: 176° 11.77′ east
Operator:	Eagle Airways Limited
Type of flight:	scheduled passenger transport
Persons on board:	crew: 2 passengers: 16
Injuries:	crew: nil passengers: nil
Nature of damage:	one engine removed for overhaul
Captain's licence:	Airline Transport Pilot Licence (Aeroplane)
First officer's licence:	Commercial Pilot Licence (Aeroplane)
Captain's age:	33
First officer's age:	28
Captain's flying experience:	5902 hours (797 hours on type)
First officer's flying experience:	2623 hours (161 hours on type)
Investigator-in-charge:	I R McClelland

[1] All times in this report are New Zealand Daylight Time (UTC + 13).

1. Factual Information

1.1 History of the flight

1.1.1 On Friday 9 March 2001 at about 0845, ZK-RCA, a Fairchild SA227-AC Metro III, took off from Auckland International Aerodrome on a scheduled passenger flight to Tauranga Aerodrome. On board the aircraft were 16 passengers and 2 crew. The first officer was the flying or handling pilot for the flight and the captain the non-flying pilot.

1.1.2 Low cloud at Tauranga required an instrument approach to be flown for runway 07. The flight became visual at about 1400 to 1500 feet on the approach and the first officer continued flying towards the aerodrome. At about 300 feet on final approach the crew observed a flock of seagulls near the threshold of the runway. The first officer advised the captain that he would flatten the approach and fly over the seagulls to land a short way into the runway. The captain agreed with the plan.

1.1.3 After passing the seagulls the first officer continued the approach to land. As ZK-RCA was flared and about to touch down, a small flock of birds rose from the runway in front of the aircraft. The crew heard several thumps as the aircraft passed through the flock and touched down.

1.1.4 Retarding the power levers past flight idle and into reverse thrust the first officer felt the aircraft starting to yaw or turn to the right. At the same time the crew detected a smell entering the aircraft and both pilots assumed that this was associated with a bird being ingested into an engine. The first officer advised the captain that he was having some difficulty controlling the aircraft and returned the power levers to the idle setting.

1.1.5 The captain scanned the instruments and noticed the left-hand engine was failing. He leaned forward and pulled the stop and feather button for the left-hand engine and advised the first officer that he was taking control of the aircraft. The captain brought the aircraft to a halt about two-thirds of the way down the runway using a moderate amount of braking. As the aircraft rolled to a stop the crew advised the control tower of the bird strike and the actions they were taking.

1.1.6 The aircraft Quick Reference Handbook (QRH) was consulted and the actions for securing the left-hand engine were initiated. The first officer ran the checklist by calling the item to be actioned. The captain identified the switch to be operated by placing his hand on the switch. After the first officer confirmed that it was the correct switch to be operated, the captain moved the switch in accordance with the instruction. This process was completed for each item on the checklist.

1.1.7 After making an announcement to the passengers and advising the tower, ZK-RCA was taxied back along the runway towards the apron outside the terminal. Approaching the turn-off to the apron the right-hand engine started to spool down and the aircraft was brought to a halt. The engine failure checklist for the right-hand engine was completed before the passengers were disembarked and the aircraft towed to the apron. Both pilots initially believed that the failure of the second engine was also due to the bird strikes on landing.

1.2 Injuries to persons

1.2.1 There were no injuries.

1.3 Damage

1.3.1 Evidence of bird strikes was observed on the left-hand engine and wing, and the right-hand wing, engine cowl and propeller. The left-hand engine suffered significant damage and was removed for major overhaul. The right-hand engine was checked and considered to be serviceable. There was no evidence of a mechanical problem that could have led to the failure of the right-hand engine. The aircraft was returned to service on 12 March 2001 after a replacement left-hand engine was installed.

1.3.2 The total cost of the incident was estimated by the operator to be about $475, 000. This included both direct costs, such as replacing damaged engine parts, and indirect costs such as loss of revenue.

1.3.3 After the incident the aerodrome rescue fire service retrieved a small number of dead birds from the runway, at about the area where the crew of ZK-RCA reported hearing several thumps on landing. The birds were identified by a member of the service as spur-winged plovers.

1.4 Personnel information

1.4.1 The captain was aged 33. He had joined the operator in January 1995 and initially flew the Embraer EMB110P1 Bandereirante, becoming a captain in September 1995. He became a captain on the Fairchild SA227 Metro in December 1999 and had accrued 5902 flying hours, including 797 hours on Metro aircraft.

1.4.2 The captain held an Airline Transport Pilot Licence (Aeroplane) and a Class 1 Medical Certificate valid until 29 May 2001.

1.4.3 As part of the operator's normal training programme, the captain had completed a Crew Resource Management (CRM) course with Air New Zealand on 26 March 1999.

1.4.4 The first officer was aged 28. He joined the operator in December 2000 and completed his Metro course on 10 January 2001. He had accrued 2623 flying hours, including 161 hours on Metro aircraft.

1.4.5 The first officer held a Commercial Pilot Licence (Aeroplane) and a Class 1 Medical Certificate valid until 12 September 2001. The first officer had yet to undertake the company CRM course but had completed some CRM training several years previously.

1.5 Aircraft information

1.5.1 ZK-RCA was a Fairchild SA227-AC Metro III, serial number AC637, twin engine all-metal aircraft, constructed in United States in 1986. The aircraft was fitted with Garrett TPE331-11U-611G turboprop engines.

1.5.2 The aircraft had been issued with a non-terminating Certificate of Airworthiness in the standard category. The aircraft was routinely used for scheduled public transport flights and had seating normally for 19 passengers and 2 pilots. The aircraft had an approved maximum take-off weight of 6578 kg and a landing weight of 6350 kg. The estimated weight on landing at Tauranga was 6344 kg.

1.5.3 The aircraft records indicated that ZK-RCA had been maintained in accordance with its approved schedule and that it had accumulated 25 670.6 hours total time-in-service. The last inspection was completed on 20 February 2001, at 25 581.6 hours. The next check was due at 25 781.6 hours.

1.5.4 The aircraft instrument panel for the Fairchild SA227 Metro followed conventional methodology, with separate flight instruments for the captain and first officer (see Figure 1). The layout of the engine performance instruments was also conventional with the instruments for the left-hand engine in a vertical row to the left of the instruments for the right-hand engine. On the central pedestal, engine control levers and switches were also divided to the left and right, generally in pairs going down the pedestal, except the fuel and hydraulic shutoff switches; which were identical and in a single row across the pedestal. The 2 sets of switches were separated in the centre by a fuel boost switch, with the 2 fuel switches to the left of the boost switch and 2 hydraulic switches to the right. With the left ENGINE STOP AND FEATHER button pulled, it was difficult to see and identify the 2 HYDR (hydraulic) SHUTOFF switches from the left-hand seat.

1.6 Meteorological information

1.6.1 The weather on the day of the accident was described by witnesses as overcast with passing showers. The wind was light and there were pools of water on the runway.

1.6.2 The weather forecast for Tauranga on 9 March 2001 predicted a surface wind of variable direction at 3 knots, visibility 30 km with showers, a layer of scattered[2] cloud at 1200 feet and a broken layer at 3000 feet. Predications were for temporary periods where the cloud would become broken at 800 feet and visibility would reduce to 4000 m in rain.

1.6.3 The relevant aerodrome information, including the actual weather at the time of the accident, reported on the aerodrome terminal information service (ATIS) is summarised as follows:

> Tauranga information D issued at 0910. Runway 07 damp. Surface wind 090° at 8 knots, visibility 15 km reducing to 10 km in rain. Cloud – few at 300 feet, scattered at 2000 feet, broken at 3000 feet. Caution increased bird activity on runway. Cloud bank 300 feet on final for runway 07.

1.7 Aerodrome information

1.7.1 Tauranga Aerodrome was located on the edge of Tauranga Harbour, a natural wetland for many species of birds. The aerodrome was owned by the Tauranga District Council and operated by Tauranga Airport Authority. The aerodrome consisted of one main sealed runway (07/25) and 3 grassed runways. All runways required aircraft to approach or depart over part of the harbour.

1.7.2 An aerodrome operating certificate, valid for 5 years, was issued for Tauranga Aerodrome on 20 August 1999. Civil Aviation Rules[3] required the aerodrome operator to have an environment management plan in place. Where any wildlife presented a hazard to aircraft operations the plan was to include a programme to minimise or eliminate any such wildlife hazard. Such a plan was included in the Standards and Operating Procedures manual issued by Tauranga Airport Authority.

[2] Cloud amount was measured in oktas or 8ths: few = 1-2 oktas, scattered = 3-4 oktas, broken = 5-7 oktas, overcast = 8 oktas.

[3] Civil Aviation Rule 139.77, effective 6 January 1993

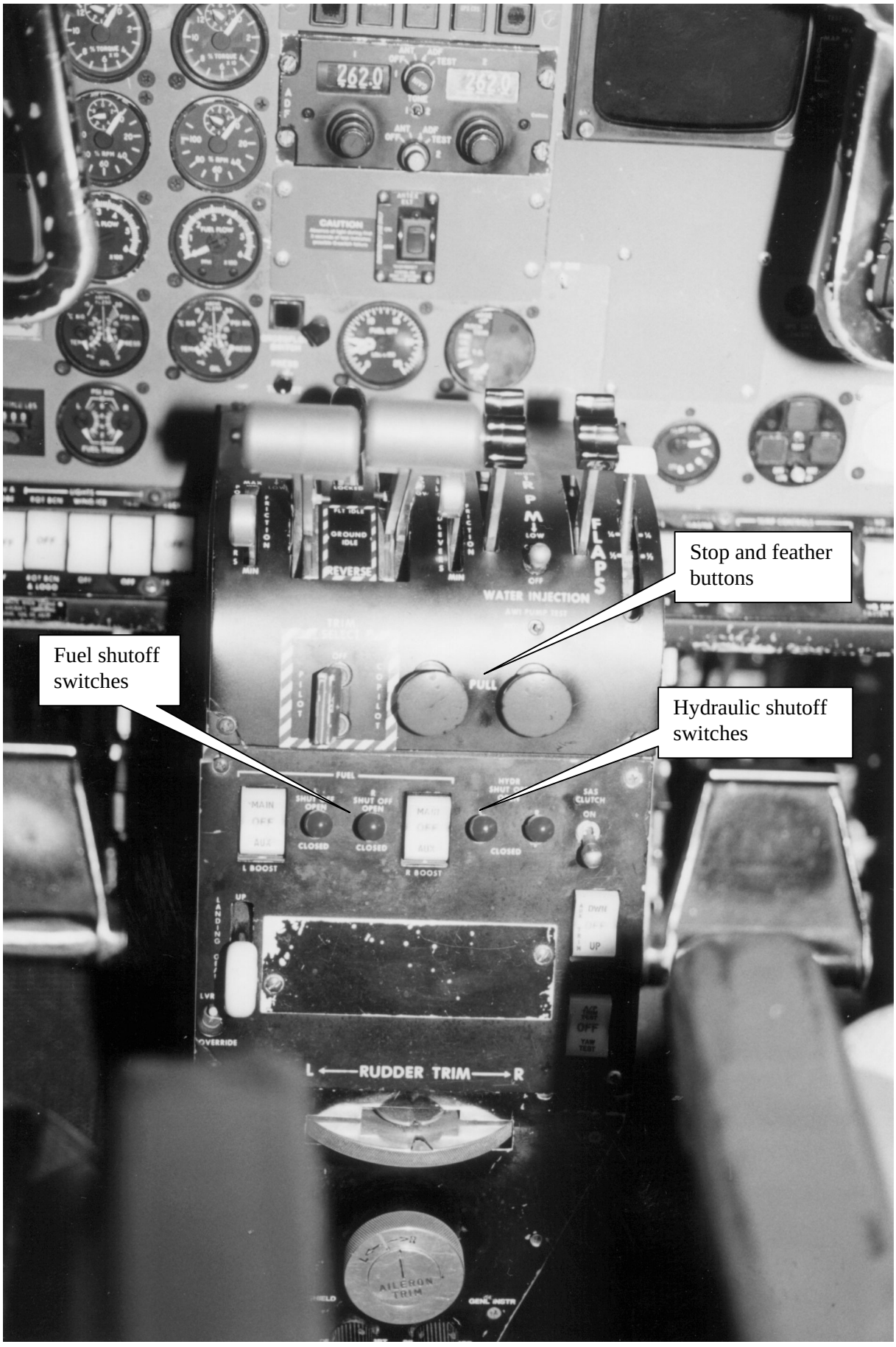

Figure 1
Aircraft instrument panel for the Fairchild SA227 Metro

1.8 Flight recorders

1.8.1 The recordings for ZK-RCA's flight data and cockpit voice recorders were not obtained after the accident.

1.9 Organisational and management information

1.9.1 The operator had an active policy of putting all aircrew through crew resource management training at the earliest opportunity, recognising the benefits of standardised procedures and positive aircrew interaction. The operator had no simulators available and so relied on a varied and practical training regime to maintain pilot currency.

1.10 Additional information

Emergency procedures

1.10.1 The operator's Flight Operations Manual stated that emergency checklists were presented in 2 sections. The first section was termed *PHASE 1 CHECKS* and contained those actions that needed to be committed to memory. The *PHASE 2 CHECKS* were to be completed using the QRH.

1.10.2 The manual stated that it was the captain's responsibility to ensure that the emergency checklist was carried out correctly and proficiently. The flying pilot was the person who would normally perform the *PHASE 1 CHECKS* and then ask for the QRH, which would be read by the non-flying pilot. The non-flying pilot was to ensure that each item was actioned correctly before proceeding onto the next item.

1.10.3 The manual further stated that the QRH did not stipulate which pilot was to action each item. Rather, the principle to be used was that each pilot would action the items on his or her side of the cockpit. Those items positioned on the centre console, for example the stop and feather buttons and the hydraulic and fuel switches, were to be actioned by the non-flying pilot. This meant that the flying pilot was able to continue controlling the aircraft as the actions were being completed.

1.10.4 The QRH checklist for an engine failure is summarised as follows:

1. ENGINE STOP AND FEATHER CONTROL.....Pull

2. Fuel Shutoff Switch.....Closed
3. Hydraulic Shutoff Switch.....Closed
4. Fuel Boost Pump Switch ..... Off
5. Generator Switch..... Off
6. Bleed Air Switch ..... Off
7. Ignition Switch ..... Off
8. CAWI Switch ..... Off
9. Propeller Synchro ..... Takeoff and Landing
10. Generator: Operating Engine..... 500 Series 200 Amps Max
    700 Series 300 Amps Max
11. FUEL MANAGEMENT CONSIDER
12. SEE SINGLE ENGINE LANDING – SECTION 11

Bird strikes

1.10.5 The incidence of reported bird strikes at Tauranga Aerodrome for 2000, recorded by Civil Aviation Authority (CAA), was 0.28 strikes per 1000 movements[4]. This was less than the calculated national average of 0.531 strikes per 1000 movements. The number of reported near bird strikes for the same year for Tauranga was 0.25 per 1000 movements, while the national average was 0.637. Data on bird strikes and near strikes at aerodromes around New Zealand for the last 5 years is attached as Appendix A.

1.10.6 For the last 5 years, the spur-winged plover has been consistently the most common bird species to be identified in bird strike statistics. With the exception of 1996, the spur-winged plover has also dominated near strike statistics. A breakdown of the strikes and near strikes by bird species is also given in Appendix A.

1.10.7 The spur-winged plover was self-introduced into New Zealand from Australia, first arriving in Southland in about 1932.[5] By 1951 there were reported to be about 100 of the birds within a 16 kilometre radius of Invercargill. In 1973 they had reached the North Island, and by 1980 they were nationwide. The bird is attracted to aerodromes because of their large, flat, treeless areas with grassed areas suitable for foraging and the ability to easily detect any potential predators.

1.10.8 The spur-winged plover is of a moderate size, similar to a magpie, with a length of about 37 cm, wingspan 85 cm and weighing up to 400 g. Due to their flocking nature, spur-winged plover often associated with multiple bird strikes during an encounter with an aircraft. According to research information, the spur-winged plover does not regard aircraft as a threat and has become habituated to aircraft noise, continuing to forage within 75 m of a jet engine being operated at full power.

1.10.9 As a self-introduced species, the spur-winged plover was not permitted to be eradicated, but aerodrome authorities were permitted under the Wildlife Act to cull the species within the confines of an aerodrome. According to some aerodrome operators, this action had assisted in the short-term reduction of the species and associated damage to aircraft. However, the numbers soon returned, estimated to be within 3 or 4 weeks, and the incidence of bird strikes increased again.

2. Analysis

2.1 The incident was initiated by the aircraft striking a flock of spur-winged plovers on landing. As a result of multiple bird strikes the left-hand engine sustained damage and probable airflow disruption causing the engine to fail. During the completion of the engine failure checklist, the captain probably selected the fuel shutoff switch for the right-hand engine by mistake. The first officer did not detect the error. The right-hand engine then flamed out as the aircraft taxied to the terminal.

The flight

2.2 The flight was a routine scheduled flight from Auckland to Tauranga. The 2 pilots were both based in Blenheim and had flown together several times previously.

2.3 After becoming visual on the instrument approach to Tauranga, the crew were able to sight a flock of seagulls near the threshold of the runway. However, the colouring of the flock of spur-winged plovers, white and grey, meant that they blended in with the colouring of the runway and were not able to be seen. The spur-winged plovers had congregated on the runway, probably because it was both dryer and warmer than the adjacent grass.

[4] An aircraft movement includes take off or landing.
[5] Information provided by Professor Peter Harper BSc (Hons) PhD, University of Canterbury.

2.4 The crew correctly assumed that the directional control problems being experienced by the first officer and the smell entering the aircraft were associated with the bird strikes that were felt during the flare and landing. The action by the first officer in cancelling the reverse thrust to help maintain directional control was correct. Likewise, the feathering of the left-hand engine by the captain after observing the failure indications was appropriate.

The checklist

2.5 By pulling the stop and feather button and taking control of the aircraft the captain was then starting to action a checklist item while becoming the handling pilot. It was therefore understandable that when the first officer began reading the QRH checklist, the captain continued to action each item after it was called. Although this action did not strictly follow standard operating procedures, it probably seemed logical to the crew because the aircraft had been brought to a halt and the handling pilot, now the captain, was not required to control or manoeuvre the aircraft again until the checklist was complete. While under the circumstances of this incident a departure from the standard operating procedures did not compromise the safety of the aircraft and passengers, a similar departure in flight could.

2.6 The first officer permitted the captain to action the checklist items probably because of the steep experience gradient between the 2 pilots. The captain was an experienced pilot with the operator and had been a captain on the aircraft type for the time the first officer had been employed with the operator. The first officer had been with the operator for a short period of time and was possibly inclined to accept the captain's initiative or reluctant to correct it. Likewise, were the captain to inadvertently place his hand on the right-hand fuel shutoff switch, the first officer may have also automatically believed this action was correct without positively checking.

2.7 Both pilots later agreed that the first officer, having relinquished control of the aircraft to the captain, should have been the person reading out the QRH items and actioning them after gaining confirmation from the captain. However, both pilots felt comfortable with the conduct of the QRH checklist under the circumstances.

2.8 After discussing the events in the terminal, the 2 pilots returned to the aircraft to check on the positions of the switches. The position of all the switches was consistent with having actioned the engine failure checklist for both engines. By repeating the QRH checklist actions for the right-hand engine when it spooled down, the captain probably closed the hydraulic shutoff switches thinking one was the fuel shutoff, thus masking the probable earlier selection of the 2 fuel shutoff switches.

Instrument layout

2.9 The positioning of the fuel and hydraulic shutoff switches across the centre pedestal, instead of down the pedestal in pairs, predisposed them to misidentification. This was further compounded by the 2 sets of switches being identical. Ideally, either the fuel and hydraulic switches, or the left and right switches for each, should have varied in their design or perhaps colour.

2.10 With the captain's hand on the left-hand fuel shutoff switch and the left-hand feather and stop button pulled, the wording for the switches would have been partly obscured from him. The next item after selecting the left-hand fuel shutoff closed was to select the left-hand hydraulic switch to closed. With the wording partly obscured the captain would have needed to fully remove his hand to correctly identify the left-hand hydraulic switch. It would have, however, been easier to simply slide the hand across to the next switch to be moved. The next switch across being the right-hand fuel shutoff switch.

Spur-winged plover

2.11 The spur-winged plover has become an increasing hazard to aircraft in New Zealand. The species is attracted to the large open spaces where aerodromes are located, as these conform closely to their natural habitat. The species do not consider an aircraft a threat and have become accustomed to living in close proximity to aircraft movements. The bird would often only lift-off when in immediate danger, such as when an aircraft is taking off or landing towards them. As a slow and erratic flyer, the spur-winged plover also remains in the way of an aircraft longer than more fleet-winged birds; starlings, for example. The species also remain close to the ground while flying, generally at around 20 feet.

2.12 The spur-winged plover has been difficult to control on aerodromes. A wary bird, it soon becomes familiar with the latest method of culling and knows to retreat to outside the aerodrome perimeter for sanctuary. The use of helicopters with an onboard shooter had initially proved successful, but again if used too often the birds would fly away only until the helicopter departed the area.

2.13 To continue controlling the number of spur-winged plovers on an aerodrome the operator needs to employ a variety of culling methods that are regularly changed. The culling range also needs to be extended to outside the immediate confines of an aerodrome to slow down the re-infestation. To be effective in reducing the incidence of damage to aircraft the status and protection of the spur-winged needs to be relaxed.

3. Findings

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

3.1 The pilots were licensed and medically fit to conduct the type of flight flown.

3.2 The aircraft had a valid Certificate of Airworthiness and its records indicated that it had been correctly maintained and was serviceable.

3.3 The flock of spur-winged plovers was not detectable in sufficient time to be avoided, and the initial actions by the crew were appropriate.

3.4 The crew departed from standard operating procedures when carrying out the checklist and in doing so removed a defence against an incorrect action.

3.5 A departure from standard operating procedures on this occasion did not significantly affect the safety of the aircraft, but such a departure whilst in flight would increase the risk of accident or serious incident.

3.6 The captain probably selected the fuel shutoff switch for the right-hand engine instead of the hydraulic shutoff switch for the left-hand engine, an action not detected by the first officer.

3.7 The ergonomics of the switches on the central pedestal predisposed them to misidentification.

3.8 The incidence of bird strikes and near strikes by spur-winged plovers has increased significantly since their arrival in New Zealand, and they now pose the largest single wildlife threat to aviation safety.

3.9 Nationally, current bird management strategies have not significantly reduced the incidence of strikes and near strikes by spur-winged plovers.

3.10 Restrictions on the culling of the spur-winged plover are inadequate for aviation safety purposes.

4. Safety Actions

4.1 The operator advised the Commission that as a result of the incident it had issued a notice to all aircrew reminding them of the need to adhere to standardised checklist procedures and methodology during the running of a checklist. The operator further advised that the appearance of the fuel and hydraulic switches had been altered to reduce the risk of misidentification.

4.2 The operator had also taken the opportunity to advise its sister company within the parent group, who also operated the same aircraft type, of the actions that had been taken to prevent a reoccurrence.

5. Safety Recommendation

5.1 On 12 September 2001 the Commission recommended to the director of Civil Aviation that he:

5.1.1 in co-ordination with the Department of Conservation, investigate the most effective way of reducing the risk to aviation safety posed by spur-winged plover either by:

- changing their protection status under the Wildlife Act 1953, or
- amending the guidelines relating to permits giving authority to disturb or kill protected birds at aerodromes,

and to determine a timetable for the implementation of the changes or amendments. (035/01)

5.2 On 14 September 2001 the director of Civil Aviation replied:

5.2.1 I accept the spirit of the recommendation but not as it is worded. I will meet with the Department of Conservation, to investigate the most effective way of reducing the risk to aviation safety posed by spur-winged plover and to determine a timetable for the implementation of the agreed actions. This will be completed by 1 February 2001.

I come to this decision because the CAA may wish to explore methods other than those proposed in the above recommendation for reducing the risk to aviation safety posed by the spur-winged plover. Any amendment to the protective status of birds and/or amendments to the permits issued to airport operators are subject to consultation and any timetable for implementation of changes or amendments cannot be agreed in advance of the consultation process.

Approved for publication 5 September 2001

Hon. W P Jeffries
Chief Commissioner

Appendix A

Bird Strike and Near Strike Rates per 1000 movements

	Annual Strike Rate					Annual Near Strike Rate				
Aerodrome	**1996**	**1997**	**1998**	**1999**	**2000**	**1996**	**1997**	**1998**	**1999**	**2000**
Ardmore	0.05	0.03	0.00	0.02	0.03	0.00	0.00	0.00	0.01	0.01
Auckland	0.22	0.34	0.34	0.39	0.39	0.57	0.86	0.51	0.39	0.52
Christchurch	0.30	0.30	0.30	0.42	0.29	0.56	0.61	0.61	0.51	0.40
Dunedin	1.10	0.75	0.76	0.27	0.33	2.69	2.10	1.07	0.76	0.96
Gisborne	0.36	0.54	0.61	0.63	0.37	1.22	1.20	1.08	0.76	0.51
Hamilton	0.45	0.32	0.50	0.45	0.46	0.40	0.41	0.26	0.26	0.35
Invercargill	0.63	0.85	0.42	0.39	0.82	0.77	0.67	0.50	0.61	1.21
Napier	0.73	0.72	0.42	0.82	1.09	1.42	1.21	0.77	1.09	1.38
Nelson	0.43	0.28	0.36	0.33	0.68	0.08	0.21	0.11	0.19	0.29
New Plymouth	0.56	0.90	0.70	1.39	1.10	1.04	0.97	1.30	1.82	2.26
Ohakea	0.21	0.25	0.29	0.28	0.33	1.98	2.15	1.37	1.02	0.54
Palmerston North	0.19	0.31	0.50	0.27	0.45	0.84	0.87	0.63	0.29	0.45
Paraparaumu	0.07	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Queenstown	0.57	0.47	0.18	0.28	0.30	0.37	0.66	0.20	0.11	0.23
Rotorua	0.40	0.51	0.69	0.74	0.54	0.35	0.41	0.57	0.61	0.51
Taupo	0.22	0.12	0.22	0.29	0.35	0.19	0.17	0.00	0.10	0.13
Tauranga	0.50	0.29	0.33	0.18	0.28	0.13	0.11	0.09	0.06	0.25
Wellington	0.26	0.21	0.20	0.17	0.19	1.02	0.92	0.96	0.74	0.66
Whenuapai	0.74	1.07	0.94	1.31	1.35	0.63	0.93	0.57	0.83	0.89
Woodbourne	0.57	0.81	0.74	0.31	1.27	0.24	0.46	0.50	0.19	1.19

Bird Species

	Bird Strikes					Bird Near Strikes				
Bird Species	**1996**	**1997**	**1998**	**1999**	**2000**	**1996**	**1997**	**1998**	**1999**	**2000**
Unknown	87	86	69	91	116	124	147	109	6	114
Black-Backed Gull	11	11	17	10	36	38	46	76	49	104
Black-Billed Gull				1			1		1	
Black Swan	1					2	2			3
Blackbird	1			4	1		2	1		2
Dotterel	1		1		1				1	
Duck	5	2	7	7	2	9	24	21	14	16
Finch	7	5	2	16	9	1			4	1
Gull	37	40	37	32	15	192	173	90	98	40
Harrier Hawk	2	10	5	10	6	37	55	35	27	50
Magpie	6	8	4	3	3	23	21	6	5	13
Myna		1	1							1
Other	1		2			5	1	2	2	1
Other Wader			1			1				
Oystercatcher	29	9	14	8	24	15	6	10	6	15
Pigeon	3	4	5		1	9	21	12	12	11
Pukeko		2	1		2	1		1	1	1
Red-Billed Gull		1		1			2		1	
Shag					1	3	2	2	3	5
Skylark	2	4	4	3	1	2	2			1
Sparrow	65	57	72	78	95	72	56	55	44	50
Spur-Winged Plover	101	131	117	117	147	156	200	133	128	138
Starling	17	13	12	22	8	35	35	36	18	8
Swallow	5	4	4	2	3	5	2	1	2	
Tern	1	2	4	1		2		3	2	
Thrush	1	4	1	4	1		1			1
White Faced Heron	1	1		2		1	1		2	
Yellowhammer				1					1	
TOTAL	384	395	380	413	472	733	800	593	427	575