Report 96-015

Fairchild SA 227-AC

ZK-OAA

runway excursion

Gisborne Aerodrome

16 August 1996

Abstract

On Friday 16 August 1996 at 1250 hours, shortly after Fairchild SA 227-AC, ZK-OAA touched down at Gisborne Aerodrome, it swerved to the right. The pilot was able to regain control but when he engaged reverse thrust, the aircraft swung to the right a second time and the pilot was unable to prevent the aircraft veering off the runway onto the adjacent grass area. The aircraft sustained minor damage and there were no injuries to the two pilots or the 14 passengers.

The causal factors were not identified.

The safety deficiencies identified in this incident were; the permissive operation of scheduled passenger services into aerodromes with no rescue fire services, lack of more effective rescue fire services facilities at some aerodromes used by scheduled passenger services, the lack of guidance in the New Zealand Aeronautical Information Publication on the meaning of the rescue fire services facilities provided at aerodromes and the inaccuracy of some of the information provided on rescue fire services facilities and the inadequacy of checks to confirm the serviceability of flight data recorders.

Transport Accident Investigation Commission

Aircraft Incident Report 96-015

Aircraft type, serial number and registration:	Fairchild SA 227-AC, AC546, ZK-OAA
Number and type of engines:	Two Garrett TPE 331-11U-6611G
Date and time:	16 August 1996, 1250 hours[1]
Year of manufacture:	1983
Location:	Gisborne Aerodrome Latitude: 38° 40' S Longitude: 177° 59' E
Type of flight:	Scheduled Air Transport
Persons on board:	Crew: 2 Passengers: 14
Injuries:	Nil
Nature of damage:	Minor to aircraft and substantial to one set of precision approach path indicator lights
Pilot-in-Command's Licence:	Airline Transport Pilot Licence (Aeroplane)
Pilot-in-Command's age:	44
Pilot-in-Command's total flying experience:	7100 hours 3400 on type
Investigator in Charge:	R Chippindale

[1] All times in this report are in NZST (UTC + 12 hours)

1. Factual Information

1.1 History of the flight

1.1.1 At 1250 hours on Friday 16 August, 1996 Fairchild Metroliner III, ZK-OAA, arrived at Gisborne Aerodrome on scheduled passenger service NZ2234 from Wellington, with the Captain, First Officer and 14 passengers on board. The Captain was the pilot flying (PF).

1.1.2 This was the fourth leg of the pilots' shift, during which they had alternated as PF. On none of the previous flights had the PF experienced any difficulty with the directional control of the aircraft during its landing run. The first flight had been to Auckland. The second, from Auckland back to Gisborne, was with the First Officer as PF. The conditions for the First Officer's landing at Gisborne had been with a strong cross-wind from a direction similar to that prevailing at the time of the incident. The third flight had involved an uneventful, into-wind landing at Wellington.

1.1.3 When he was flying his approach to Gisborne the Captain nominated a target threshold speed (TTS) of 115 knots to allow a margin for the cross-wind and gustiness (50% of the reported gust strength) over the TTS for steady wind conditions.

1.1.4 In response to the First Officer's report, "Eagle 234 right base runway 14", the Tower replied, "Eagle 234 cross-wind up to 18 knots, clear to land." The First Officer acknowledged the clearance, "Cleared to land Eagle 234. Request a wind check on short final."

1.1.5 Just after the Captain called for full flap on the final stage of the approach, the First Officer confirmed, "Flaps are running, four greens, cleared to land." At this time the Tower advised, "Surface-wind 200 at 22 gusting 29 cross-wind up to 20 knots." The First Officer acknowledged this. (The operator's maximum cross-wind component for landing a Metroliner is 25 knots.)

1.1.6 Immediately prior to touchdown at approximately 1250 hours the First Officer, who had been calling the difference in the speed of the aircraft from the nominated TTS, called, "TTS".

1.1.7 The Captain's next comment was, "Whoops" followed by cursing the effect of the wind and repeating "Lost it." three times. At no time had the First Officer called, "90 knots" which is the call to advise the PF that he can use full reverse thrust.

1.1.8 As the aircraft came to rest the Tower called, "234 do you require assistance?" and the First Officer responded, "Affirm."

1.1.9 The Captain's recollection of events was that after departure from Wellington, flying conditions were smooth until the last three or four minutes of the flight. Approaching Gisborne there was slight turbulence and quite a strong wind on the ground, but not as bad as he had anticipated. His assessment was that the Tower's call of an 18 knot cross-wind was "pretty accurate". He recalled flying the aircraft on the precision approach path indicator (PAPI) profile and the First Officer calling the speeds down to the threshold speed "which was spot on".

1.1.10 He continued:

> There was a slight gust just before we touched down which I corrected and nothing unexpected in that sort of wind conditions. We touched down in what I would call a normal position relative to completing a successful landing. What appeared to happen to me as soon as I put the [power] levers to Beta, [was] the aircraft veered violently to the right and went onto the grass.

> I then took it out of Beta and tried to push it straight with power which I seemed to succeed in doing and we ran down the grass edge. As I recall we were completely on the grass, both mains and the nosewheel and I then got it back onto the runway; probably over half of the distance and half of the runway distance had been used by this time. We were then going straight down the runway in a normal position on the centreline.
>
> I then put it into reverse, as we were going too quick and I had my doubts that we would stop by the end of the runway at this stage, and it just veered to the right. No matter what I did, it was just a series of right jerks, right through [one of] the PAPI lights until we came to rest, nose wheel in the ditch on the edge of the runway.

1.2 Site evidence

1.2.1 Marks on the runway showed that the aircraft had regained the runway centreline and veered off as the Captain had recalled. No evidence was found to confirm that the aircraft had veered off the runway prior to this, however. Although the initial swing had been observed by the Air Traffic Control Officer (ATCO) in the Tower he believed that the aircraft had not left the runway at that stage.

1.3 Flight recorders

1.3.1 The cockpit voice recorder (CVR) in the aircraft provided a clear record of the flight deck conversation.

1.3.2 The aircraft digital flight data recorder (DFDR) was read out for each of the landings at Gisborne that day. The heading information recorded by the DFDR was obviously incorrect but a correction factor of 70 degrees resulted in an acceptable record of the landing track of the aircraft for the First Officer's landing earlier in the day. However no correction factor could be found to produce a useable record of the Captain's landing. The record indicated that after touchdown the direction of the rollout was far from steady but the resultant track could not be reconciled either with the events as described by the crew or the witness marks on the runway. The rollout lasted 30 to 35 seconds.

1.3.3 The DFDR was checked daily by the operator, in accordance with the manufacturer's recommendation, as being serviceable.

1.4 Aircraft information

1.4.1 The aircraft made three uneventful landings earlier that day, one was directly into wind and another involved a 20 knot cross-wind at Gisborne.

1.4.2 The nosewheel steering system of the aircraft was not used at any stage of the landing roll during the last landing at Gisborne.

1.4.3 The Metroliner aircraft has a tendency to swing past the desired heading following coarse rudder inputs on the ground. This feature is aggravated when the aircraft has a rearward centre of gravity as it did on this occasion. The pilot was familiar with this characteristic and used a combination of two cross-wind landing techniques; "kicking" the aircraft straight, in line with the runway, with an application of rudder immediately prior to touchdown, and landing the aircraft so the upwind main-wheels touched down first.

1.4.4 The landing weight of the aircraft was calculated as 5958 kg, 392 kg below its maximum landing weight of 6350 kg. Its centre of gravity (CG) was 27.2% of the mean aerodynamic chord (MAC). The CG limits at that weight are 14 to 34% MAC.

1.5 Damage

1.5.1 The damage resulting from the incident was limited to two adjacent right propeller blades of the aircraft and substantial damage to one of the PAPI light fittings on the aerodrome.

1.6 Propeller Modes

1.6.1 The propellers of the Metroliner operate in either the Beta (or ground mode) or the propeller governing mode.

1.6.1.1 In the Beta mode, the blade angles are hydro-mechanically selected by the pilot to facilitate handling of the aircraft on the ground. Operation of the Beta mode is indicated by amber lights on the annunciator panel labelled "L BETA" and "R BETA".

1.6.1.2 In the propeller governing mode, at any constant power setting, the blade angle is varied automatically to maintain a selected revolutions per minute (rpm) (the constant speed mode).

1.6.2 Apart from abnormal or emergency situations each propeller is controlled by the interaction of a power lever and a speed lever.

1.6.3 Two power levers on the centre pedestal of the aircraft operate in a quadrant which is marked "FLT IDLE", "GROUND IDLE" and "REVERSE". The power lever is connected to the propeller pitch control and the manual fuel valve of the fuel control unit. When the power lever is between FLT IDLE and REVERSE, any movement of the lever positions the propeller pitch control to provide a blade angle proportionate to power lever movement without affecting the position of the manual fuel valve in the fuel control unit.

1.6.4 When a power lever is positioned forward of FLT IDLE it controls fuel flow to the engine by operating the manual fuel valve in the fuel control unit. The power levers can move freely between HIGH (full forward) and FLT IDLE positions but must be lifted over a gate before they can be moved aft of FLT IDLE into the GROUND IDLE and REVERSE range.

1.7 Negative Torque-Sensing (NTS) system

1.7.1 Negative torque occurs when the propeller drives the engine. This situation results in drag which increases the yawing moment produced by a reduction in the power output of the relevant engine.

1.7.2 The engine has an NTS system that provides for an automatic reduction in windmilling drag, in the event of a negative torque situation arising, by increasing the propeller blade angle. It does not coarsen the blade angle sufficiently to feather the propeller.

1.8 NTS Lockout

1.8.1 When the pilot moves the power levers aft of FLT IDLE during the landing roll an NTS lockout system prevents the NTS system from operating thus allowing the windmilling drag of the propellers to assist in reducing the ground speed of the aircraft. This lockout system is operated by a valve linked mechanically to the power levers to prevent NTS oil pressure building up and increasing the propeller blade angles.

1.8.2 It is not normal for the NTS system to operate on an engine during the landing roll with the power lever in the FLT IDLE position (prior to being positioned in the Beta range) as the minimum fuel flow of the engine is intended to ensure it still drives the propeller in this setting. However the NTS system might operate for one or more of the following reasons:

- The propeller blade angle not being set correctly for the FLT IDLE power lever position.
- Incorrect rigging of the power lever.
- The fuel flow for the FLT IDLE power lever position not being set correctly.

1.8.3 There was a history of adjustments being required to the fuel flow and rigging of the left engine during the three weeks prior to the incident; the last being made on the day before the incident flight.

1.8.4 Running of the left engine/propeller combination during the post-incident investigation did not reveal any of the above problems. It was impractical to run the right engine due to the damage incurred by the propeller and possible consequential damage to the engine. No inaccurate adjustments were detected by such investigation as could be carried out.

1.8.5 The theories for the runway excursion were considered during the investigation by the appropriate representatives of the manufacturer and the operator.

1.9 Gisborne Aerodrome

1.9.1 Gisborne Aerodrome is a non-certificated[2] Public Aerodrome. It has four runways; three grass surfaced and a main runway, 14/32, with a bitumen surface. The 45 m wide main runway involved in this incident has a landing distance of 1310 m which includes an "extension" of 442 m separated from the rest of the runway by an active single track railway. The full distance was available for the landing of flight NZ2234 on the day of the incident.

1.9.2 The Rescue Fire Service (RFS) on the aerodrome listed in the New Zealand Aeronautical Information Publication (NZAIP) Instrument Flight Guide Operational Data page for Gisborne Aerodrome dated 5 Jan 95 were:

> RFS: CAT 1. Fire extinguisher located outside terminal buildings. Available for regular air transport passenger services.

1.10 Survival aspects

1.10.1 The ATCO's response to the aircraft crew's indication that they required assistance was to activate the aerodrome "crash alarm". This sounded alarms in certain locations around the aerodrome and the personnel therein checked with the Tower to determine the reason for the alarm.

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[2] A certificated aerodrome is an aerodrome operated by an organisation which has been granted a certificate by the Director of Civil Aviation which confirms that he is satisfied that its design, limitations, personnel requirements, emergency plan, RFS, public protection, wildlife hazard management, procedure for notification of aerodrome data and information, and internal quality assurance procedures, meet the requirements of Civil Aviation Rule (CAR) Part 139.

1.10.2 The Eagle Air personnel at Gisborne Aerodrome, who were alerted by a loud horn, were asked by the ATCO in the Tower, when they arrived at the aircraft within a minute of the occurrence, if the emergency services were required and their reply was, "Hold on."

1.10.3 While waiting for a response the ATCO contacted the New Zealand Fire Service (NZFS) at Palmerston North (the designated alerting location), using the emergency radio, one and a half minutes after the incident. He was about to transmit an emergency message to them when the Eagle Air ground staff advised him that no emergency services were required. Consequently the services available in Gisborne were not summoned.

1.10.4 At Gisborne Aerodrome there are no established RFS personnel and the "crash alarm" activated by ATC personnel does not alert the Police, ambulance or the NZFS. NZFS, Police and ambulance services are alerted by a separate telephoned "111" call. An NZFS radio installed in the Control Tower, for directing the NZFS when they arrive at the aerodrome, is also a backup for alerting the NZFS. The response time from Gisborne City to the aerodrome, once the emergency vehicles are under way, is about eight minutes.

1.10.5 Personnel at the aerodrome have access to a 1.5 kg bromochlorodifluromethane (BCF) and three 8 kg dry powder extinguishers available to carry to the site of any occurrence but are cautioned that any action taken should not be at the risk of personal injury. All except one have had training in the use of the extinguishers.

1.10.6 The NZAIP Planning Manual in the Aerodromes and Ground Aids (AGA) section page 24 published on 15 August 1996 and effective from 12 September 1996 stated:

RESCUE FIRE SERVICE (RFS)

The provision of airport rescue fire services is the responsibility of the aerodrome operator.

The principal extinguishing agent used at New Zealand aerodromes is aqueous film forming foam (AFFF). Complementary extinguishing agents used are CO_2 dry chemicals, halocarbons, or a combination of these agents. Facilities for foaming runways are not available.

RFS AT DOMESTIC AIRPORTS

For the purpose of determining the level of rescue and firefighting protection, domestic airports are categorised as follows:

- **D1** Aerodromes with regular air transport services by aircraft with less than 30 passenger seats;
- **D2** Aerodromes with regular air transport services by non-turbo jet aircraft with 30 or more passenger seats and less than 700 movements during the busiest three consecutive months;
- **D3**...
- **D4**...

CAA advised that these categories correspond with the category tabulated and explained in Civil Aviation Rule (CAR) Part 139.

1.10.7 New Zealand CAR Part 139, Aerodromes - Certification, Operation and Use, which came into effect on 6 January 1993 and was amended on 13 November 1995 contains the following provisions:

> Rule Objective and Extent of Consultation
>
> The objective of Part 139 is to define a regulatory safety boundary for-
>
> (a) the certification and operation of aerodromes, and
>
> (b) the security measures applicable to aerodromes, and
>
> (c) the use of aerodromes by aircraft operators.
>
> *[The consultation process which is detailed thereafter is summarised as follows:*
>
> *As a result of an invitation to interested parties 39 organisations registered their wish to be consulted in the development of Rules for aerodromes.*
>
> *After an informal document drafted and distributed by the CAA in consultation with the above organisations had been evaluated by the consultants and various industry groups a Notice of Proposed Rule making was issued. This was advertised in the daily newspapers of the five main provincial centres and mailed to interested parties including overseas aviation authorities.*
>
> *Sixty five days were allowed for comment after which the submissions received were considered and where appropriate the proposed rules were amended to take account of the concerns raised.*
>
> *From the initial notification to the ratification of CAR Part 139 a period of five years and nine months was involved.]*
>
> 139.5 **Requirement for Certificate**
>
> (a) No person shall operate an aerodrome serving any aeroplane having a certified seating capacity of more than 30 passengers that is engaged in regular air transport operations except under authority of, and in accordance with the provisions of, an aerodrome operating certificate issued for that aerodrome under this Part.
>
> (b) An aerodrome operator who is not required under paragraph (a) to hold an aerodrome operating certificate may apply for an aerodrome operating certificate under this Part.
>
> 139.51 **Rescue and Firefighting - Category Determination**

Aerodrome category	Aeroplane over-all length	Maximum fuselage width
(1)	(2)	(3)
1	0 up to but not including 9 m	2 m
2	9 m up to but not including 12 m	2 m
3	12 m up to but not including 18 m	3 m
4	18 m up to but not including 24 m[3]	4 m

[3] The Metroliner aircraft's over-all length is 18.09 m

Note (1) To categorise the aerodrome according to the largest aeroplane type regularly using the aerodrome, first evaluate their over-all length and, second, the fuselage width of the aeroplane.

(c) Each applicant for the grant of an aerodrome operating certificate for a domestic aerodrome shall determine the rescue and firefighting category of the aerodrome as follows:

(1) when the aerodrome serves any turbojet aeroplane with a certified seating capacity of more than 30 passengers engaged in regular air transport operations, it shall be that category according to the largest aeroplane type regularly using the aerodrome as provided in table 1 reduced by two categories but in any case shall not be less than category 4:

(2) when the aerodrome does not serve any turbojet aeroplane of the kind specified in paragraph (c)(1), but serves any non-turbojet aeroplane with a certified seating capacity of more than 30 passengers engaged in regular air transport operations, and has more than 700 aeroplane movements of such aeroplane in the busiest three consecutive months of the year, it shall be category 3.

139.57 **Aerodrome Emergency Plan**

(a) Each applicant for the grant of an aerodrome operating certificate shall develop and maintain an aerodrome emergency plan designed to minimise the possibility and extent of personal injury and property damage at, or in the vicinity of, their aerodrome in an emergency.

[*This plan provides for procedures for prompt response of the emergency services, guidance for each person involved in the plan, the agencies involved and their responsibilities, a description of the equipment available and its location, names and telephone numbers of persons to be contacted, and a grid map of the aerodrome and its environs.*]

(c) The applicant shall-

(1) Co-ordinate its aerodrome emergency plan with law enforcement agencies, security providers, rescue and firefighting agencies, medical personnel and organisations, the principal tenants of the aerodrome, and all other persons who have responsibilities in the plan; and

(2) To the extent practicable, provide for participation by all agencies and personnel specified in paragraph (c)(1) in the development of the aerodrome emergency plan.

139.61 **Rescue and Firefighting - Extinguishing Agents**

(c) Each applicant for the grant of an aerodrome operating certificate shall have the minimum extinguishing agents required for the category determined under 139.59, as provided in Table 2.

Table 2. Minimum useable amounts of extinguishing agents.

	Foam meeting performance level B *		Complementary agents		
Aerodrome Category	Water (litres)	Discharge rate foam solution/minute (litres)	Dry chemical powders (kg)	or Halons (kg)	or CO_2 (kg)
1	230	230	45	45	90
2	670	550	90	90	180
3	1200	900	135	135	270
4	2400	1800	135	135	270

[No explanation of "Performance level B" was found in the source document, (CAR Part 139); or Advisory Circular 139.04 but ICAO Document 9137-AN/898 Part 1 Rescue and Fire Fighting explains that "performance level B" is a foam which achieves similar results with a lower application rate on a larger fire. The table in ICAO Document 9137 is identical apart from the inclusion of two columns for "Foam meeting performance level A".]*

139.63 **Rescue and Firefighting - Vehicles**

(a) Each applicant for the grant of an aerodrome operating certificate shall have the minimum rescue and firefighting vehicles for the category determined under 139.59, as provided in Table 3.

[*Table 3 required one rescue and firefighting vehicle for aerodromes in Categories 1 to 5 inclusive.*]

139.65 **Rescue and Firefighting - Personnel Requirements**

Each applicant for the grant of an aerodrome operating certificate shall establish a procedure to ensure that all rescue and firefighting personnel at their aerodrome are-

(1) equipped with adequate protective clothing and rescue equipment needed to do their duties; and

(2) trained, medically and physically fit, and competent in the use of rescue and firefighting equipment, and

(3) receiving current training and regular practices to maintain their competency; and

(4) sufficient in number and readily available to operate the rescue and firefighting vehicle or vehicles and the equipment at maximum capacity; and

(5) alerted by siren, alarm, or other means to any existing or impending emergency requiring their assistance.

139.67 **Rescue and Firefighting - Response Capability**

Each applicant for the grant of an aerodrome operating certificate shall when required by the Director, demonstrate the following rescue and firefighting response capability in optimum conditions of visibility and surface conditions:

(1) within 3 minutes of the time of the alarm, the rescue and firefighting vehicles and personnel needed to discharge foam at a rate of at least 50 percent of the discharge rate specified in 139.61 Table 2 for the aerodrome category shall reach the furthest point of the movement area from their assigned posts and be in position at that point to apply that amount of foam.

(2) ...

139.305 **Use of Aerodromes - Air Transport Aeroplanes**

No person operating an aeroplane engaged on an air transport operation shall use any place for the purpose of landing at or taking off from unless-

(5) if the aeroplane has a certified seating capacity of more than 30 passengers and is engaged on a scheduled flight, the place is certificated as an aerodrome under this Part or licensed as an aerodrome under the Civil Aviation Regulations 1953; and

(6) ...

1.10.8 The International Civil Aviation Organisation (ICAO) Document 9137 -AN/898, Airport Services Manual Part 1, Rescue and Fire Fighting, gave the following guidance relevant to the above:

1.1 INTRODUCTION

1.1.1 The principal objective of a rescue and fire fighting service is to save lives in the event of an aircraft accident or incident.

1.1.2 This contingency must assume at all times the possibility of and need for extinguishing a fire which may:

(a) exist at the time an aircraft is landing, taking off, taxiing or parked or,

(b) occur immediately after an aircraft accident or incident; or

(c) occur at any time during rescue operations.

The rupture of fuel tanks in an aircraft crash and the consequent spillage of highly volatile fuels and other flammable liquids used by aircraft, presents a high degree of probability of ignition by coming into contact with hot metal parts of the aircraft or because of sparks caused by movement of wreckage or disturbance of electrical circuits. Fires may also occur through the discharge of accumulated electrostatic charges at the time of ground contact.

1.1.3 For this reason the provision of adequate and special means of dealing promptly with an aircraft accident or incident occurring at, or in the immediate vicinity of, an airport assumes primary importance because it is within this area that there are the greatest opportunities for saving lives.

2.3 AMOUNTS OF EXTINGUISHING AGENTS

2.3.1 The amounts of water for foam production and the complementary agents to be provided on the rescue and fire fighting vehicles should be in accordance with the airport category...,except that these amounts may be modified as follows:

(a) for airport categories 1 to 4 ..., up to 100 percent of the water may be replaced by complementary agent.

2.7 RESPONSE TIME

The operational objective of the rescue and fire fighting service should be to achieve response times of two minutes and not exceeding three minutes to the end of each runway in optimum conditions of visibility and surface conditions.

11.1 AIRPORT EMERGENCY PLAN

11.1.1 Every airport should establish an emergency plan to deal with aircraft emergency situations...Only in this way can it be established that the organisation is capable of coping with every likely contingency and that the authorities, as well as each individual concerned, will be acquainted with the action to be taken.

1.10.9 The Metroliner aircraft met the requirements of the emergency evacuation test required by United States Federal Aviation Requirement (FAR) 23.803 and the interior material burn tests required by FAR 23.853. The seats of the aircraft were also tested to combined side and forward loading tests, in excess of the requirement, without failure.

2. Analysis

2.1 Factors leading to loss of directional control

2.1.1 The cause of this incident was not isolated. There were two possible causes: either the pilot was unable to control the aircraft in the cross-wind conditions, or an aircraft system unserviceability combined with the cross-wind conditions to make the aircraft uncontrollable during the landing run.

2.1.2 Under the conditions as described, if the flight idle fuel flow on one engine was set too low, it could have caused the NTS to activate on that engine when the power levers were retarded. Concomitantly if the other engine was adjusted properly, that propeller could have gone into Beta or even reverse thrust. This could be further aggravated if the engine controls were not rigged evenly. The end result might be an asymmetric thrust condition where directional control could not be maintained.

2.1.3 Although there was a history of adjustments being required to the rigging and fuel flow of the left engine the fact that no control difficulties were encountered by either pilot on the three prior landings indicates the rectification had corrected the most recent problem reported.

2.1.4 The Captain's repeated comment that he had "lost it" coupled with him cursing the cross-wind indicated that he thought at that time he had not been able to counter the effects of the cross-wind after touch down and he had lost control of the aircraft. Against this hypothesis, the Captain was an experienced Metroliner pilot and he apparently regained control of the aircraft as soon as he moved the power levers out of the Beta range; also the First Officer had no problems handling similar conditions on the previous landing on the same runway.

2.1.5 The circumstances indicated that the Captain was faced with an asymmetric thrust situation because:

- one propeller went into reverse or ground fine pitch when the other did not, or
- one went into reverse or ground fine before the other, or
- the negative torque system of one propeller operated before its Beta range was selected.

2.1.6 Whether an asymmetric power situation arose or not the pilot was able to return the aircraft to the runway centreline. Once re-established on the normal track for a landing roll he considered the aircraft was in danger of over-running the runway end and applied full reverse thrust. This action produced a similar reaction from the aircraft in that it again veered sharply to the right. The absence of the First Officer's "90 knot" call indicates the groundspeed of the aircraft was in excess of 90 knots until after it departed from the runway.

2.1.7 As the pilot was able to regain control of the aircraft when he moved the power levers out of the Beta range but it went out of control again as soon as Beta was re-selected, the unexpected operation of the negative torque system was considered unlikely. This system is de-activated as soon as the power levers are placed in the Beta range so with full reverse on both engines it is unlikely that any NTS system problem would persist due to the NTS lockout.

2.1.8 As the time span involved was approximately 35 seconds from touchdown until the aircraft came to rest the Captain's acceptance of the yaw, which he experienced when using reverse thrust, in the interests of stopping the aircraft short of the obstructions was understandable.

2.1.9 No technical problem could be isolated despite employing the combined resources of the manufacturer's customer service representative and the operator's maintenance staff to analyse the problem.

2.2 Rescue Fire Services

2.2.1 Because Gisborne Aerodrome was not a certificated aerodrome there was no requirement for its operators to provide RFS or to have an emergency plan.

2.2.2 An emergency plan was in place to maximise the potential of the Gisborne City's emergency services to deal with an aircraft accident. As these services had a response time in the best circumstances of approximately eight minutes they could not be expected to arrive in time to effect the rescue of any trapped occupants in the event of an immediate post-accident aircraft fire. They could however perform a lifesaving function if no fire occurred or the onset of a fire was delayed, or some occupants escaped despite a fire.

2.2.3 An aerodrome emergency plan which is dependent upon resources at such a distance cannot tolerate any delay in its initiation.

2.2.4 The collision of an aircraft with an obstruction, even one as small as a PAPI light installation, has the potential to rupture its fuel tanks and produce a serious potential for a conflagration, which would not be obvious to an observer in the Tower.

2.2.5 When the ATCO asked the aircraft crew if they needed assistance and received an answer in the affirmative, immediate action was necessary.

2.2.6 An outstanding characteristic of aircraft fires is their tendency to reach lethal intensity within a very short time. This presents a severe hazard to the lives of those directly involved and handicaps rescue efforts.

2.2.7 The absence of any guidance to the ATCO on the parameters to be considered when deciding if the emergency services should be called in the event of a landing occurrence, had the potential to further degrade the effectiveness of the response from the remote emergency services. Steps have been taken to improve the guidance to ATCOs in similar circumstances.

2.2.8 The Civil Aviation Authority (CAA) went through a prolonged and thorough consultation process to establish realistic CARs for the RFS services which are required for the certification of a domestic aerodrome. The scale of RFS was arrived at after discussion by an international panel of experts on which local operators were well represented. The provisions in CARs for rescue and firefighting are the same, essentially, as those recommended by ICAO. The relevant RFS category for a domestic aerodrome serving air transport services operated by aircraft with less than 30 passenger seats is based on the fuselage dimensions of the aircraft and was published in the NZAIP AGA Section on 12 September 1996. (The provisions for domestic aerodromes in New Zealand which serve aircraft with more than 30 passenger seats engaged in regular air transport operations are further qualified in CAR 139.59 paragraphs (c) (1) and (2)).

2.2.9 These thoroughly researched Rules require RFS of a significant scale for the regular operation of an aircraft such as the Metroliner if the aerodrome is certificated. In spite of this, the current CAR permits turbine-powered aircraft with a potential passenger load of 30 persons, (or more if the permissible number of infants in arms were carried), plus crew, to land and take off from non-certificated aerodromes with no RFS or emergency response plan. To allow the operation of any scheduled passenger service into an aerodrome with no RFS because the aerodrome is not certificated, is illogical and inappropriate when it has been decided after careful consideration that significant RFS services are appropriate by both ICAO and the CAA.

2.2.10 That these provisions are not required to be observed by companies operating aircraft with up to 30 passenger seats is a situation which should be addressed without delay.

2.2.11 While it is inappropriate to indicate that the use of such fire extinguishers as are available at the passenger terminal is restricted to "regular air transport passenger services" there was no indication that should the need arise, such life-saving equipment is not available to any person to use.

2.2.12 As Gisborne Aerodrome is a non-certificated aerodrome it is not required to provide any RFS, however, without a ready means of transport the extinguishant available at Gisborne Aerodrome has limited potential as a substitute for the RFS recommended in CAR Part 139 for a certificated domestic aerodrome. The extinguishers available at this aerodrome do not meet the recommended minimum standard for quantity and/or type of extinguishant. Even if they did it is not sufficient to have the recommended minimum quantity of extinguishant available for the type of aircraft operations conducted at that airport unless there is a ready means for transporting it to the site. The fire retardant furnishings, accident resistant seats and standard egress facilities are factors taken into account when determining the response time for the RFS to be effective.

2.3 Flight recorders

2.3.1 This incident illustrated the futility of fitting flight recorders to aircraft if they are not recording information accurately. In the accident involving the Convair aircraft ZK-FTB neither the CVR nor the FDR were operating (report 89-064). The fault in the DFDR on ZK-OAA was difficult to detect as it related to the inaccuracy of the heading information, rather than a failure to record any heading information. Nevertheless, as flight recorders are expensive to fit and impose a weight penalty on the operator which is to no avail if the valuable record which they have the potential to make is not recorded accurately, the routine checks should ensure that any such errors are detected as soon as practicable.

3. Findings

3.1 No substantive reason could be determined for the Captain's loss of directional control of the aircraft during its cross-wind landing.

3.2 Although there was a potential for flying debris to have punctured a fuel tank, this did not occur and there was no risk of a post-incident fire in this case.

3.3 The ATCO had no clear instructions which required him to declare an emergency when he witnessed the event and he acted as he saw fit in the circumstances.

3.4 As the distance from the Gisborne Aerodrome of the bases for the emergency services makes it impossible for them to arrive within the recognised response time necessary for an aircraft accident, it is imperative that they be alerted without delay when a potential exists for them to be required.

3.5 The unserviceability of the DFDR may have deprived the Commission of information which was crucial to verifying the sequence of events in this case.

3.6 The provision of more effective means of aircraft firefighting and rescue at non-certified airports into which scheduled air services operate, should be addressed without delay.

3.7 The rescue and firefighting facilities at Gisborne Airport are not adequate to fight a post-accident aircraft fire on the aerodrome.

3.8 The cut-off point for the provision of rescue fire facilities at aerodromes used by scheduled air transport services does not embody the recommendations of the reference material used to support CAR 139.

3.9 The absence of any guidance for the reader on the relationship of the references in the NZAIP to an airport category of "D1" for the purpose of determining the level of rescue and firefighting protection available at domestic airports or "CAT 1" for the promulgated status of the RFS at Gisborne should be addressed without delay.

3.10 It is inappropriate to establish guidelines for the scale of RFS required to cover scheduled passenger services at certificated aerodromes yet not to require similar facilities to be provided for such services at aerodromes which do not meet the standards for certification.

4. Safety Recommendations

4.1 It was recommended to the Director of Civil Aviation that he:

4.1.1 take immediate steps to review CAA policy of permitting companies to operate scheduled passenger services into uncertificated aerodromes with aircraft having up to 30 passenger seats, (005/97) and;

4.1.2 clarify the level of rescue and firefighting protection required for the categories of domestic aerodromes described in the NZAIP, and its relationship to the categories of rescue fire services listed on the landing charts, (006/97) and;

4.1.3 specify the relationship between the categories of rescue fire services listed on the NZAIP landing charts and those listed in CAR 139, (007/97) and;

4.1.4 review the relevance and accuracy of the RFS information given on each landing chart in the NZAIP. (008/97).

4.2 The DCA responded as follows:

4.2.1 Recommendation 005/97, the CAA accepts the recommendation to the extent that it plans to conduct a review of Part 139 during 1997 as part of its routine ongoing review of existing legislation. This recommendation will be specifically considered.

4.2.2 Recommendation 006/97, the CAA accepts the recommendation in that the NZAIP Planning Manual will be amended, removing the table of Rescue Fire Services (RFS) categories for international airports and the table of domestic aerodrome RFS categories (D1, D2, etc.). This action will be taken because the CAA considers that the pilots do not need to know precisely what manpower and equipment is required under each category; all they need to know is the minimum acceptable category for their aircraft and that the published category is the same as, or higher than, that minimum. Detailed RFS requirements are the province of the aerodrome operator who needs to know them when deciding what level of service needs to be provided for the aircraft that are going to use the aerodrome. The category shown on the Operational Data page of the Flight Guide for each aerodrome, which corresponds with the category tabulated and explained in Civil Aviation Rule (CAR) Part 139, is published on behalf of aerodrome operators at their request. It will continue to be published if they so desire. It is intended that unless RFS facilities meet the requirements of Part 139, they should not be published in New Zealand AIP.

4.2.3 Recommendation 007/97, the CAA believes that the intent of the recommendation has already been met for certificated aerodromes. There is a direct relationship between the RFS category published in the Flight Guides and that in CAR Part 139, which is based on ICAO Annex 14. For non-certificated aerodromes, the matter is being addressed as indicated in response to recommendations 006 and 008.

4.2.4 Recommendation 008/97, the CAA does not accept the recommendation as it believes the intent of the recommendation is already met, in that it is the aerodrome operator who is responsible for ensuring that the information relating to their aerodrome is correctly published in the Flight Guides, including RFS category information on the Operational Data page. The CAA already has in place an established process of routine audit and or spot check that discovers any inaccuracies. In such cases, the operator is required to request an amendment as soon as possible.

4.3 It was recommended to the Gisborne District Council as the operator of the Gisborne Aerodrome that they:

4.3.1 take immediate steps to review the adequacy of the RFS service provided at Gisborne Aerodrome for the scheduled passenger service aircraft presently operating into Gisborne Aerodrome, (003/97) and;

4.3.2 advise that the fire extinguishers which are provided are available to any person in an emergency. (004/97).

4.4 Gisborne District Council responded:

4.4.3 003/97
The current level of R.F.S. provided at Gisborne Aerodrome meets the requirements of C.A.A. Rule Part 139 for non-certified aerodromes. We are, however, in consultation with the major schedule airline operator (Eagle Air) proposing a review of the current level of R.F.S. and procedures. A meeting between ourselves and Eagle Air's management is scheduled for 6 May 1997.

4.4.4 004/97
We confirm that the fire extinguishers provided and located on a trolley positioned on the apron during hours of regular schedules air transport passenger services are available to any person in an emergency.

We have requested Aviation Publishing to amend the V.F.G. and I.F.G under the "Facilities" heading in the Gisborne Operational Data (2) in the next issue (effective 14 August 1997).

The wording requested is as follows:

"Fire extinguisher located outside Terminal building available during hours of regular air transport passenger services."

4.5 It was recommended to Eagle Air, the aircraft operator, that they

4.5.1 review the adequacy of the RFS services provided at the aerodromes into which they operate scheduled passenger services, (001/97) and;

4.5.2 take immediate steps to ensure the continued serviceability of the flight recorders fitted to their aircraft. (002/97).

4.6 The Acting General Manager of Eagle Airways Limited responded:

4.6.1 We believe Recommendation 001/97 should be deleted because of concerns raised earlier. These concerns as raised by Eagle Airways were:

1. The rules on certification have been set for an aerodrome which has operations of aircraft with 30 seats or larger and it is incidental that these facilities are available if a Metroliner operates to such an aerodrome.

2. Reference to CAR 139 is inappropriate because Gisborne is not a certified aerodrome.

3. The extinguishers carried at the aerodrome exceed the recommended minimum requirements specified in the AIP set by CAA.

4. CAR 139 applies to certificated airports with regular services provided by aircraft with 30 seats or more it does not apply to non-certificated airports.

A review will be undertaken by Eagle in conjunction with Gisborne Airport Authority, however and this will form the basis for further review of other airports.

11 June 1997

Hon. W P Jeffries
Chief Commissioner

Glossary of aviation abbreviations

AD	Airworthiness Directive
ADF	automatic direction-finding equipment
agl	above ground level
AI	attitude indicator
AIC	Aeronautical Information Circular
AIP	Aeronautical Information Publication
amsl	above mean sea level
AOD	aft of datum
ASI	airspeed indicator
ATA	actual time of arrival
ATC	Air Traffic Control
ATD	actual time of departure
ATPL (A *or* H)	Airline Transport Pilot Licence (Aeroplane *or* Helicopter)
AUW	all-up weight
°C	degrees Celsius
CAA	Civil Aviation Authority
CASO	Civil Aviation Safety Order
CDI	course deviation indicator
CFI	Chief Flying Instructor
C of A	Certificate of Airworthiness
C of G (*or* CG)	centre of gravity
CPL (A *or* H)	Commercial Pilot Licence (Aeroplane *or* Helicopter)
DME	distance measuring equipment
E	east
ELT	emergency location transmitter
ERC	Enroute Chart
ETA	estimated time of arrival
ETD	estimated time of departure
°F	degrees Fahrenheit
FAA	Federal Aviation Administration (United States)
FL	flight level
ft	foot/feet
g	acceleration due to gravity
GPS	Global Positioning System
h	hour
HF	high frequency
hPa	hectopascals
hrs	hours
HSI	horizontal situation indicator
HT	high tension
IAS	indicated airspeed
IFR	Instrument Flight Rules
IGE	in ground effect
ILS	instrument landing system

IMC	instrument meteorological conditions
in	inch(es)
ins Hg	inches of mercury
kg	kilogram(s)
kHz	kilohertz
KIAS	knots indicated airspeed
km	kilometre(s)
kt	knot(s)
LAME	Licensed Aircraft Maintenance Engineer
lb	pound(s)
LF	low frequency
LLZ	localiser
Ltd	Limited
m	metre(s)
M	Mach number (e.g. M1.2)
°M	degrees Magnetic
MAANZ	Microlight Aircraft Association of New Zealand
MAP	manifold absolute pressure (measured in inches of mercury)
MAUW	maximum all-up weight
METAR	aviation routine weather report (in aeronautical meteorological code)
MF	medium frequency
MHz	megahertz
mm	millimetre(s)
mph	miles per hour
N	north
NDB	non-directional radio beacon
nm	nautical mile
NOTAM	Notice to Airmen
NTSB	National Transportation Safety Board (United States)
NZAACA	New Zealand Amateur Aircraft Constructors Association
NZDT	New Zealand Daylight Time (UTC + 13 hours)
NZGA	New Zealand Gliding Association
NZHGPA	New Zealand Hang Gliding and Paragliding Association
NZMS	New Zealand Mapping Service map series number
NZST	New Zealand Standard Time (UTC + 12 hours)
OGE	out of ground effect
okta	eighths of sky cloud cover (e.g. 4 oktas = 4/8 of cloud cover)
PAR	precision approach radar
PIC	pilot in command
PPL (A *or* H)	Private Pilot Licence (Aeroplane *or* Helicopter)
psi	pounds per square inch
QFE	an altimeter subscale setting to obtain height above aerodrome
QNH	an altimeter subscale setting to obtain elevation above mean sea level
RNZAC	Royal New Zealand Aero Club
RNZAF	Royal New Zealand Air Force
r.p.m.	revolutions per minute
RTF	radio telephone or radio telephony

s	second(s)
S	south
SAR	Search and Rescue
SSR	secondary surveillance radar
^{o}T	degrees true
TACAN	Tactical Air Navigation aid
TAF	aerodrome forecast
TAS	true airspeed
UHF	ultra high frequency
UTC	Coordinated Universal Time
VASIS	visual approach slope indicator system
VFG	Visual Flight Guide
VFR	visual flight rules
VHF	very high frequency
VMC	visual meteorological conditions
VOR	VHF omnidirectional radio range
VORTAC	VOR and TACAN combined
VTC	Visual Terminal Chart
W	west