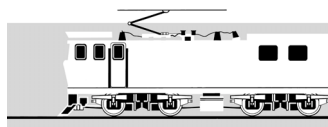
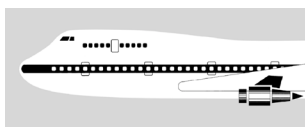


AVIATION OCCURRENCE REPORT

05-001

Gulfstream G-IV ZK-KFB and Piper PA 28 ZK-FTR , loss of separation, near Taupo

7 January 2005



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Report 05-001

Gulfstream G-IV ZK-KFB

and

Piper PA 28 ZK-FTR

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Abstract

On Friday 7 January 2005, at 1852, ZK-KFB, a Gulfstream G-IV, and ZK-FTR, a Piper PA 28, came into close proximity 10 nautical miles south of Taupo Aerodrome, during their instrument approaches to the aerodrome. On board ZK-KFB were 5 passengers, a flight attendant and 2 pilots. On board ZK-FTR were a passenger and the pilot.

Both aeroplanes were in uncontrolled airspace and flying different published instrument approaches to the aerodrome in visual meteorological conditions, when ZK-FTR descended through the altitude of ZK-KFB and came within one nautical mile of ZK-KFB. Following traffic alert and collision avoidance system traffic advisories, the crew of ZK-KFB abandoned their instrument approach and continued visually to land. Although the pilot of ZK-FTR was aware of ZK-KFB and had kept the aeroplane in sight, he did not maintain adequate separation on ZK-KFB or communicate his intentions clearly to its crew.

A safety issue identified was the need for pilots carrying out instrument approaches in uncontrolled airspace to the same aerodrome to be aware that they were to mutually coordinate and maintain their own proper separation. A safety recommendation was made to the Director of Civil Aviation to remind pilots about this issue.

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Abbreviations

ATC	air traffic control
DME	distance measuring equipment
IFR	instrument flight rules
NDB	non-directional radio beacon
nm	nautical miles(s)
TCAS	traffic alert and collision avoidance system
UTC	coordinated universal time

Data Summary

Aircraft registrations:	ZK-KFB ZK-FTR
Types and serial numbers:	Gulfstream G-IV, 1362 Piper PA 28, 28-8216133
Numbers and types of engines:	2 Rolls Royce Tay 611-8 (turbofan) one Lycoming 0-320 B2C (piston)
Years of manufacture:	1999 1982
Operators:	Air National Corporate private
Date and time:	7 January 2005, 1852 ¹
Location:	10 nm south of Taupo latitude: 38° 54' south longitude: 176° 05' east
Types of flight:	air transport, charter private
Persons on board:	crew: 3 1 passengers: 5 1
Injuries:	nil
Nature of damage:	nil
Licences held by Pilots-in-Command:	Airline Transport Pilot Licence (Aeroplane) Commercial Pilot Licence (Aeroplane)
Ages of Pilots-in-Command:	45 28
Total flying experience of Pilots-in-Command:	about 14 000 hours (450 on type) about 284 hours (61 on type)
Investigator-in-charge:	K A Mathews

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

Factual Information

1.1 History of the flight

- 1.1.1 On 7 January 2005 at about 1815, ZK-FTR, a Piper PA 28, took off from Hastings Aerodrome on an instrument flight rules (IFR) training flight to Rotorua Aerodrome. The pilot planned to carry out a practice instrument approach at Taupo Aerodrome before continuing to Rotorua. On board were the pilot and a passenger pilot who was to fly the aeroplane back from Rotorua to Hastings.
- 1.1.2 After take-off ZK-FTR was cleared by air traffic control (ATC) to intercept the direct track from Napier to Taupo, and to climb to 9000 feet.
- 1.1.3 About 17 minutes later at 1832, ZK-KFB, a Gulfstream G-IV, call sign National 401 (NTL 401), took off from Napier Aerodrome on an IFR flight to Taupo Aerodrome. On board were 5 passengers, one cabin attendant and 2 pilots.
- 1.1.4 After take-off NTL 401 was cleared by the ATC controller to 11 000 feet, also on the direct Napier to Taupo track.
- 1.1.5 After ZK-FTR had reached its cruising altitude, the pilot advised the controller that he intended to do an NDB (non-directional beacon) DME (distance measuring equipment) Alpha arc approach at Taupo (see Figure 1).
- 1.1.6 About 2 minutes later the co-pilot of NTL 401 requested descent and advised the controller that NTL 401 would be carrying out an NDB DME runway 35 approach at Taupo. The controller cleared NTL 401 to descend to 10 000 feet.
- 1.1.7 A short time later the controller instructed the pilot of ZK-FTR to make 2 right orbits at 9000 feet to facilitate the descent of NTL 401, which was overtaking ZK-FTR.
- 1.1.8 The controller then cleared NTL 401 to 7000 feet. About a minute later, the controller cleared NTL 401 to vacate controlled airspace via the NDB DME runway 35 approach, and advised the crew that ZK-FTR was behind them at 9000 feet for some training at Taupo. When NTL 401 had passed 8000 feet, the controller instructed the crew to change to the local Taupo Aerodrome frequency.
- 1.1.9 When NTL 401 was about 4 minutes from Taupo Aerodrome, the co-pilot broadcast on the local Taupo Aerodrome frequency that NTL 401 was a Gulfstream aircraft and was tracking to fly overhead the aerodrome to carry out the NDB DME runway 35 approach.
- 1.1.10 An ATC radar data plot showed that NTL 401 was at 6400 feet when it first flew over the Taupo NDB to begin its instrument approach, and that ZK-FTR was then at 9000 feet and about 14 DME from Taupo, or 4 nm from joining the arc for the instrument approach.
- 1.1.11 About 2 minutes after the co-pilot's broadcast, the controller cleared ZK-FTR to descend to 8000 feet, and after about another minute cleared ZK-FTR to leave controlled airspace via the NDB DME Alpha approach via the arc for runway 35. The controller advised the pilot that NTL 401 was just overhead Taupo for the NDB DME runway 35 approach, and that it was descending through 5500 feet.
- 1.1.12 The pilot of ZK-FTR acknowledged his clearance, and the controller further advised him that NTL 401 had just started the entry procedure and was doing the reversal turn before continuing outbound on the approach, and that NTL 401 was just north of Taupo and descending through 5000 feet. About one minute later, the controller instructed the pilot of ZK-FTR to change to the local Taupo Aerodrome frequency and to coordinate with NTL 401, which the controller advised him was tracking south at 4800 feet and about one minute away from being overhead the NDB. The pilot replied saying that he had copied the traffic.

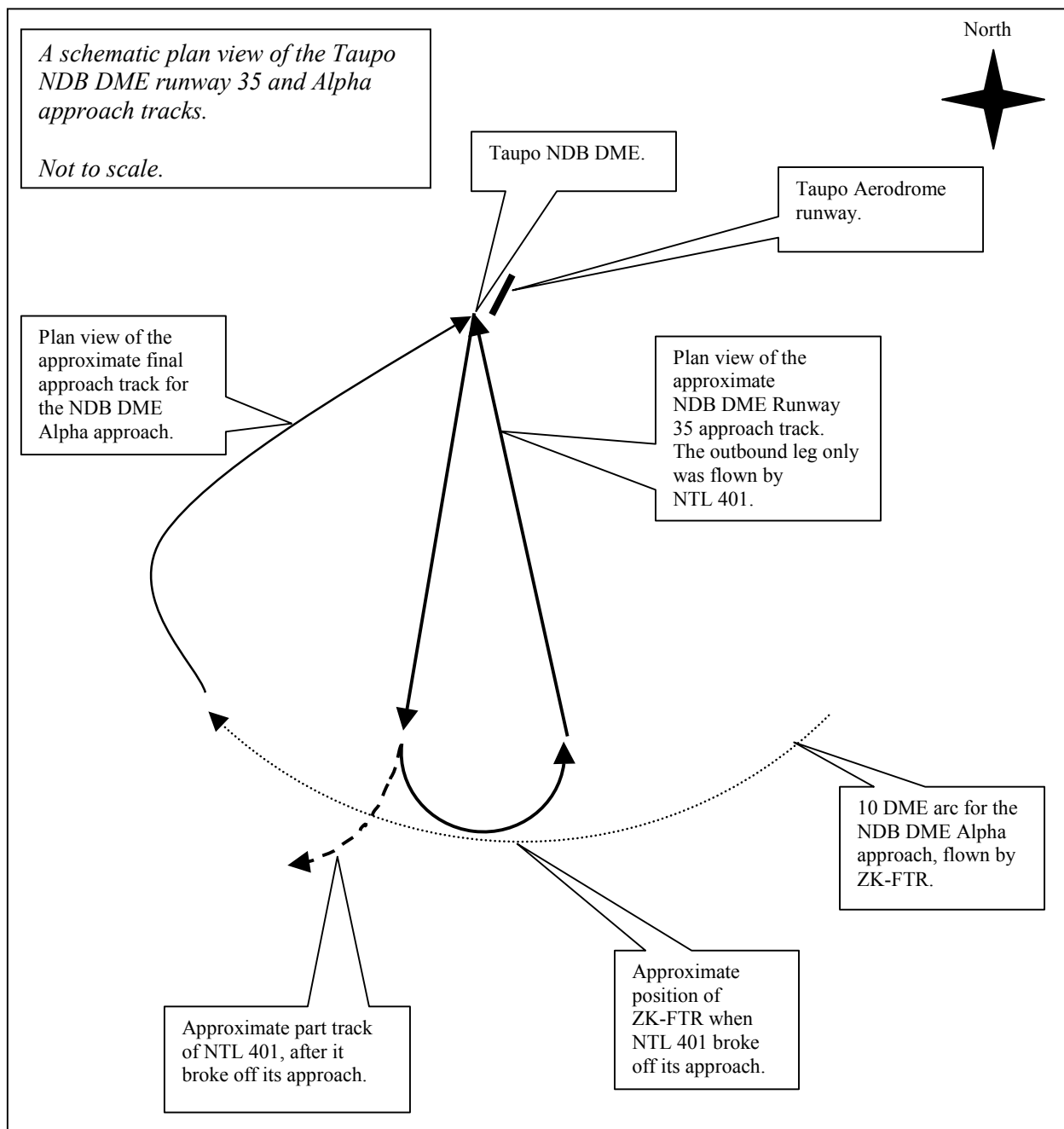


Figure 1
Plan view depiction of the approximate part approach tracks flown by each aeroplane

- 1.1.13 The NTL 401 co-pilot broadcast on the local Taupo Aerodrome frequency that NTL 401 had finished its reversal turn and was about to commence the outbound leg at 4800 feet. The published procedure for the NDB DME runway 35 instrument approach required aircraft to go no lower than 4800 feet when carrying out the reversal turn and when orbiting in the holding pattern. Aircraft were also to remain within 10 DME of Taupo when flying outbound, and to go no lower than 4500 feet until the completion of base turn.
- 1.1.14 ZK-FTR descended and joined the arc at 6900 feet. About 2 minutes after the co-pilot had broadcast that NTL 401 had finished its reversal turn, the pilot of ZK-FTR also broadcast on the local Taupo Aerodrome frequency that he was on the arc for the NDB DME Alpha approach and passing 6200 feet. The published procedure for the approach required aircraft to fly the 10 DME arc from Taupo no lower than 4900 feet on the first sector until passing relative bearing 010°, and then no lower than 4000 feet on the second sector until established inbound.

- 1.1.15 About a minute later, a commuter pilot approximately 40 nm to the south asked the pilot of ZK-FTR if he was doing the Alpha approach, and whether that was from the north. The pilot replied that he was 9 miles south of Taupo on the NDB DME Alpha approach via the arc at 5200 feet.
- 1.1.16 NTL 401 had maintained 160 knots throughout its approach. The crew later said that when NTL 401 was about 3 DME outbound from Taupo at 4800 feet, they noticed that their traffic alert and collision avoidance system (TCAS) had displayed an “other traffic”² aircraft symbol (ZK-FTR), at about 11 o’clock and descending at about 500 feet per minute from above and toward them. The radar data plot showed that ZK-FTR was then at 5800 feet and about 6 nm from NTL 401, in its 11 o’clock position. A short time later the TCAS showed a “proximate traffic” contact, when ZK-FTR had closed to within 5 nm and had descended through 5500 feet.
- 1.1.17 When NTL 401 was at 7 DME and 4800 feet outbound the crew heard the commuter pilot’s radio call, and the response from the pilot of ZK-FTR. The NTL 401 crew checked the Taupo approach charts but looked at the NDB Alpha approach chart instead of the NDB DME Alpha approach chart, and were unaware that ZK-FTR could be doing a DME arc approach from the south. The crew later said that the pilot’s accent made him difficult to understand, and consequently they initially thought that ZK-FTR was to the north.
- 1.1.18 At about the same time, the TCAS showed a “traffic advisory” contact at the same altitude and closing, and gave an audible alert to the crew. Both pilots tried to visually locate ZK-FTR but could not see the aeroplane. From the radar data plot, ZK-FTR was then at 4900 feet and about 2.5 nm from NTL 401, and still in its 11 o’clock position. The co-pilot challenged the pilot of ZK-FTR, and advised him that he was flying straight toward NTL 401 that was carrying out an NDB DME runway 35 approach, and asked him if he was visual.
- 1.1.19 The passenger pilot in ZK-FTR responded saying that they had NTL 401 in sight and that they were well clear.
- 1.1.20 When NTL 401 reached 9 DME a short time later, the crew should have started a left base turn toward the approaching ZK-FTR, to intercept the inbound track, in accordance with the published approach procedure. The crew had still not seen ZK-FTR, and the TCAS “traffic advisory” was showing a contact at a similar altitude closing from the 11 o’clock position. Because NTL 401 was in visual meteorological conditions, the crew broke off the approach and turned right and descended over Lake Taupo for a visual approach and landing on runway 35. The co-pilot broadcast the crew’s intentions on the local Taupo Aerodrome frequency. From the radar data plot, ZK-FTR was at 4600 feet and about one nm from NTL 401 in its 11 o’clock position, when NTL 401 broke off its approach.
- 1.1.21 The NTL 401 crew said they did not get a TCAS “resolution advisory”. Had they received such an advisory they would have had to take avoiding action by following the flight director command bar. Company procedures required the crew to take no avoiding action for the “traffic advisory” they received, but to visually try and locate the other traffic and, if they were in controlled airspace, to advise ATC.
- 1.1.22 The pilot of ZK-FTR later said he had flown the arc in visual meteorological conditions. He said there was some scattered cloud to the east of Taupo, but that it was clear over Taupo and to the west. He said that shortly after joining the arc he had identified NTL 401 flying outbound on its approach, and had kept NTL 401 in sight the whole time. He said that because the controller had earlier instructed him to hold by completing 2 orbits, he thought that ZK-FTR would be well clear of NTL 401 and therefore it would not be necessary for him to maintain vertical separation. He said that he had also slowed ZK-FTR down on the arc to give more room to NTL 401.
- 1.1.23 The pilot of ZK-FTR continued with the arc approach, then followed the missed approach procedure and proceeded to Rotorua.

² TCAS provides 4 levels of traffic information depending upon the computed level of threat, namely Other Traffic, Proximate Traffic, Traffic Advisory and Resolution Advisory.

- 1.1.24 Once the aeroplanes had left controlled airspace the controller was no longer responsible for their separation, and gave priority to controlling other aircraft flying in controlled airspace. Both aeroplane tracks though were still visible on radar. About 3 minutes after the pilot of ZK-FTR had changed to the local Taupo Aerodrome frequency, the controller saw that there could be a conflict but could not contact the pilots of either aeroplane. The controller asked the commuter pilot to contact the crew of NTL 401, and thus established that they had abandoned the instrument approach and were visual over Lake Taupo.

1.2 Personnel information

- 1.2.1 The captain of NTL 401 was aged 45. He held an Airline Transport Pilot Licence (Aeroplane) and a Class 1 Medical Certificate valid until 26 April 2005. He had flown approximately 14 000 hours and 450 hours on type. He was qualified to fly the aeroplane and had met the competency requirements.
- 1.2.2 The co-pilot of NTL 401 was aged 40. He held an Airline Transport Pilot Licence (Aeroplane) and a Class 1 Medical Certificate valid until 29 June 2005. He had flown approximately 8100 hours and 450 hours on type. He was qualified to fly the aeroplane and had met the competency requirements.
- 1.2.3 The pilot of ZK-FTR was aged 28. He held a Commercial Pilot Licence (Aeroplane) issued on 21 September 2004, and a Class 1 Medical Certificate valid until 17 July 2005. He had flown approximately 284 hours and 61 hours on type. He held an instrument rating for single pilot, single engine aeroplane operations, which was issued on 25 November 2004. In the 90-day period before the incident he had flown 30 hours under IFR, and his total instrument flight experience was about 63 hours. He was qualified to fly the aeroplane and had met the competency requirements.
- 1.2.4 English was not the first language for the pilot of ZK-FTR, but he had graduated from an English language school in New Zealand before his pilot training. The flight examiner who had tested him for his commercial licence and instrument rating considered that he had sufficient ability in the English language for him to adequately carry out his responsibilities as the holder of the licence and rating. The chief instructor whose school had trained the pilot recognised that at times the pilot did have some difficulty with the English language, but believed that he had sufficient ability in the language for him to adequately carry out his responsibilities as a pilot.

1.3 Aircraft information

- 1.3.1 ZK-KFB (NTL 401) was a Gulfstream G-IV SP, serial number 1362, twin turbofan engine executive aeroplane, capable of carrying up to 14 passengers and 2 pilots.
- 1.3.2 ZK-FTR was a Piper PA 28-161, serial number 28-8216133, 4-seat single piston engine aeroplane.
- 1.3.3 Both aeroplanes were recorded as being serviceable and were approved for their respective operations.

1.4 Meteorological information

- 1.4.1 Both aeroplanes were in visual meteorological conditions during the instrument approaches.

1.5 Aids to navigation

- 1.5.1 Taupo Aerodrome was equipped with a co-located NDB and DME. Both aeroplanes were fitted with a suite of navigational equipment for IFR flight, including automatic direction finders for NDB tracking, and DME.

1.6 Communication

1.6.1 All communications were by very high frequency transceivers.

1.7 Aerodrome information

1.7.1 Taupo Aerodrome was uncontrolled, with the uncontrolled airspace around Taupo extending from the ground to 6500 feet. A mandatory broadcast zone existed around the aerodrome, primarily to the north, west and south, to 12 nm. On the direct Napier to Taupo track, the zone boundary was 4 nm from the aerodrome. An aerodrome and weather information broadcast service provided relevant information for arriving and departing flights.

1.8 Flight recorders

1.8.1 ZK-KFB (NTL 401) was equipped with separate cockpit voice and flight data recorders, but no data readings were taken.

1.8.2 ZK-FTR was not equipped with any flight recorders, nor was it required to be.

1.9 Additional information

1.9.1 All applicants for a New Zealand pilot licence or rating had to be able to read, speak and understand the English language. Civil Aviation Rule Part 61.11 stated, in part:

(c) An applicant for a pilot licence or rating issued under this Part must have sufficient ability in reading, speaking and understanding the English language to enable the applicant to adequately carry out his or her responsibilities as the holder of that licence or rating.

1.9.2 The New Zealand Aeronautical Information Publication stated that when a flight was being conducted under IFR outside controlled airspace, the pilot was responsible for maintaining separation from other traffic. To assist pilots, ATC would pass on information about other traffic. The normal minimum vertical separation between controlled flights was 1000 feet, below flight level 290 (approximately 29 000 feet).

2 Analysis

2.1 This incident occurred in uncontrolled airspace when the 2 aeroplanes were flying different published instrument approaches to the same aerodrome, with the pilots having responsibility to maintain their own separation. The aeroplanes came within one nm of each other, and ZK-FTR descended through the altitude of NTL 401.

2.2 Because the aeroplanes were in visual meteorological conditions and the pilot of ZK-FTR had NTL 401 in sight, and because the crew of NTL 401 got a TCAS alert, there was little possibility of a mid-air collision. However, had the aeroplanes been in instrument meteorological conditions, and NTL 401 not been equipped with a TCAS, a collision could have resulted.

2.3 Had the crew of NTL 401 continued to follow the published approach procedure, NTL 401 would have turned left and, at 10 DME, both aeroplanes would have been flying toward each other at similar altitudes, until NTL 401 had completed its base turn. The radar data plot showed that had this occurred, ZK-FTR would have passed under NTL 401, having descended through its altitude. In this situation, the crew of NTL 401 probably would have received a TCAS “resolution advisory”, and taken avoiding action by following the aeroplane flight director commands.

2.4 Because NTL 401 was a high performance turbofan powered aeroplane, it quickly overtook the slower ZK-FTR on the route from Napier to Taupo, and was cleared to descend to a lower altitude after it had overtaken ZK-FTR. Consequently, when NTL 401 started its instrument approach it was 2600 feet lower than ZK-FTR, which still had about 4 nm to run to join the NDB DME arc.

- 2.5 Because the pilot of ZK-FTR was in the following aeroplane, he should have maintained vertical separation of 1000 feet above NTL 401, the lower aeroplane. In this situation, a procedural or geographical separation was probably not workable. When ZK-FTR reached 5800 feet on the NDB DME arc (when NTL 401 was at 4800 feet and 6 nm away), the pilot should have maintained that altitude until the aeroplanes had crossed and were clear of each other, and the crew had advised that NTL 401 was in position for a normal landing. The pilot should have also advised his intentions to the crew of NTL 401. He then could have continued with his practice approach.
- 2.6 The controller had been careful to advise the pilot of ZK-FTR about the position and intentions of NTL 401 on several occasions, and had also instructed him to coordinate with NTL 401 once ZK-FTR left controlled airspace. The pilot therefore had sufficient information about the location and intentions of NTL 401 to maintain vertical separation, and should have spoken to the crew. However, he had thought that by having earlier completed 2 holding orbits, and having slowed ZK-FTR down on the arc, he would be clear of NTL 401. Even though the pilot had kept NTL 401 in sight he did not seem to be aware of the developing conflict, which could be explained by his low experience and possibly mixing visual and IFR separation standards.
- 2.7 Had the pilot contacted the crew of NTL 401, he could have given them up-to-date information about his position and intentions, and thus given the crew opportunity to locate ZK-FTR and coordinate with him. Even though ZK-FTR did not enter the mandatory broadcast zone until after it was established on the arc, the pilot could have broadcast his intentions on the local Taupo Aerodrome frequency before he descended and joined the arc. Such a broadcast should have given the crew of NTL 401 an early alert to the possibility of a conflict. Only after the commuter pilot had asked the pilot of ZK-FTR to verify his position, did the crew fully understand the pilot's intentions and the source of the TCAS target.
- 2.8 The pilot's accent did not help the situation, and when the co-pilot of NTL 401 challenged the pilot the passenger pilot responded, having seen the need to intervene. Even though English was not the pilot's first language, he had demonstrated sufficient ability to carry out his normal pilot duties. However, other pilots not familiar with the pilot's accent could possibly have some difficulty comprehending some of his phrases if he did not speak clearly, or if there was radio interference. In this sort of situation, clarification should always be sought, and pilots whose first language was not English should endeavour to always speak clearly and concisely.
- 2.9 The crew of NTL 401 knew that ZK-FTR was behind them for Taupo and could have contacted the pilot to verify his intentions. They could also have considered how an aircraft carrying out a different instrument approach might conflict with NTL 401 on the NDB DME runway 35 approach. If they had viewed the NDB DME Alpha approach chart they would have seen that ZK-FTR should not be to the north, but to the south. However, because NTL 401 was much faster than ZK-FTR and had overtaken it and descended below its altitude, it was reasonable for the crew to consider that ZK-FTR would not come into conflict with NTL 401 during its approach.
- 2.10 This incident had the potential to become a mid-air collision, but it could have been avoided by better communication and situational awareness, and the proper application of mutual separation in uncontrolled airspace.

3 Findings

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

- 3.1 This reduced separation incident occurred in uncontrolled airspace, when the pilots had the responsibility to maintain their own adequate separation.
- 3.2 Because the published instrument approach track flown by ZK-FTR intersected the published instrument approach track flown by NTL 401, there was potential for a conflict if aircraft were not vertically separated when flying the different approaches.
- 3.3 The pilot of ZK-FTR was aware of NTL 401, but continued with his approach descent because he mistakenly believed that he had adequate separation with that aeroplane.
- 3.4 Because ZK-FTR was the higher aeroplane, the pilot should not have descended ZK-FTR through the altitude of NTL 401, but stayed 1000 feet above NTL 401 until the aeroplanes had passed and were clear of each other and NTL 401 was in position to land.
- 3.5 The developing situation could have been avoided if the pilots had spoken directly to each other and established positive mutual separation.
- 3.6 The pilot's accent made some of his radio communications unclear to those not familiar with his voice, which contributed to the crew of NTL 401 being uncertain as to the position of ZK-FTR and the pilot's intentions.
- 3.7 This incident highlighted the potential for a mid-air collision to occur between aircraft flying instrument approaches in uncontrolled airspace to the same aerodrome, and the need for pilots to maintain situational awareness and to establish positive mutual separation on these occasions.

4 Safety Recommendation

- 4.1 On 29 July 2005 the Commission recommended to the Director of Civil Aviation that he:
 - 4.1.1 publish educational material to remind IFR pilots about their mutual separation responsibilities in uncontrolled airspace, particularly when carrying out instrument approaches to the same aerodrome. (065/05)
- 4.2 On 26 July 2005 the Civil Aviation Authority responded on behalf of the Director advising that he had accepted preliminary safety recommendation 065/05 as worded. The response to the preliminary safety recommendation is the final response, which stated in part:
 - 4.2.1 The Director will accept this recommendation and will publish an article in the November/December [2005] issue of the CAA Safety Magazine Vector, to this effect.

Approved on 18 August 2005 for publication

Hon W P Jeffries
Chief Commissioner



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