

**Aviation Safety Investigation Report
199502765**

**Boeing Co
B747
Boeing Co
B737-400**

25 August 1995

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NOTE: All air safety occurrences reported to the ATSB are categorised and recorded. For a detailed explanation on Category definitions please refer to the ATSB website at www.atsb.gov.au.

The Bureau did not conduct an on scene investigation of this occurrence. The information presented below was obtained from information supplied to the Bureau.

Occurrence Number: 199502765 **Occurrence Type:** Incident
Location: 6km SE Sydney, Aerodrome
State: NSW **Inv Category:** 3
Date: Friday 25 August 1995
Time: 0714 hours **Time Zone** EST
Highest Injury Level: None

Aircraft Manufacturer: Boeing Co
Aircraft Model: 747-400
Aircraft Registration: F-GEXA

Serial Number:

Type of Operation: Air Transport High Capacity International Passenger
Scheduled
Damage to Aircraft: Nil
Departure Point: Sydney NSW
Departure Time: 0714 EST
Destination: Tontouta Noumea

Aircraft Manufacturer: Boeing Co
Aircraft Model: 737-476
Aircraft Registration: VH-TJN

Serial Number: 24439

Type of Operation: Air Transport Domestic High Capacity Passenger
Scheduled
Damage to Aircraft:
Departure Point: Sydney NSW
Departure Time: 2113 EST
Destination: Brisbane QLD

Approved for Release: Thursday, January 30, 1997

FACTUAL INFORMATION

History of the flight

The B747 had been cleared to depart from Sydney for Noumea via a Runway 16 Right Jet Three departure. This departure required a track of 155 degrees after takeoff to an altitude of 800 ft, then a right turn to intercept the 163-degree radial from the Sydney very high frequency omni-directional radio range beacon (VOR). The B737 had been cleared to depart from Sydney for Brisbane via a Runway 16 Left West Maitland Seven standard instrument departure (SID). This departure required a track of 155 degrees after takeoff to an altitude of 600 ft, then a left turn to intercept the 126-degree radial from the Sydney VOR.

After receiving the clearance from air traffic control, the B747 crew read it back correctly.

The B747 took off from runway 16R, followed by the B737 which took off from runway 16L. When the B747 reached 800 ft altitude, the pilot initiated a left turn, putting the aircraft in conflict with the B737. The Departures North controller asked the pilot of the B747 to confirm that he was turning right to intercept the 163-degree radial and the pilot replied that he was turning left to intercept the 126-degree radial. The controller immediately instructed the B747 to turn right onto a heading of 180 degrees and passed traffic information on the B737 to the B747 crew. The B747 crew complied with the instruction immediately.

The pilot of the B737 reported that he had the B747 in sight and that both aircraft were turning away from each other. Recorded radar information indicated a minimum separation of 0.5 NM horizontally and 200 ft vertically. The procedural separation standard of 1,000 ft vertically and the radar separation standard of 3 NM horizontally had both been breached.

The aerodrome controllers observed both aircraft become airborne but they became diverted by other tasks and did not see the B747 commence the left turn. As a result, visual observation was not maintained and a breakdown of separation standards occurred.

Pilot's understanding of procedures

Two days before this occurrence, a B747 crew of the same operator, with the same pilot in command and carrying out the same departure, had made the same error. However, on that occasion, the Departures North controller instructed the crew to take up headings to achieve the required departure track. The crew was not advised of its error and no conflict with other traffic occurred.

After the second occurrence, the pilot reported that he had felt some confusion due to the naming of the departure procedures but had realised his mistake when he looked at the departure chart after being advised to alter heading to 180 degrees.

While admitting his mistake, the pilot added that there were contributing factors, namely:

- (a) the two departures were depicted diagrammatically on the same sheet of his documentation (Atlas chart number 7);

(b) he had not been aware of his error two days previously; and

(c) the aircraft taking off from runway 16L was on a different tower frequency and he had no information on this traffic.

Documentation

The pilot was using the Atlas chart entitled "JET 3 DEPARTURE RWY 16L/R, 34L", dated 22 June 1995. The chart was bounded by a border 27.0 cm by 18.5 cm in width (approximately A4 size) and depicted three departures plus airspace and terrain information to 40 NM by distance measuring equipment (DME). The chart was designed to be read in the landscape orientation. Despite the size of the sheet, the departure details were depicted within a circular area 10.7 cm in diameter. The details of the procedures out to 10 DME were depicted within a circular area 7 cm in diameter. There were no warnings about parallel runway operations on runways 16L and 16R to alert crews not to turn toward the other runway centreline after takeoff.

The Atlas documentation included another page headed "SIDs RWY 16R...SYDNEY (Austr)". The sheet was bounded by a border 18.3 cm by 13 cm (approximately A5 size) and was designed to be read in the portrait orientation. The page contained textual descriptions of seven SIDs from Sydney runway 16R. The description of the Jet-3 departure was headed "Sydney Jet 3" and was written in letters approximately 2 mm in height. The description was contained within an area 10 cm by 1 cm and was worded:

"Sydney Jet 3

Climb on 155 (degrees)

Initial turn at 800

RT to intercept R163 SY 115.4

Expect radar vectors at or before BELLA (DME 15 SY)"

Nomenclature of procedures

There were three Sydney Jet Three departures differentiated only by the runway designator, runway 16R, 16L or 34L. All three procedures were totally different, despite the similarity of their names. The pilot in command reported that he found the similarity of procedure naming confusing and conducive to error.

The use of the one title, differentiated only by the runway designator, for a number of departures was common practice. There were five (Sydney) Radar Six, three Wollongong Three, three Shellys Three, two Richmond Five, two Mudgee Five, two Katoomba Five, three West Maitland Seven and three Williamtown Seven departures.

ANALYSIS

Crew awareness

Despite the crew's correct readback of the allocated departure to Air Traffic Control, the crew members were obviously unsure of the procedure. The fact that the same pilot in command had made the same error two days earlier and that the air traffic services staff did not highlight the error to the pilot, meant that an opportunity to clarify any uncertainty in the pilot's mind was lost.

Tower monitoring

The closest proximity between the two aircraft was 0.5 NM horizontally and 200 ft vertically, thus breaching the procedural and radar separation standards. This would not normally have been a problem as the tower controllers would be providing visual separation; but on this occasion, they were concentrating upon other traffic and did not observe the B747 turn left. As there were no radar or procedural standards in place, this action resulted in no separation being applied by Air Traffic Control. However, as the B737 pilot had the B747 in sight throughout the sequence of events, no serious collision risk was present. The rapid response of the Departures North controller, who detected the error and instructed the B747 crew to turn right onto 180 degrees immediately, prevented the situation deteriorating further.

The Manual of Air Traffic Services, Chapter 4, "Separation Standards", Section 1, Para 26 describes the obligation of a controller to issue a safety alert when he/she believes that an aircraft is in an unsafe proximity to terrain, obstructions, or other aircraft. The paragraph recognises that a controller cannot immediately see the development of every situation where a safety alert must be issued, but he/she must remain vigilant for such situations and issue a safety alert when the situation is recognised.

Documentation

The Atlas chart depicted the departure procedures in a small central section of the chart but also showed a considerable quantity of additional detail that was not part of the procedures. In contrast, the Airservices and Jeppesen charts showed only the details of the procedures. The Jeppesen and Airservices charts carried warnings about parallel runway operations but the Atlas chart did not carry this warning. Although any useability comparisons must be subjective, as crews become accustomed to the charts that they use, the Atlas chart seemed to be less convenient for crew use than either the Airservices or Jeppesen charts.

The Airservices and Jeppesen charts depicted the procedures both diagrammatically and in text on the same sheet. The Atlas chart depicted the procedures only diagrammatically on the sheet, the description in text was on a separate sheet. Arguably, this would further reduce the Atlas chart's user convenience.

None of the Jet Three departure charts contained a hachured region between the 126 and 163-degree radials as a clear warning to crews that parallel runway operations take place and that aircraft must not turn toward the extended centreline of the other runway. However, other Airservices charts depicting the standard instrument departures for jet aircraft departing north, south and west contained hachured areas with warnings.

Nomenclature of procedures

In the case of parallel runways where the nomenclature of different procedures differs by only the words "left" or "right", there may be a greater likelihood of crew confusion and error than in the case of a single runway. In addition, if parallel runway operations are taking place, the consequences of an error could be more serious than in the case of a single runway.

SIGNIFICANT FACTORS

1. The Sydney Jet Three departure chart used by the B747 crew was relatively easy to misread.
2. The B747 pilot did not follow the departure procedure as cleared by Air Traffic Control.
3. The tower controllers did not adequately monitor the B747 from its takeoff to the commencement of its turn, resulting in a breakdown of separation standards.

SAFETY ACTION

As a result of this investigation, on 21 September 1995, the Bureau issued Interim Recommendation IR950203 to Airservices Australia as follows:

IR950203

"The Bureau of Air Safety Investigation recommends that Airservices Australia review the presentation of parallel runway operations on the Sydney Jet Departure charts, to improve the indication of the dangers of turning across the departure path of the other parallel runway.

"It is also recommended that the number and naming of departure procedures should be reviewed to ensure that any likelihood of flight crew selecting the wrong procedure is reduced."

An information copy of the interim recommendation was issued to the Civil Aviation Safety Authority.

On 13 November 1995, the Civil Aviation Safety Authority responded as follows:

"I refer to your interim recommendation IR950203 concerning an incident involving Boeing 747, F-GEXA and Boeing 737, VH-TJN near Sydney Airport on 25 August 1995.

"Summary

"A revised Sydney Jet Departure Procedure plate will become effective on 7 December 1995.

"A forthcoming "Terminal Area Workshop" sponsored by Airservices Australia and attended by industry representatives will discuss the adequacy of the current SID naming convention.

"Background to Response

"Following the earlier similar incident by this operator, the Sydney Jet Departure Procedure plate was amended by the hachuring of the area between the two runways and the re-organisation of the presentation of the departure wording in the text section of the procedure. The line weight of the Caution note was also increased to make it more prominent. The revised presentation reflects the intent of the BASI interim recommendation. The revised plate will become effective on 7 December 1995. Copy of the 07 DEC 95 plate is attached.

"With reference to the BASI comments on the naming of the multiple departure instructions, the naming format used conforms with the ICAO Annex 4 naming convention. This format was introduced with the revised SID presentation some years ago which allowed the number of SID procedures to be considerably reduced. For instance, the Sydney SIDs were reduced from 72 to the current 11 procedures and the DAP page numbers from 22 to 6. At that time, this initiative was applauded by both industry and ATC.

"The foregoing notwithstanding, the subject of SID naming will be discussed at the Terminal Area Workshop on 20 - 21 November 1995. This workshop is sponsored by Airservices Australia and will be attended by representatives of the industry. The discussion should give a good indication of the adequacy of the current SID naming convention."

On 22 January 1996, Airservices Australia responded as follows:

"I refer to your interim recommendation IR950203, concerning an incident near Sydney Airport on 25 August 1995.

"In response to your recommendations, I can advise that a revised Sydney Jet Departure Procedure plate became effective on 7 December 1995. The main amendments involved hachuring of the area between the two runways and the re-organisation of the presentation of the departure wording in the text section of the procedure. In addition, the line weight of the caution note has been increased to make it more prominent.

"In respect of your comments relating to the naming of the multiple departure instructions, I am advised that the naming format complies with the ICAO Annex 4 naming convention."

Classification of response: CLOSED - ACCEPTED