Australian Government

Australian Transport Safety Bureau

Loss of separation involving Boeing 777, registered N2333U and ATR 72, registered VH-FVQ

About 4 km north of Sydney Airport, NSW on 22 January 2020

ATSB Transport Safety Report

Aviation Occurrence Investigation

AO-2020-005

Final – 28 July 2020

Released in accordance with section 25 of the *Transport Safety Investigation Act 2003*

Publishing information

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Addendum

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Safety summary

What happened

On 22 January 2020, a Boeing 777 was being operated by United Airlines as regular public transport flight UA870 from Sydney, Australia to San Francisco, United States.

At about the same time, a GIE Avions de Transport Régional ATR 72 was being operated by Virgin Australia as regular public transport flight VOZ1153 from Sydney to Tamworth, New South Wales.

Sydney Airport was configured for parallel runway operations, including simultaneous independent departures. VOZ1153 departed from runway 34R, to an assigned heading of 350º, just prior to UA870 departing from runway 34L. UA870 was required to maintain runway heading (335º) until reaching 1,500 ft, at which point the aircraft was cleared to turn left and track towards Richmond, northwest of Sydney. However, UA870 climbed straight ahead through to about 2,100 ft and then the aircraft turned to the right about 45º from the required heading, resulting in a loss of separation with VOZ1153. At their closest point of approach, the two aircraft were separated by 1,843 m (about 1.0 NM) laterally and 60 m (about 200 ft) vertically.

Air traffic control detected the loss of separation and issued interventional instructions to both aircraft. The required separation was re-established and both flights continued without further incident.

What the ATSB found

The ATSB found that the UA870 pilot flying was expecting a more simplistic procedure often provided to foreign crew departing Sydney for an oceanic route. The pilot flying then became confused regarding aspects of the flight management computer (FMC) coding generated to represent the actual departure clearance provided. This may have been due to an unfamiliarity with radar transitions from a standard instrument departure to an en route track. This led the pilot flying to incorrectly adjust the FMC prior to engine start, and resulted in the aircraft turning right after departure, bringing it into conflict with VOZ1153.

The pilot flying probably did not effectively communicate the changes made to the FMC to the crew. The FMC departure specific coding was also not effectively cross-checked by the pilot monitoring or relief pilots prior to take-off.

Safety message

The ATSB's **SafetyWatch** program highlights broad safety concerns that come out of ATSB investigation findings and from the occurrence data reports by industry. One of these safety concerns is data input errors.

This occurrence illustrates the importance of procedural correctness, effective communication and crew coordination towards the conduct of safe flight operations. Any amendment to the flight management computer, particularly those applicable to the more critical phases of flight (departure and arrival procedures) should always be announced, and then carefully and independently verified by at least one other crew member. The incident also outlines that when possible, air traffic controllers can potentially further assist foreign crew by proactively factoring the crew's unfamiliarity when providing airways clearances.

The investigation

Decisions regarding whether to conduct an investigation, and the scope of an investigation, are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, a limited-scope, fact-gathering investigation was conducted in order to produce a short summary report, and allow for greater industry awareness of findings that affect safety and possible safety actions.

The occurrence

On the early afternoon of 22 January 2020, a Boeing 777-300ER (777), registered N2333U, was being operated by United Airlines as regular public transport flight UA870 from Sydney, New South Wales to San Francisco, United States.

At about the same time, a GIE Avions de Transport Régional ATR 72-600 (ATR72), registered VH-FVQ, was being operated by Virgin Australia as regular public transport flight VOZ1153 from Sydney to Tamworth, New South Wales.

The Sydney Airport automatic terminal information service (ATIS)[1] indicated to all crews that parallel runway operations were in progress, including simultaneous independent departures[2] from runways 34L and 34R. The weather was fine, with excellent visibility, no cloud below 10,000 ft and a light wind from the northwest.

The flight crew for flight UA870 consisted of a captain and three first officers. The captain was the pilot flying (PF) and one of the first officers was the pilot monitoring (PM).[3] The remaining first officers occupied the two observers' seats positioned directly behind the PF and PM on the flight deck.

Sydney air traffic control attempt to facilitate expeditious departures to all aircraft, particularly aircraft transiting over extended distances (oceanic crossings). This regularly involves a clearance via the SYDNEY ONE RADAR (SYD1) standard instrument departure (SID).[4] The PF had operated from Sydney Airport on a number of other occasions. While preparing for departure at the gate, after receiving the ATIS, but prior to receiving their pre-departure clearance, the PF configured the flight management computer (FMC)[5] for the SYD1 based on an expectation from prior experience.

At about 1330 Eastern Summer Time (ESuT),[6] Sydney clearance delivery (SCD) air traffic control (ATC) provided a different pre-departure clearance via VHF radio:

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1. Automatic terminal information service (ATIS): continuous broadcast of recorded aeronautical information. ATIS broadcasts contain essential information, such as current weather information, active runways, available approaches, and any other information required by flight crew.
2. Simultaneous independent departures refers to the delegation of controlling responsibilities to two tower controllers simultaneously, each responsible for either runway 34L, via very high frequency (VHF) 120.5, or the parallel runway (34R) via VHF 124.7.
3. Pilot flying (PF) and pilot monitoring (PM) are procedurally assigned roles with specifically assigned duties at specific stages of a flight. The PF does most of the flying, except in defined circumstances; such as planning for upcoming stages of the flight. The PM carries out support duties and monitors the PF's actions and the aircraft's flight path.
4. Standard instrument departure (SID): an air traffic control (ATC) defined procedure, usually coded via the FMC, that simplifies departure tracking while also balancing terrain/obstacle avoidance, noise abatement and airspace management considerations.
5. Flight management computer (FMC): is a specialised computer system that automates multiple in-flight tasks reducing the workload of the flight crew. The system is able to combine multiple inputs to generate a blended solution regarding the aircrafts position and key flight parameters.
6. Eastern Summer Time (ESuT): Coordinated Universal Time (UTC) + 11 hours.

> United eight seventy (UA870), delivery, cleared to San Francisco via DIPSO,[7] flight planned route, runway three four left (34L), Richmond five departure, radar transition, climb via SID to five thousand (5,000)…

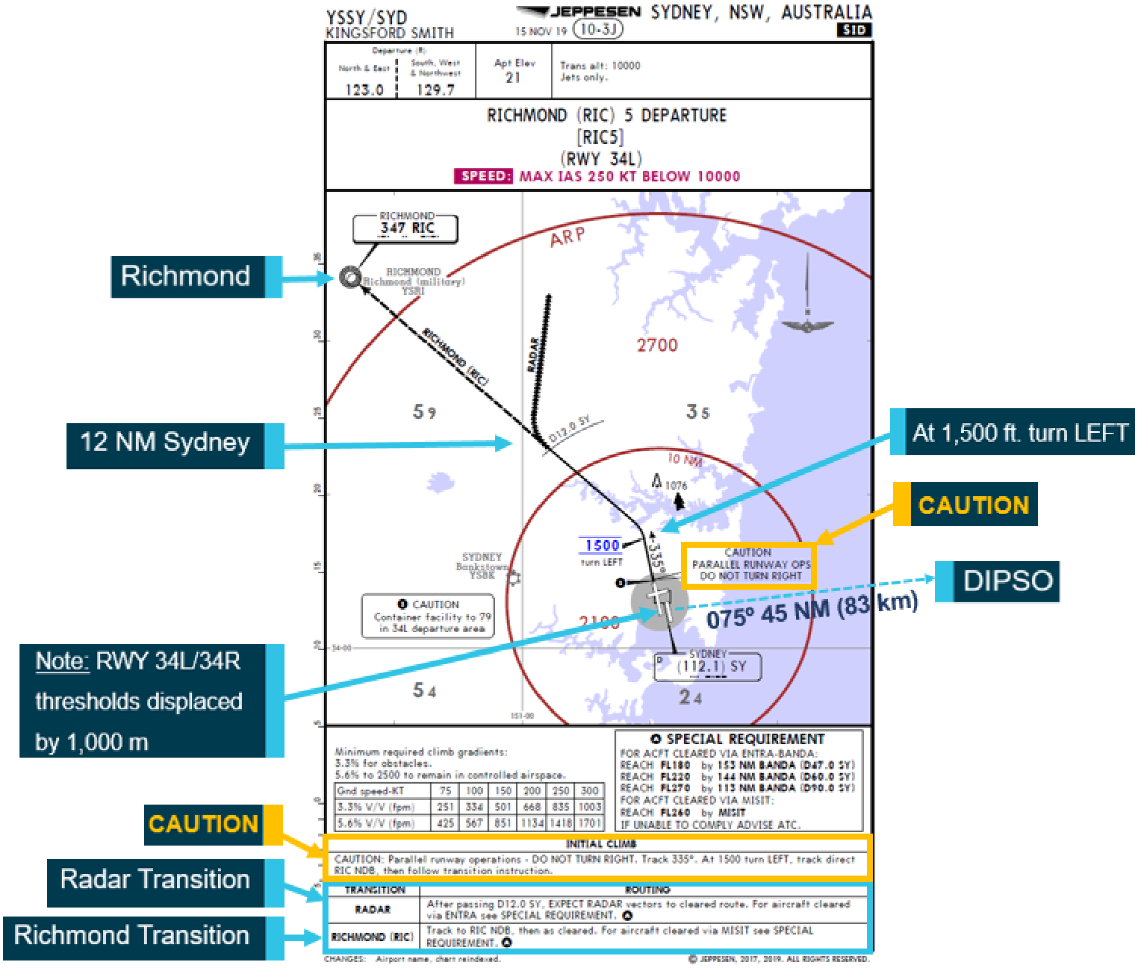
The PM provided a truncated read back of the clearance to ATC, inadvertently not repeating the radar transition[8] component.

At the same time as the UA870 crew were preparing for their departure, VOZ1153 was cleared to depart via the SYD1 radar SID via runway 34R. This procedure required the ATR72 to maintain a heading of 350º after take-off, until directed otherwise by ATC.

The UA870 crew reviewed the RICHMOND FIVE (RIC5) SID chart (Figure 1). That chart included two distinct caution notes about the initial climb. The more detailed caution stated:

> Parallel runway operations - DO NOT TURN RIGHT. Track 335º. At 1500 [ft] turn LEFT, track direct RIC NDB [Richmond], then follow transition instruction.

Figure 1: RICHMOND 5 Standard Instrument Departure (SID) from runway 34L



Source: Jeppesen (via United Airlines flight safety). Annotated by the ATSB.

The PF then re-programmed the FMC, replacing the SYD1 procedure with the RIC5. At this point, the PF reported being unsure regarding the coding specific to the two transition options (radar or Richmond) presented by the FMC.

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7 DIPSO: the first navigational waypoint beyond the Sydney terminal area, on the aircraft's flight planned (oceanic) route from Sydney to San Francisco.

8 See Context – *Transition routes*.

The radar transition option in the FMC included a deliberate discontinuity[9] (gap) in the waypoint[10] sequence (coding). The discontinuity represented the point where air traffic control would provide radar vectors to facilitate a re-join to the oceanic track (to San Francisco) after the aircraft passed 12 NM from Sydney (see Figure 1).

The PF then closed (removed) the discontinuity.[11] In effect, the PF had removed the pre-programmed radar transition procedure, which meant that after the 1,500 ft left turn, the next waypoint on the route was DIPSO, not 12 NM Sydney. The PF recalled communicating removing the discontinuity to the PM, but it was not acknowledged by the PM. The PM did not recall hearing about the coding change.

Later in the pre-departure preparation, the PM reported verifying the new departure in the FMC using the summary route (RTE) page. However, the PM did not review it using the more detailed LEGS page (see *Flight management computer discontinuities*).

While taxiing to the runway for take-off, the PM recalled that when completing the departure review[12] with the PF, they noted the FMC RTE page read:

> Runway 34L, Richmond Five (RIC5), no transition

At 1421:41 the tower controller for runway 34R cleared VOZ1153 for take-off, and 42 seconds later, the tower controller for runway 34L cleared UA870 for take-off.

At 1422:29, VOZ1153 departed runway 34R. About 35 seconds later, as VOZ1153 was climbing through 1,500 ft, UA870 departed runway 34L. (The runway 34L threshold is about 1,000 m north [ahead] of the runway 34R threshold [see Figure 1].)

At about 1424:06, climbing through 1,417 ft, the UA870 crew were instructed to contact Sydney departures control.

At 1424:33, as UA870 was climbing through 2,120 ft, the Sydney departures controller detected that the aircraft was turning right and instructed the crew to immediately turn left, to a heading of 270°. The flight crew had also identified the incorrect turn to the right. The departures controller then issued a separate interventional instruction to VOZ1153 to turn right immediately, to a heading of 090°.

On receiving their instruction, the two UA870 pilots in the observers' seats identified the traffic (VOZ1153) visually (right-hand observer) and via the traffic alert and collision avoidance system (TCAS)[13] display (left-hand observer).

Recorded flight data showed that the UA870 autopilot was disengaged about 3 seconds after the interventional instruction to UA870 was received, at an altitude of 2,160 ft. Due to the momentum of the 777, the aircraft continued turning right through a further 5 degrees to heading 018º, prior to the PF manually reversing the turn back to the left. The minimum distance between the two aircraft was 1.0 NM laterally and 200 ft vertically (Figure 2).

Both aircraft continued flight to their respective destinations without further incident.

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9 Discontinuity: exists or is created when two waypoints are not connected by a segment within the FMC route. That is, when a gap exists.

10 Waypoint: a defined position of late and longitude coordinates, primarily used for navigation.

11 See Context - *Flight management computer discontinuities*.

12 Departure review: is an operator process whereby the crew verbalise and verify key items prior to take-off including; aircraft weight, thrust setting, configuration and the FMC departure setup (cleared runway, SID and transition). Procedurally, the PM verbalises while checking the setup, the PF then 'verifies' by also checking the setup.

13 See Context – *Traffic alert and collision avoidance system.*

Figure 2: Aircraft tracks showing closest point of approach

Source: Google Earth overlaid with United Airlines and Virgin Australia data. Annotated by the ATSB.

Context

Flight crew

The flight crew of UA870 was augmented[14] with two cruise in-flight relief pilots (also first officers), due to the duration of the flight and the operator's flight crew fatigue management framework. Neither the PM or PF reported being fatigued or tired at the time of the incident. Both relief pilots reported minor tiredness at the time of the incident. All the flight crew reported having achieved two separate periods of sleep during their layover in Sydney. UA870 flight crew experience is summarised in *General details*.

Transition routes

SIDs are designed to allow pilots to navigate away from an airport with minimal radio communication with ATC (departures control). Charted transition routes facilitate the transition from the end of a basic SID to a location in the en route airways structure. In this case, the radar

[14] Augmented flight crew: refers to a flight crew complement that comprises more than the minimum number of pilots required to operate the aircraft type. The 777 requires a minimum of two pilots, one being designated the pilot-in-command (PIC) or captain. The additional pilots are referred to as relief pilots.

transition allowed for UA870 to join their route to San Francisco at waypoint DIPSO after departing Sydney via the RIC5 procedure

Normally a transition route includes a course, altitude requirements and distances between waypoints along the transition. Some SIDs have multiple transitions. The Richmond 5 SID had two transition routes.

The radar transition segment relied on the Sydney departures controller providing radar vectors for the aircraft to follow back to the east, after the aircraft passed the ‘12 NM Sydney’ point, but prior to Richmond. The aircraft would then re-join their flight planned (oceanic) route to San Francisco. In the event that a radar vector was not provided by 12 NM northwest of Sydney, the autopilot would simply maintain the aircraft’s heading from that point, until a vector was provided to the crew, or the crew amended the FMC route. The procedure required the aircraft track to initially track to the west to allow for separation with aircraft departing simultaneously from the parallel runway (34R).

The presence of a route discontinuity is unusual in a departure or arrival procedure, but it serves to highlight to the flight crew that at the point of discontinuity, a further clearance or direction is required from ATC.

Flight management computer discontinuities

The PF uploaded the flight plan to the FMC via satellite datalink. Procedurally, the crew (usually the PF), then manually entered the SID based on the departure clearance provided, which is contained within the FMC memory.[15] The majority of procedural SIDs could then be joined to the uploaded route by removing the discontinuity created between the end waypoint defining the departure procedure and the first waypoint of the main route to their destination. This was the normal process dictated by the operator’s procedures, where it was emphasised that for most departures the remaining FMC discontinuities should be rectified (removed) using the FMC legs (LEGS) page (Figure 3).

Guidance was also provided that this should not be completed in isolation from the rest of the crew.

The PF reported some confusion with the coding specific to the radar transition component of the RIC5 SID. That is, misunderstanding the necessity for the pre-programmed discontinuity as it was depicted by the FMC, which represented the radar transition segment during which ATC would provide radar vectors.

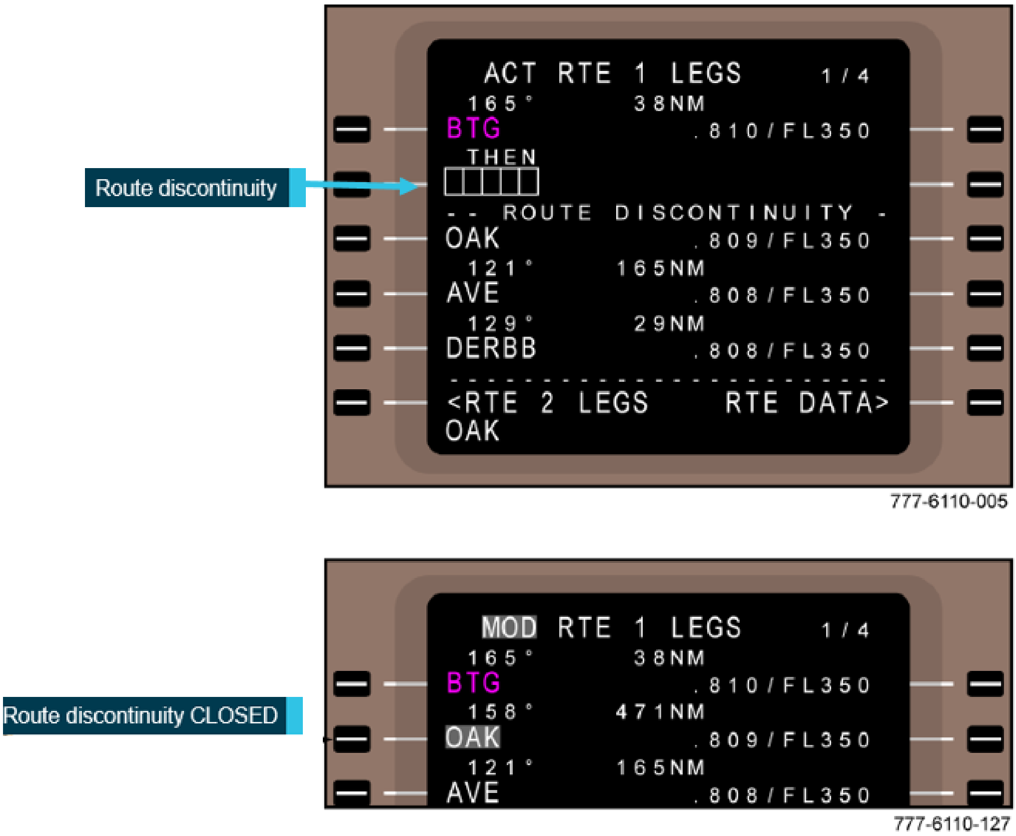
A discontinuity can be viewed by either the FMC LEGS page or route (RTE) page. The RTE page is a summary page generated displaying significant waypoints and airways (routes) that, in sequence, define the coded route the aircraft is programmed to fly via either the autopilot, if engaged or the flight director, if flying manually. The RTE page does not contain the same level of detail contained via the FMC LEGS page (Figure 3).

The operator’s supplementary procedures regarding the FMC setup prior to departure also included the following warning:

> Do not use the RTE page to repair discontinuities resulting from SID entries. Critical changes in departure ground track may result.

[15] FMC databases are updated every 28 days in order to capture any changes to any of the data (e.g. airport infrastructure, permanent obstacles, magnetic variation etc.).

Figure 3: Example of a route discontinuity displayed via the B777 FMC LEGS page



Source: Boeing B777 supplementary procedures (via United Airlines)

United Airlines procedures

The operator's procedural documentation included guidance and direction specific to departure preparation. They detailed the PF and PM tasks and responsibilities, including the requirement to conduct a pre-departure briefing. The crew were also required to conduct a comprehensive departure review, immediately prior to take-off, which included a final confirmation of the FMC departure route setup. These procedures highlighted the importance of verbalisation, independent review and cross-checking.

The operator also provided guidance specific to Sydney Airport departures, including tailored charts illustrating the RIC5 SID (detailing the radar transition procedure), specifically the requirement to not turn right.

The operator's procedures also mandated that relief pilots were to remain at their designated stations (observer's seats) on the flight deck from the commencement of the departure briefing until the aircraft was above flight level 180.[16] More generally, a number of important support duties were also defined for relief pilots including active participation in crew briefings (departure briefing and review) and a specific requirement to ensure compliance with clearances.

Air traffic control information

Separation standards[17] are used by air traffic controllers to manage air traffic safely. They refer to the minimum horizontal and/or vertical distance, or time apart, that aircraft operating in controlled

[16] Flight level: at altitude above 10,000 ft in Australia, an aircraft's height above mean sea level is referred to as a flight level (FL). FL180 equates to about 18,000 ft.

[17] These are outlined in the Manual of Standards for Air Traffic Services (MATS).

airspace must maintain. When the separation between two or more aircraft is less than the standard, there is a loss of separation.

A surveillance separation standard is used when aircraft position information is derived from air traffic services' surveillance systems (including radar). When aircraft are operating inside terminal area airspace, such as Sydney, controllers must maintain a minimum separation between aircraft of 3 NM (5.6 km) laterally or 1,000 ft vertically.

A runway separation standard is applied for aircraft taking off from parallel runways. Following take-off, separation is facilitated visually until a surveillance (radar) or vertical separation standard exists. Aerodrome controllers (ADCs) may reduce the radar separation minima in the vicinity of aerodromes when adequate separation can be provided using visual observation and each aircraft is continuously visible to the ADC. However, ADCs are not permitted to provide visual separation if the projected flight paths of the aircraft conflict.

When a significant loss of separation occurs, air traffic control is required to issue a safety alert[18] to notify pilots of information that is of a time-sensitive and safety-critical nature. It is important pilots understand the critical nature of these instructions and respond in a timely manner to ensure the safe conduct of flight.[19]

Traffic alert and collision avoidance system

Modern high capacity transport aircraft such as the 777 and ATR72 are required to be equipped with an advanced traffic alert and collision avoidance system (TCAS).[20] TCAS is designed to prevent mid-air collisions between aircraft. TCAS operates independently of ATC by using on-board surveillance capability to detect other transponder-equipped traffic and provides:

- Traffic display (proximate traffic) and traffic advisories (TA) for situational awareness of relatively close aircraft
- Resolution advisories (RA) for very close aircraft with vertical guidance to resolve the threat.

Both TA and RA are generated based on the projected closest point of approach (CPA) or miss distance and the time to co-altitude (TAU). In general, the thresholds (time and distance) for CPA and TAU increase as altitude increases.

All RA are inhibited when below 1,000 ft (+/- 100) above ground level (AGL) and all TCAS aural alerts are inhibited when below 500 ft (+/- 100).[21] This is to ensure that alerts are not generated during the initial take-off climb for two reasons: to avoid distracting the crew and, because the aircraft is already flying close to the performance limit (body angle/attitude and thrust).

Safety analysis

Flight management computer - departure setup

The foreign captain was expecting to receive a clearance via the SYD1 standard instrument departure and had pre-programmed the FMC in anticipation of this and briefed the other crew accordingly. However, the pre-departure clearance provided by air traffic control was different (RIC5). This was likely due to the captain's limited exposure to the varying Sydney-centric departure procedures (SYD1 versus RIC5). In addition, the clearance included the radar transition procedure, with which the captain was unfamiliar, due to the predominant use of procedural-based transitions in the United States. Anything non-standard in departures or arrivals can add additional complexity, but particularly for crew that have very limited experience with the location, such as

18 Safety alert: information issued by ATC that is considered time-sensitive or safety-critical.

19 Source: Airservices Australia Safety Bulletin, *Safety alerts and avoiding action advice*, 7 March 2014.

20 ICAO Annex 6 Part I mandates traffic alert and collision avoidance system type II (TCAS II) be fitted to all aircraft capable of carrying more than 30 passengers. TCAS II includes the capability of generating; 'proximate traffic' and both 'traffic advisory' and 'resolution advisory' if necessary.

21 Source: Eurocontrol *ACAS Guide – Airborne Collision Avoidance*, December 2017, p 46.

long-haul foreign crew. Air traffic controllers have an opportunity to take into account the likelihood of a crew's familiarity with the airport when issuing clearances to foreign crew.

The clearance meant the FMC needed to be re-programmed for the RIC5 procedure. During this process, the PF removed the discontinuity that was automatically generated in the FMC flight path, that is, the waypoint sequence to the cleared oceanic route. This would have been appropriate for many procedural transitions but not for a radar transition. The predominance of procedural transitions in the United States likely meant that the PF was focussed on removing the discontinuity (gap) in the FMC coding.

In this case, the purpose of the discontinuity was to represent controller-issued vectors as the aircraft tracked beyond 12 NM northwest of Sydney. In effect, the aircraft was cleared to 12 NM. From that point they were required to wait for a controller initiated radar vector to re-join their cleared oceanic route to San Francisco commencing at waypoint DIPSO (to the east). In removing the discontinuity, the aircraft was re-programmed to track directly to DIPSO after reaching the initial waypoint at 1,500 ft where the aircraft should have turned left (before they reached the 12 NM point). Ultimately, this resulted in a right turn and, therefore, the loss of separation.

Crew coordination

Effective crew coordination is fundamentally dependent upon effective communication. In order for cockpit crew members to share a 'mental model', or common understanding of the nature of events relevant to the safety and efficiency of the flight, communication is critical.[22] The operator's procedures were clear and provided an established framework for the flight crew to communicate and coordinate their activities to ensure a safe and expeditious departure.

A number of opportunities existed not only for the PM, but also the crew positioned in the observers' seats (in-flight relief pilots), to verify the FMC setup between the departure briefing and entering the runway prior to take-off. The operator's procedures included a comprehensive process by which crew use different pages (information sources) within the FMC to ensure the departure clearance is reflected accurately by the computer coding (waypoint sequence).

The PM was not aware of the amendment to the radar transition (deletion of the route discontinuity), which indicated that the PF may not have clearly verbalised the change and/or ensured the PM heard and understood the change, in accordance with the operator's procedures. By not clearly verbalising this misunderstanding or the amendments to the departure route setup, the PF did not provide an opportunity for the rest of the crew to contribute effectively.

However, there were further opportunities for the PM or relief pilots to discover this error. The PM verified the FMC set up, but only used the summary RTE page rather than the LEGS page with greater detail, and therefore the waypoint sequencing error was not detected. Further, in the departure review just before take-off, both the PF and the PM noticed the 'no transition' on the FMC RTE page, but no-one recognised this was not in accordance with the radar transition segment of the clearance.

Communication

Effective communications also includes with external sources such as air traffic control. Readbacks of clearances and instructions to crew in the aviation context serves two main purposes; acknowledgement of both the intent and content of the clearance, and to reinforce the message has been acknowledged and understood. In this case, the PM provided a truncated readback to ATC, which did not provide this assurance. The truncated readback was not challenged by the controller. As such, the controller did not have any assurance that the flight

[22] Sexton, B.J. & Helmreich, R.L. (2000). Analyzing cockpit communication: the links between language, performance, error, and workload. In *Human Performance in Extreme Environments*, p 63-68.

crew heard and understood that they were cleared for a radar transition. This increased the risk of errors to the FMC setup and could have led to further confusion during the initial climb.

Findings

Contributing factors

- The pilot flying incorrectly amended the flight management computer (FMC) for the cleared departure.
- The amended FMC setup was probably not effectively communicated to the crew or effectively cross-checked by the pilot monitoring or relief pilots.

Other factors increasing risk

- The pilot monitoring did not complete a full readback of the radar transition component of the pre-departure clearance, nor did the Sydney clearance delivery controller insist on a full readback.

Other findings

- The Sydney departures controller observed UA870 turning right and towards VOZ1153 and quickly issued unambiguous and immediate instructions to both aircraft to rectify the situation and re-establish the required separation.

General details

Occurrence details

Date and time:	22 January 2020 – 1425 AEDT	
Occurrence category:	Serious incident	
Primary occurrence type:	Loss of Separation	
Location:	2 km north of Sydney Airport	
	Latitude: 33º 52.432' S	Longitude: 151º 10.356' E

Crew details

United Airlines 870

	Captain	Senior FO	Observer 1 (FO)	Observer 2 (FO)
Total Flight hours	21,072	19,000	17,600	14,200
Flight hours on B777	4,309	3,500	2,500	2,600
Flight hours in last 90 days	166	350	175	148
Total instrument hours	11,000	18,500	500	Not available
Instrument hours last 90 days	100	350	3	Not available
Medical	Class 1	Class 1	Class 1	Class 1
Last simulator check*****	13 Dec 2019	21 Aug 2019	28 Jun 2019	20 Jun 2020

*Note: In United Airlines, crew resource management (CRM) and threat and error management (TEM) is incorporated into training and evaluation events, or simulator checking activities.

Aircraft details

Aircraft 1 - United Airlines 870

Manufacturer and model:	Boeing 777-322ER	
Registration:	N2333U	
Operator:	United Airlines	
Serial number:	62644 LN:1466	
Type of operation:	Air Transport High Capacity - passenger	
Departure:	Sydney, NSW	
Destination:	San Francisco, United States	
Persons on board:	Crew – 17	Passengers – 145
Injuries:	Crew – Nil	Passengers – Nil
Aircraft damage:	None	

Aircraft 2 - Virgin Australia 1153

Manufacturer and model:	GIE Avions de Transport Régional ATR72-212A	
Registration:	VH-FVQ	
Operator:	Virgin Australia	
Serial number:	1053	
Type of operation:	Air Transport High Capacity - passenger	
Departure:	Sydney, NSW	
Destination:	Tamworth, NSW	
Persons on board:	Crew – 4	Passengers – 58
Injuries:	Crew – Nil	Passengers – Nil
Aircraft damage:	None	

About the ATSB

The ATSB is an independent Commonwealth Government statutory agency. The ATSB is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within the ATSB's jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to operations involving the travelling public.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

Purpose of safety investigations

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.