



Australian Government

Australian Transport Safety Bureau

Operational non-compliance involving GIE Avions De Transport Regional ATR72, P2-ATR

Cairns Airport, Queensland, 4 September 2017

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Addendum

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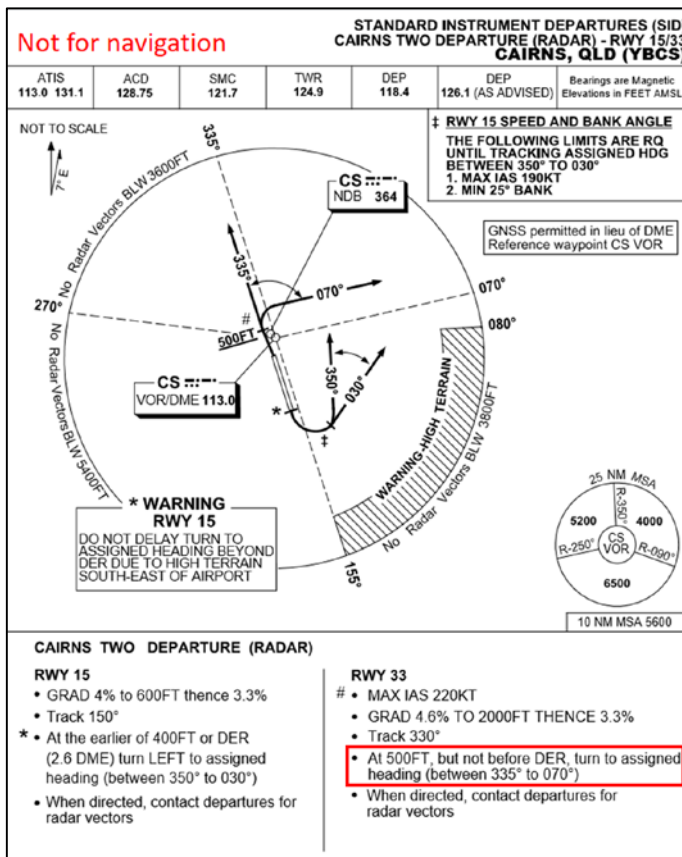
Operational non-compliance involving GIE Avions De Transport Regional ATR72, P2-ATR

What happened

At about 1330 Eastern Standard Time (EST), on 4 September 2017, the flight crew of a PNG Air GIE Avions de Transport Regional ATR 72-212A aircraft, registered P2-ATR, prepared to operate passenger charter flight CG950 from Cairns, Queensland, to Lihir Island Airport,¹ Papua New Guinea. On board the aircraft were the captain, first officer, three cabin crew and 49 passengers.

While preparing for the flight, the flight crew noted the weather conditions included no significant cloud below 6,500 ft and visibility in excess of 10 km. The flight crew then contacted air traffic control (ATC) to obtain an airways clearance. The airways clearance included a departure from runway 33 via the CAIRNS TWO standard instrument departure (SID). This departure required the flight to maintain the runway track of 330° magnetic (M) until the aircraft climbed to an altitude of 500 ft above mean sea level (AMSL) and had passed the departure end of the runway. The SID then required the flight crew to turn the aircraft to a heading assigned by ATC which would be between 335°M and 070°M (Figure 1).

Figure 1: Cairns Two standard instrument departure



The figure shows the CAIRNS TWO departure including the direction to turn to an ATC assigned heading after passing the departure end of the runway (DER) and upon reaching 500ft. Source: Airservices Australia, annotated by ATSB.

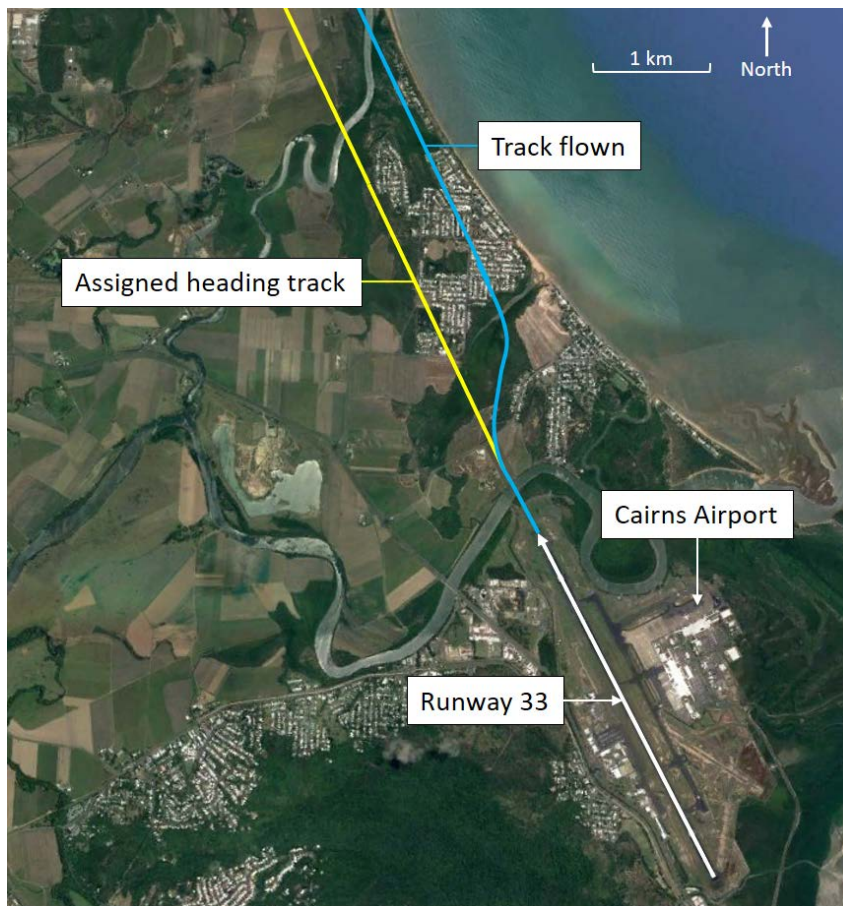
¹ Lihir Island Airport is also known as Londolovit or Kunaye.

After receiving the airways clearance, the flight crew identified the assigned heading segment of the SID. The captain noted that he had not previously departed using a SID with an assigned heading segment. The captain, acting as pilot flying,² elected to depart initially using the lateral navigation mode of the flight management system (FMS). Once the aircraft had climbed through 500 ft AMSL and had past the departure end of the runway, the captain planned to instruct the first officer to select the automatic flight control system (AFCS)³ heading mode with the ATC assigned heading selected. The captain would then turn the aircraft to the heading assigned by ATC.

At 1344, the flight crew taxied the aircraft to runway 33 and reported being ready for departure. At 1345:07, ATC provided a take-off clearance to the flight crew with an assigned heading of 335°M. This was just a five degree right turn from the runway heading of 330°M. The captain selected the heading bug to 335 and entered the assigned heading using the scratch pad function of the control display unit of the FMS for later reference.

The take-off was conducted normally and as the aircraft climbed through 500 ft, the FMS, in lateral navigation mode, directed a right turn past the assigned heading. The captain followed the FMS direction and turned the aircraft right. As the aircraft turned to 335°M the FMS continued to command a right turn. The captain followed the FMS direction and continued the turn past the assigned heading (Figure 2).

Figure 2: Overview of departure



An overview of the initial departure showing both the assigned flight path and actual flown flight path.
Source: Google earth, annotated by ATSB

² Pilot Flying (PF) and Pilot Monitoring (PM): 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 descent, approach and landing. The PM carries out support duties and monitors the PF's actions and the aircraft's flight path.

³ The automatic flight control system uses information provided by the flight crew and the FMS along with other aircraft sensors and instrumentation systems to provide autopilot and flight director functions.

As the aircraft climbed through about 700 ft, the captain instructed the first officer to select the heading mode of the AFCS with the assigned heading of 335°M selected. Recorded flight data showed that by this time, the aircraft had turned to a heading of 013°M. The AFCS then directed a left turn toward the assigned heading of 335°M. Both flight crew members immediately identified that they had turned past the assigned heading. The captain then began a left turn back to heading 335°M. At about the same time, ATC contacted the flight crew to confirm the assigned heading of 335°M. The flight crew responded confirming the assigned heading and continued the left turn to this heading.

At 1346:24, ATC contacted the flight crew again to confirm that operations were normal, and the flight crew confirmed that they were. ATC then cleared the flight to continue the departure visually on heading 335°M, without reference to the SID.

The flight continued to Lihir Island without further incident. No persons were injured, and the aircraft was not damaged during the incident.

Flight management system

The lateral navigation mode of the FMS provided flight path guidance along a series of pre-programmed waypoints. The aircraft manufacturer advised that when the FMS was programmed with the CAIRNS TWO SID from runway 33 and operated in lateral navigation mode, the system was programmed to maintain the runway track of 330°M until the aircraft climbed to 500 ft. For further track guidance, the continuing flight path needed to be managed by the flight crew.

In the absence of a manually programmed flight path, as in this incident, the SID navigation database within the FMS was programmed to command a turn to a heading of 025°M. This turn was presented to the flight crew on the aircraft's navigation display prior to departure.

The heading mode of the AFCS provided means for the flight crew to manually select a desired, or ATC instructed, heading. Once activated, the heading mode provided flight director guidance to turn the aircraft to the selected heading.

Operator SID training

Cairns was the only airport in the operator's network at which SIDs were used.⁴

The company conducted regular simulator training for flight crews at six monthly intervals. The training included departures involving SIDs. However, this training used SIDs that required navigating along a path of pre-programmed waypoints. In these cases, the FMS provided automated guidance.

The training did not include SIDs that involved an assigned heading component.

Captain comments

The captain provided the following comments:

- The captain had not previously encountered a SID with an assigned heading component.
- In future he will use the heading mode of the FMS for SIDs with an assigned heading component.

First officer comments

The first officer provided the following comments:

- The flight crew were not expecting a 5 degree heading change. When assigned the heading, they did not recognise that the heading change was so minor.
- The first officer had previously flown ATR72-212A aircraft for an Australian domestic operator and had flown SIDs extensively. In that role, she always conducted SIDs in heading mode.

⁴ The operator's home airport, Port Moresby International Airport, also provided SIDs. However, the operator and both flight crew reported that these were not used operationally.

Safety analysis

When preparing for the departure, the flight crew elected to use the lateral navigation mode of the FMS to provide flight path guidance instead of the more appropriate heading mode.

After take-off, the FMS directed a turn past the assigned heading of 335°M to a heading of 025°M. The flight crew initially followed this guidance, incorrectly turning the aircraft to a heading of 013°M before selecting heading mode and detecting the error. At about the same time, ATC observed the aircraft turning beyond the assigned heading and contacted the flight crew. The error was then managed by both ATC and the flight crew and the flight continued without further incident.

Findings

These findings should not be read as apportioning blame or liability to any particular organisation or individual.

- The selected FMS mode was inappropriate for the assigned departure and provided flight path guidance not aligned with the SID. The flight crew followed the guidance provided by the FMS before the error was identified and corrected.

Safety action

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following proactive safety action in response to this occurrence.

Aircraft operator

As a result of this occurrence, the aircraft operator has advised the ATSB that they are taking the following safety actions:

Flight crew education and training

- Aircrew notices were circulated to all flight crew, providing education on SIDs and operations at Cairns.
- The simulator training program has been changed to include a greater focus on SIDs and Cairns operations.

Aircraft manufacturer

As a result of this occurrence, the aircraft manufacturer, in coordination with the navigation database provider, has taken the following safety action:

Change to SID navigation database

- To avoid a sharp right turn during a take-off using an incorrect AFCS mode, the runway 33 CAIRNS TWO SID navigation database commanded heading has been changed from 025°M to 335°M.

Safety message

This incident highlights the importance of effective use of flight management systems. Modern flight management systems, when used appropriately, can greatly reduce flight crew workload and provide increased levels of safety and efficiency. However, to effectively manage a modern aircraft, flight crews need to ensure they have a thorough understanding of the relevant flight management systems.

Also underlined is the need to effectively cross check flight instrumentation indications to ensure that the aircraft follows the intended flight path. The United States Federal Aviation Administration publication: [Advanced Avionics Handbook, Chapter four Automated Flight Control](#) provides the following guidance for effective use of the flight director:

The convenience of flight director cues can invite fixation or overreliance on the part of the pilot. As with all automated systems, you must remain aware of the overall situation. Never assume that flight director cues are following a route or course that is free from error. Rather, be sure to include navigation instruments and sources in your scan. Remember, the equipment will usually perform exactly as programmed. Always compare the displays to ensure that all indications agree. If in doubt, fly the aircraft to remain on cleared track and altitude, and reduce automation to as minimal as possible during the problem processing period. The first priority for a pilot always is to fly the aircraft.

General details

Occurrence details

Date and time:	4 September 2017 – 1346 EST	
Occurrence category:	Incident	
Primary occurrence type:	Operational non-compliance	
Location:	Cairns Airport, Queensland	
	Latitude: 16° 53.15' S	Longitude: 145° 45.32' E

Aircraft details

Manufacturer and model:	ATR - Gie Avions De Transport Regional ATR72-212A	
Registration:	P2-ATR	
Operator:	PNG Air	
Serial number:	1287	
Type of operation:	Charter passenger	
Persons on board:	Crew – 5	Passengers – 49
Injuries:	Crew – Nil	Passengers – Nil
Aircraft damage:	Nil	

About the ATSB

The Australian Transport Safety Bureau (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; and 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 Commonwealth 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.

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

About this report

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 potential safety issues and possible safety actions.