Australian Government
Australian Transport Safety Bureau

Incorrect configuration involving ATR - Gie Avions De Transport Régional ATR72, VH-FVL

Brisbane Airport, Queensland, 2 April 2017

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Addendum

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Incorrect configuration involving ATR - Gie Avions De Transport Régional ATR72

What happened

On 2 April 2017, at about 1730 Eastern Standard Time (EST), a Virgin Australia ATR - Gie Avions De Transport Regional ATR72-212A aircraft, registered VH-FVL, departed Moranbah for Brisbane, Queensland on a scheduled passenger service. There were two flight crew, two cabin crew and 38 passengers on board the aircraft. The captain was the pilot flying (PF) and the first officer was the pilot monitoring (PM).[1] The flight also acted as line training for the first officer.

While in the cruise, air traffic control (ATC) cleared the aircraft for the LAVEG ONE standard arrival route for runway 19 at Brisbane Airport. Weather conditions were clear and at 5,700 ft the crew established visual contact with the runway. ATC then gave them radar vectors to intercept the final approach leg.

At around 2,500 ft on descent, the captain disconnected the autopilot and manually flew the aircraft. ATC instructed the crew to track to a 5 NM (9.3 km) final approach leg for runway 19 and cleared the aircraft to descend to 1,700 ft for a visual approach. At 2,300 ft, the captain directed the first officer to select flap 15 and to set 140 kt on the automatic flight control system. The first officer then confirmed that this had been completed. The landing gear was extended soon after.

While the aircraft was turning onto the final approach leg, the captain directed the first officer to select flap 30, set the airspeed indicator bug to the approach speed (V_{APP}),[2] and start the before landing checklist. The first officer completed a radio call with ATC, moved the flap selection lever (Figure 1), set the approach speed (104 kt) and responded 'V approach set', and then started the checklist.

Figure 1: Location of flap lever on ATR72

Source: Virgin Australia

As the aircraft descended on the final approach leg, the crew noticed that the aircraft was not performing as expected. The captain had to keep adjusting the aircraft attitude and engine torque

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1 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 descent, approach and landing. The PM carries out support duties and monitors the PF's actions and aircraft flight path.

2 Final approach speed (V_{APP}) is the speed on the final approach in landing configuration.

setting to control the speed. Passing about 1,000 ft, the captain recognised that the speed was too high, but thought that this could be corrected by 500 ft and continued the approach. The first officer also noticed the unusually high speed and called out 'speed' to alert the captain.

The flight crew had no recollection of completing the before landing checklist or completing the callout at 500 ft to ensure that aircraft was in a stabilised approach.[3] Passing 173 ft, the enhanced ground proximity warning system[4] (EGPWS) activated with the alert, TOO LOW FLAP. The captain immediately conducted a missed approach. During the subsequent climb, the captain called 'flap 15, check power' and the first officer responded accordingly.

When the aircraft achieved a positive rate of climb, the captain called 'positive rate, gear up'. ATC cleared the aircraft to climb and then vectored them for a right base leg to conduct the same approach to runway 19. At this time, the first officer commented to the captain a concern that they may have left the flap at 15. After landing, the captain decided to stand the crew down and not conduct the next two sectors.

Recorded data

The operator extracted the flight data from the aircraft's quick access recorder. It was recorded that the aircraft commenced the turn onto the final approach at 1,720 ft above the airport and was at 1,729 ft when the flaps lever was moved from 15 to 0 degrees at a calibrated air speed (CAS) of 139 kt.

At 900 ft, the air speed had increased to 148 kt and the aircraft was low on the approach. At 542 ft the aircraft had slowed to 123 kt, which coincided with the thrust lever angle set to idle.

Immediately after the TOO LOW FLAP warning at 173 ft, the thrust lever was moved to the go around position and the flap lever moved from flap 0 to flap 15.

The stall speed for the aircraft at flap 0 was about 106 kt at the estimated approach weight of 18 tonnes. The V_{APP} speed was set at 104 kt, which was below the flap 0 stall speed. The minimum speed recorded on approach was 114 kt at 507 ft.

The stick-shaker[5] activates at 15.9 degrees angle of attack[6] and the maximum angle of attack reached during the approach was 14.6 degrees.

Flap procedures

The operator's ATR 72-500 standard operating procedures stated that all normal landings are conducted using flap 30. On approach, the pilot flying must call 'flaps 30, set speed bug V approach'. The pilot monitoring is then required to check the speed, select flap 30, monitor the extension of the flap, and set the speed bug to V_{APP} and call '[speed] set'. The pilot flying then calls out the before landing checklist for the pilot monitoring to action. The last item on the before landing checklist is for both crew to check that flap 30 has been set.

The flap lever is in the 12 o'clock position for flap 0, in the 2 o'clock position for flap 15, and in the 5 o'clock position for flap 30. The flap position is also shown on the flap indicator where the needle points at 0, 15, or 30 (Figure 2).

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3 On the glidepath at correct airspeed, correctly configured, all checklists and paperwork complete.

4 An aircraft system that uses aircraft inputs with onboard terrain, obstacle, and airport runway databases to predict potential conflicts between the aircraft's flight path and terrain or an obstacle.

5 A tactile warning to alert the flight crew that the aircraft was near an aerodynamically-stalled condition of flight.

6 The angle between the oncoming air or relative wind and a reference line of the aeroplane or wing.

Figure 2: A screen capture from the operator's flight data showing the flap indicator positioned at 0 degrees while the aircraft was passing 1,000 feet on descent

Source: Operator, modified by the ATSB

Stabilised approach criteria

The operator's stabilised approach criteria included that all approaches shall be stabilised by 1,000 ft above ground elevation. However, in terms of speed, if the pilot-in-command is confident the speed target will be achieved by no later than 500 ft above field elevation, the approach can continue.

The speed criteria is that the aircraft must be within -5 to +10 kt of the speed target.

If the speed remains outside the stabilised criteria at 500 ft above field elevation, or if at any time before it becomes apparent the stabilised criteria will not be met, then a go around must be initiated.

The V_{APP} set for flaps 30 on the day was 104 knots. At 507 ft, the airspeed was 114 kts, which was within the stabilised approach criteria. However, at 358 ft, the airspeed had increased to 128 kts.

The go around was initiated at 173 ft at an airspeed of 121 kts.

Captain's comments

The captain provided the following comments:

- The captain recalled seeing the first officer's hand reaching out and grasping the flap lever when instructed to set flap 30, but was also busy hand flying the aircraft at the time.
- While the aircraft is climbing on a go around, it is the pilot monitoring's responsibility to call 'positive rate', but there was no call from the first officer so the captain made the call.
- When they recognised that the aircraft was performing unusually, the captain thought it was an issue with the aircraft power settings because the aircraft was descending below the approach path.
- Normally, both the pilot flying and pilot monitoring would check the flap settings when it is called in the checklist by checking the position of the flap lever, then the flap indicator, and say 'set'. However, because the captain was busy controlling the aircraft, they may not have checked.
- The first time the captain became aware that the flap was set to 0 degrees was during a review of the flight data animation produced by the operator.
- The captain completed a fatigue report after the flight, although later reported not feeling overly tired during the flight. The captain had arrived at the airport to sign on at 1140 instead of 1340, due to confusion around the rostered flight time. However, to be safe the captain decided that the crew would not continue onto the next destination.

- There are inherent risks with visual approaches at night, given that they are not using the instrument landing system.[7]

First officer's comments

The first officer provided the following comments:

- The workload of the crew increased during the approach when there was a combination of turning onto the final approach path, conducting a visual approach, managing radio calls with ATC and responding to the unexpected aircraft performance.
- Flap settings are generally confirmed through the completion of the before landing checklist, whereby the flap lever and indicator must be visually checked. However, in this case, this part of the checklist happened during a high workload period, and it was subsequently rushed. This checklist item may have been missed.
- The first officer recalled looking at the flap indicator and seeing movement, but may have wrongly assumed that the flaps were moving to flap 30 in lieu of flap 0.

Previous occurrences

A search of the ATSB's database found the following occurrences where the incorrect flap setting was selected on approach:

- On 28 July 2011, the crew of an Airbus A320 was on approach to Melbourne, Victoria (ATSB investigation AO-2011-089).[8] The approach brief included the requirement for flap 2[9] to be selected. At about 245 ft, the captain realised the landing checklist had not been completed and the crew received an EGPWS warning TOO LOW FLAP. The captain identified the aircraft was not in the landing configuration, including flaps and called for a go-around.
- On 24 July 2013, the crew of an Airbus A320 was on approach to Newman Airport, Western Australia (ATSB investigation AO-2013-149).[10] Shortly after passing 500 ft above ground level, the crew received an EGPWS warning TOO LOW FLAP. Full flap was selected at about 185 ft and the aircraft landed shortly after.
- On 2 April 2017, the crew of a Boeing 737 were on approach to land on runway 19 at Brisbane Airport (ATSB occurrence 201701579). At 1,400 ft the call for flap 30 was made, but flap 25 was selected. The landing checklist was commenced at 1,200 ft but interrupted by the issue of a landing clearance from air traffic control. The checklist was recommenced and completed at 1,000 ft, however, the flap setting was not identified. At 300 ft, the EGPWS warning TOO LOW FLAP activated and the crew conducted a missed approach.

Safety analysis

The approach and landing is known to be a phase of flight with a high workload due to the number of tasks to be completed in addition to monitoring the flight path. During the approach, as the aircraft was turning, the first officer was responding to a radio call and completing a checklist. It is likely that the first officer inadvertently selected the flap lever up from 15 to 0, instead of down to 30, and did not crosscheck the flap indicator before moving on to the other tasks. This inadvertent action led to an increase in the aircraft's airspeed, which the flight crew recognised, but at the time were unable to ascertain why. The incorrect flap setting was not detected and a go around initiated after a ground proximity warning alerted the crew to an incorrect configuration at 173 ft.

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7 A standard ground aid to landing, comprising two directional radio transmitters: the localiser, which provides direction in the horizontal plane; and the glideslope, for vertical plane direction, usually at an inclination of 3°. Distance measuring equipment or marker beacons along the approach provide distance information.

8 www.atsb.gov.au/publications/investigation_reports/2011/aair/ao-2011-089/

9 Flap 2 is equivalent to 15 degrees position.

10 www.atsb.gov.au/publications/investigation_reports/2013/aair/ao-2013-149/

Due to the high workload in managing the aircraft's performance on approach, the crew did not detect the aircraft's speed was exceeding the stabilised approach criteria of V_{APP} + 10 kts or that the aircraft was incorrectly configured with flap 0. Although at 507 ft, the airspeed was 114 kts, which was within the stabilised approach criteria with the V_{APP} set at 104 kts, at 358 ft, the airspeed had increased to 128 kts, which was outside the stabilised approach criteria.

Since the incorrect flap setting was not detected by the crew on approach, had they managed to slow the aircraft to the V_{APP} of 104 kts for flap 30, they would have been 2 kts below the stall speed for the actual flap setting (106 kts).

Findings

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

- During the approach, the first officer moved the flap lever up from flap 15 to flap 0, instead of from flap 15 to flap 30 as intended. This resulted in an unstable approach.
- The crew did not identify the incorrect flap setting until the ground proximity warning system alerted them to an incorrect configuration, likely due to workload.

Safety message

Approach and landing have a higher workload compared to other phases of flight because of the continuous monitoring of aircraft parameters and the external environment to maintain a stable approach. This investigation highlights the potential impact crew workload has on flight operations as it can lead to adding, shedding, or rescheduling actions. Handling approaches to land continues to be a safety priority for the ATSB.

General details

Occurrence details

Date and time:	2 April 2017 – 1930 EST	
Occurrence category:	Incident	
Primary occurrence type:	Incorrect configuration	
Location:	Brisbane Airport	
	Latitude: 27° 23.05' S	Longitude: 153° 07.05' E

Aircraft details

Manufacturer and model:	ATR - Gie Avions De Transport Regional ATR72-212A	
Registration:	VH-FVL	
Operator:	Virgin Australia	
Serial number:	974	
Type of operation:	Air Transport High Capacity - Passenger	
Persons on board:	Crew – 4	Passengers – 38
Injuries:	Crew – 0	Passengers – 0
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.