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# Pre-flight planning event involving a Boeing 737, VH-VUC

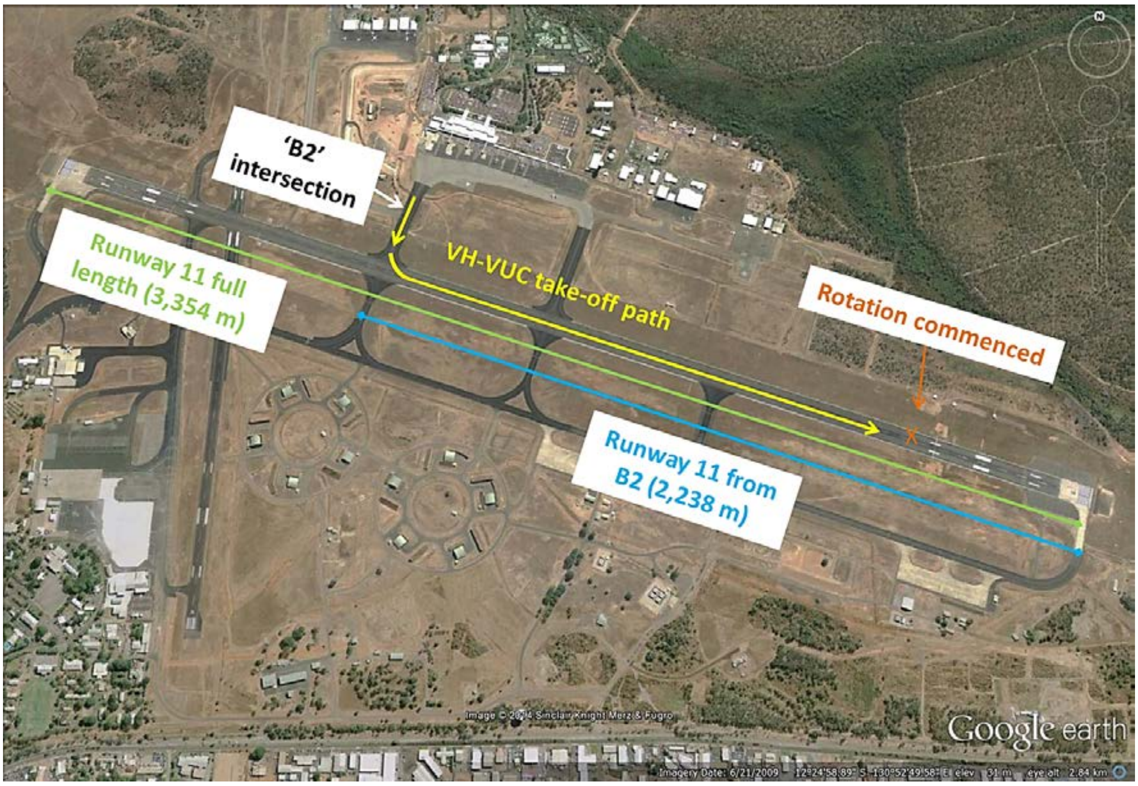
## What happened

On 14 October 2013, the crew of a Virgin Australia Airlines Boeing 737 aircraft, registered VH-VUC, were preparing for a scheduled passenger service from Darwin, Northern Territory to Melbourne, Victoria.

The flight was scheduled to depart at about 1815 Central Standard Time; however, it was delayed due to thunderstorms passing through the area.

In preparation for the flight, the captain conducted an external inspection of the aircraft, while the first officer (FO) remained in the cockpit and prepared two take-off data cards (TODCs). This included referencing the Darwin Airport charts in the 'Airport Analysis Manuals' (AAMs) and extrapolating the take-off reference speeds (V speeds)[1] for a runway 11 full length departure and an intersection departure from taxiway 'Bravo 2' (B2) (Figure 1).[2] The take-off performance data for a full length and intersection departure were then transcribed onto the TODCs and the data for a full length departure entered into the flight management computer (FMC).

**Figure 1: VH-VUC take-off**




**Source: Google earth; ATSB**

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[1] Take-off reference speeds, commonly referred to as V speeds, assist pilots in determining when a rejected take-off can be initiated and when the aircraft can rotate, lift-off and climb away safely given the existing flight conditions.

[2] The operator specified take-off run available (TORA) for the full length of runway 11 was 3,354 m, while the TORA for the intersection departure from B2 was 2,238 m.

The captain completed his inspection and returned to the cockpit where he conducted an independent check of the take-off performance data and the data entered into the FMC. The TODCs were then placed on the centre pedestal.

As the crew had elected to conduct a runway 11 full length departure, they noted that a Notice to Airmen (NOTAM) required them to backtrack along the runway to the beginning of the runway due to taxiway closures.

Shortly after, at dusk, the aircraft was taxied to the B2 intersection holding point where the crew were advised by air traffic control of two inbound aircraft, which would delay a full runway length departure. Consequently, the crew elected to depart from the B2 intersection. The FO re-programmed the FMC with the take-off performance data previously transcribed on the TODC for that departure and subsequently cross-checked by the captain.

At about 1847, the aircraft departed, with the crew reporting a normal take-off occurred. After take-off, the crew noted that the TODC for the full runway length departure was visible on the centre pedestal, on top of the intersection departure TODC. The crew discussed whether the take-off from the B2 intersection was conducted based on the take-off performance data for a full runway length departure. While the crew were unable to determine what data was used, in the interests of safety, the event was reported to the operator and the Australian Transport Safety Bureau (ATSB).

## *Take-off performance data preparation*

Prior to take-off, the FO had prepared one TODC for a runway 11 full length departure, referencing the AAM for a 24,000 lbs (24K) engine thrust rating,[3] with an 'assumed' temperature.[4] A second TODC was also prepared for a runway 11 B2 intersection departure, referencing the 26,000 lbs (26K) engine thrust rating AAM. The V speeds obtained from each AAM and subsequently entered onto the TODCs were based on a range of variables including, a wet runway, flap 5 setting, air conditioning 'auto' and a 5 kt tailwind component.

After preparing the TODCs, the FO closed the AAMs. In accordance with the operator's standard operating procedures (SOPs), the captain independently cross-checked the take-off performance data by completing a full recalculation.

## *Recording information*

The aircraft was fitted with a quick access recorder (QAR) and following the incident, the data was downloaded and provided to the ATSB. The recorded data showed that the V speeds were initially entered into the FMC as 145 kt ($V_1$),[5] 149 kt ($V_R$)[6] and 153 kt ($V_2$),[7] but changed to 145 kt ($V_1$), 148 kt ($V_R$) and 152 kt ($V_2$) when at the B2 holding point. The FMC selected temperature (assumed temperature) was initially 36 °C and changed to 48 °C.

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3 Take-off operations conducted at engine thrust settings less than the maximum take-off thrust available (reduced thrust) may provide substantial benefits in terms of engine reliability, maintenance, and operating costs (United States Federal Aviation Administration Advisory Circular 25-13).

4 As ambient air temperature increases, the thrust produced by an engine will decrease. By using a temperature higher than the actual ambient temperature, a lower thrust setting for take-off will result. To do this, an 'assumed' temperature is used to calculate the thrust setting.

5 $V_1$ is the critical engine failure speed or decision speed. Engine failure below this speed shall result in a rejected takeoff; above this speed the take-off run should be continued.

6 $V_R$ is the speed at which the rotation of the aircraft is initiated to takeoff attitude. This speed cannot be less than $V_1$ or less than 1.05 times $V_{MC}$. With an engine failure, it must also allow for the accelerations to $V_2$ at the 35-foot height at the end of the runway.

7 $V_2$ is the minimum speed at which a transport category aircraft complies with those handling criteria associated with climb, following an engine failure. It is the take-off safety speed and is normally obtained by factoring the stalling speed or minimum control (airborne) speed, whichever is the greater, to provide a safe margin.

## *Take-off performance data comparison*

The initial V speeds entered into the FMC corresponded to the V speeds contained in the 24K AAM for a runway 11 full length departure, which provided an assumed temperature of 36 °C and a take-off weight of 73,000 kg.[8] The revised V speeds (for the intersection departure) entered into the FMC when positioned at the B2 holding point, corresponded to the V speeds contained in the 26K AAM for a runway 11 full length departure; which provided an assumed temperature of 48 °C and take-off weight of 72,100 kg. Table 1 provides a comparison of the V speeds used by the crew and that required for the B2 intersection departure (26K B2 intersection).

**Table 1: Take-off performance data comparison**

| Parameter | FMC (for take-off) | AAM | | |
|---|---|---|---|---|
| | | 24K full runway length (initial) | 26K B2 intersection (required) | 26K full runway length (used) |
| Outside air temperature | | | 24 °C | |
| Assumed temperature | | 36 °C | | 48 °C |
| $V_1$ (kt) | 145 | 145 | 136 | 145 |
| $V_R$ (kt) | 148 | 149 | 145 | 148 |
| $V_2$ (kt) | 152 | 153 | 153 | 152 |
| Take-off weight | 71,196 | 73,000 kg | 71,600 kg | 72,100 kg |

## *Virgin Australia Airlines investigation*

Virgin Australia Airlines conducted an internal investigation into the incident and identified the following:

- The aircraft departed from the runway 11 B2 intersection using the take-off performance data for a full length runway departure.
- It was possible that the FO had inadvertently referenced the runway 11 full length page in the 26K AAM instead of the B2 intersection page, which was subsequently not detected by the captain during the cross-check process.
- The TODCs for the flight were not required to be retained, which made it difficult to determine if the correct information was obtained from the AAM and if the correct data was entered into the FMC.
- The AAM full length and intersection pages were the same colour and therefore, not readily discernible.
- The 26K and 24K AAM's on the operator's Boeing 737 aircraft were similar in appearance.
- On the day of the incident, the FO prepared two TODCs. No documentation could be found on the use of two completed TODCs as a procedure or recommendation, however, recent feedback indicated that this may be a possible outcome on the line when a departure on different runways was possible.
- When there was a possibility of conducting either a full length or intersection departure, it was common practice to calculate one set of conservative take-off performance figures (for the intersection) as this data could be used for either departure. However, this process could be perceived by crews to conflict with engine wear management.
- At the time of the incident, a possible situational factor was the reduced lighting conditions between sunset and last light.
- While the flight was delayed due to thunderstorm activity and taxiway closures, the crew's preparation for the flight was not rushed and was very methodical.

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8 The flight planned take-off weight for the aircraft was 71,589 kg.

- The captain and FO had completed the company's non-technical skills training course, which included a module on take-off data input errors.

## 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.

### *Virgin Australia Airlines*

Virgin Australia Airlines has advised the ATSB that, in addition to the pre-take-off brief requirement, they are introducing a procedure to verify the intersection on line-up. This procedure could provide a latent defence as reminder for the take-off data used.

## Safety message

The ATSB SafetyWatch highlights the broad safety concerns that come out of our investigation findings and from the occurrence data reported to us by industry. One of the safety concerns is data input errors www.atsb.gov.au/safetywatch/data-input-errors.aspx.

Research conducted by the ATSB, *Take-off performance calculation and entry errors: A global perspective*, documented 20 international and 11 Australian occurrences identified between 1 January 1989 and 30 June 2009 where the calculation and entry of erroneous take-off performance data were involved. It also provided an analysis of the safety factors that contributed to the international occurrences and suggested ways to prevent and detect such errors.

Errors involving take-off performance data calculations and data entry probably occur frequently, but in most cases, there are sufficient defences in place to detect these errors prior to the aircraft leaving the gate. However, as there is varying take-off performance data calculation methods used by airlines, different aircraft involved, and different aircraft systems used to calculate and enter take-off performance data, there is no single solution to ensure that such errors are always prevented or captured.

The results of this study, and that from other related research, have recognised that these types of events occur irrespective of the airline or aircraft type, and that they can happen to anyone; no-one is immune. The following publications and ATSB investigations provide additional information on these types of occurrences:

- Tailstrike and runway overrun involving an Airbus A340 (ATSB investigation AO-2009-012) www.atsb.gov.au/publications/investigation_reports/2009/aair/ao-2009-012.aspx
- Performance calculation event involving an Airbus A321 (ATSB investigation AO-2011-073) www.atsb.gov.au/publications/investigation_reports/2011/aair/ao-2011-073.aspx
- Pre-flight planning event involving a Boeing 737 (ATSB investigation AO-2012-020) www.atsb.gov.au/publications/investigation_reports/2012/aair/ao-2012-020.aspx
- Take-off performance calculation and entry errors: A global perspective: www.atsb.gov.au/publications/2009/ar2009052.aspx
- Use of erroneous parameters at takeoff: www.skybrary.aero/bookshelf/books/668.pdf
- Performance Data Errors in Air Carrier Operations: Causes and Countermeasures www.human-factors.arc.nasa.gov/publications/NASA_TM2012-216007.pdf

## Occurrence details

| | | |
|---|---|---|
| Date and time: | 14 October 2013 – 1847 CST | |
| Occurrence category: | Incident | |
| Primary occurrence type: | Flight preparation/navigation | |
| Location: | Darwin Airport, Northern Territory | |
| | Latitude: 12° 24.88' S | Longitude: 130° 52.60' E |

## Aircraft details

| | | |
|---|---|---|
| Manufacturer and model: | The Boeing Company 737-800 | |
| Registration: | VH-VUC | |
| Operator: | Virgin Australia Airlines | |
| Serial number: | 34014 | |
| Type of operation: | High capacity – air transport | |
| Persons on board: | Crew – 6 | Passengers – 147 |
| Injuries: | Crew – Nil | Passengers – Nil |
| Damage: | Nil | |

# Flight envelope protection event involving an Airbus A320, VH VQY

## What happened

On 12 March 2014, at about 0920 Eastern Daylight-savings Time (EDT), an Airbus A320 aircraft, registered VH-VQY, departed Melbourne, Victoria on a ferry flight to Darwin, Northern Territory, with a captain and first officer on board.

When established in the cruise, at FL 360,[1] the crew completed checks and all indications were normal. After about 5 minutes in the cruise at FL 360, the captain briefed the first officer on the nearest suitable airport in case of emergency and then the captain temporarily left the cockpit. At that time, the aircraft was operating in managed[2] cruise mode, with speed in selected[3] mode at Mach 0.78. The aircraft had encountered minor turbulence during the cruise.

When abeam Mildura, Victoria, the first officer received a clearance from air traffic control (ATC) to climb to FL 380. As the captain exited the cockpit, the first officer read back the clearance and the captain confirmed the read-back.

The first officer selected a managed climb mode to FL 380, and the speed remained in selected mode at Mach 0.78. Approaching FL 380, at about FL 373, the first officer observed the airspeed increase to about Mach 0.81 and the airspeed trend indicator approaching the maximum Mach number at which the aircraft has been certified to operate ($M_{MO}$), which was Mach 0.82. He also observed a rate of climb of about 3,000 feet per minute (fpm). The first officer reported that the normal rate of climb when within 1,000 ft of the selected altitude, is about 1,000 fpm and he had not previously observed such a high rate of climb when approaching the top of climb.

The first officer attempted to reduce the airspeed by selecting the speed back to M 0.76 however he observed that the airspeed and the trend continued to increase. One of the Airbus ‘Golden Rules’ was: ‘Take action if things do not go as expected’ (Figure 1). Following this ‘Golden Rule’, the first officer reduced the thrust to idle, which disconnected the autothrust, and took manual control of the thrust in an attempt to reduce the airspeed. He extended the speed brake and disconnected the autopilot to adjust the pitch attitude of the aircraft in an attempt to maintain the selected altitude. With the autopilot disconnected, the speed brake extended fully (with the autopilot engaged only half extension of the speed brake is available).

**Figure 1: Golden Rules Card**


Source: Airbus

The aircraft climbed above the assigned altitude of FL 380 and the altitude warning sounded. When at about FL 383, ATC called the first officer to confirm altitude, to which he responded that

1 At altitudes above 10,000 ft in Australia, an aircraft’s height above mean sea level is referred to as a flight level (FL). FL 360 equates to 36,000 ft.

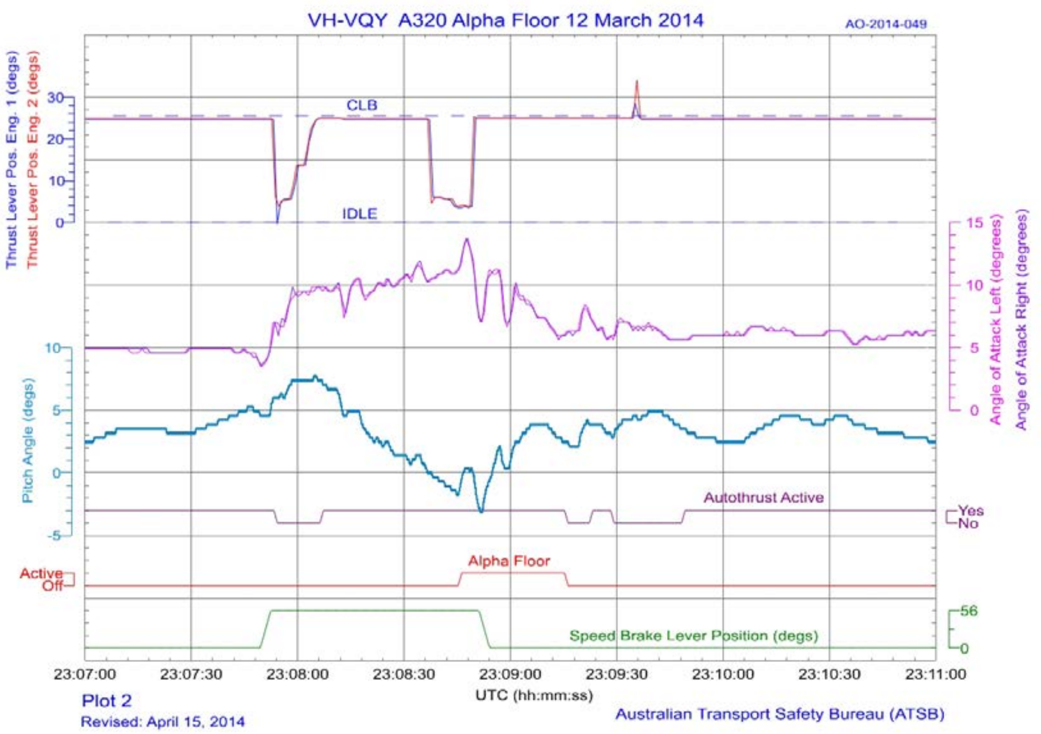
2 The aircraft is guided along the pilot-defined flight management system (FMS) lateral and vertical flight plan, speed profile and altitude targets, as managed by the FMS (accounting for altitude and speed constraints, as applicable).

3 The aircraft is guided to acquire and maintain the targets set by the crew, using the modes engaged or armed by the crew (i.e., using the flight control unit (FCU) target setting knobs and mode arming / engagement pushbuttons).

the aircraft was returning to FL 380. The first officer then re-engaged the autothrust, and returned the thrust levers to the climb detent. He also momentarily engaged the autopilot, however again disconnected it and applied forward pressure on the sidestick to lower the nose attitude of the aircraft in an attempt to recapture FL 380.

The aircraft then descended and the airspeed slowed below the $V_{LS}$ speed: the lowest selectable speed that autothrust permits. The first officer then applied rearward pressure on the sidestick in an attempt to regain FL 380 and reduced the thrust levers towards idle, but short of the idle stop position. This limited the maximum amount of thrust available. The application of back pressure increased the aircraft's angle of attack. At the Alpha Protection speed,[4] which corresponds with the angle of attack at which Alpha Protection becomes active, the Alpha Floor function activated. In that mode, the speed brakes retracted[5] (Figure 2) and the take-off/go-around (TOGA) thrust lock was activated.

**Figure 2: Thrust settings, angle of attack, pitch, speed brake and Alpha Floor**




Source: ATSB

The first officer reported that the aircraft changed very rapidly from an overspeed to an Alpha Protection state, and this rate of change may have been due to a combination of the high altitude and the light weight of the aircraft. He observed the TOGA LOCK display on the electronic centralized aircraft monitoring (ECAM), but did not recall an ALPHA FLOOR annunciation on the Flight Mode Annunciator (FMA).

At this time, the captain returned to the cockpit and immediately scanned the primary flight display (PFD) to establish the current state of the aircraft. He observed the pitch attitude at about 0, on the horizon. The speed was in the 'yellow band' about half way between the Alpha Protection speed and $V_{LS}$ and the trend accelerating. The aircraft was then at about FL 365 and descended to about

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4 When the angle of attack is greater than Alpha Protection (black and amber band on the airspeed scale) Alpha Protection is activated. When airspeed is in the Alpha Protection range to Alpha Max, the side stick commands angle of attack directly.

5 The lever remained in the extended position.

FL 362 prior to re-commencing the climb. There were no returns visible on the aircraft's traffic collision avoidance system (TCAS) display, indicating no other aircraft were likely to come into conflict. The captain also observed TOGA LOCK displayed on the engine display.

The captain placed his left hand on the sidestick and his right hand on the thrust levers and stated that he had control of the aircraft. He noted that the thrust levers were just above the idle position, and 'double clicked' the autothrust disconnect pushbuttons to take control of the thrust levers and remove the TOGA LOCK. The captain detected that the speed brake lever was in the extended position and moved the lever to the retracted position. The captain then set a pitch attitude of about 5° to 7°, a rate of climb of about 700 – 1,000 fpm, selected the thrust levers to the climb detent, and heard the altitude warning horn.

ATC observed the aircraft below the assigned altitude of FL 380 and called the crew to confirm the altitude and to check whether operations were normal. The first officer replied that they were climbing to FL 380 and 'ops normal'.

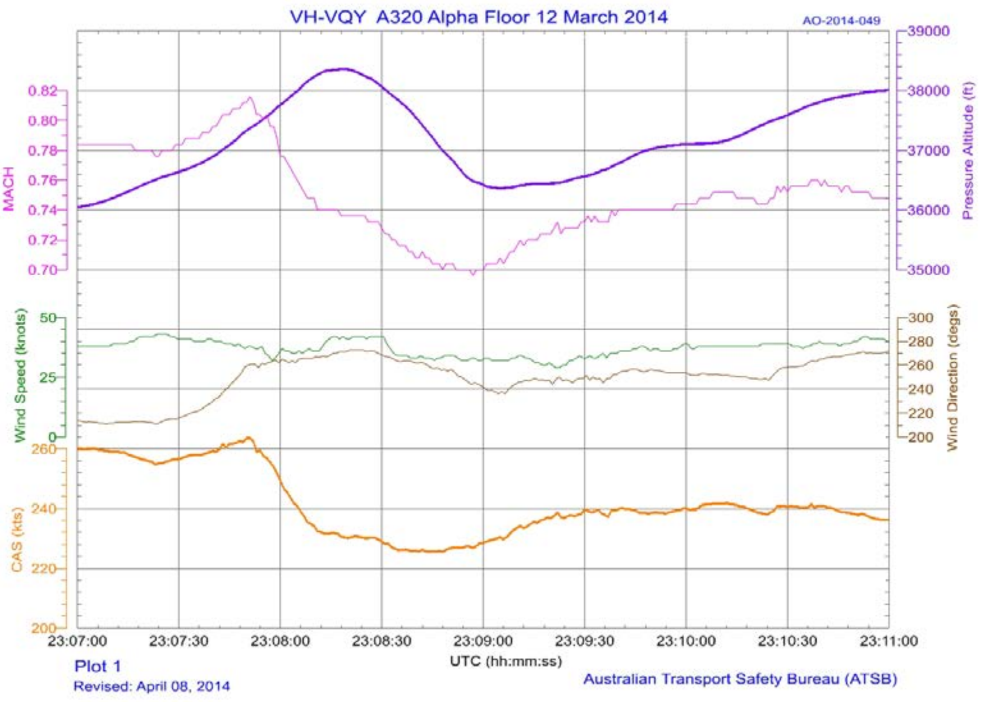
The captain continued to observe the Flight Mode Annunciator (FMA) during the climb and once re-established in the cruise at FL 380. He reported that he was cognisant of conducting a gentle recovery given the high altitude and potential for a secondary flight envelope event.

### *Flight data*

The flight data indicated the following (Figure 3):

- During the climb, passing about FL 365, the wind shifted from a tailwind of about 20 knots to a headwind of about 15 kt, resulting in an effective 35 kt windshear on the aircraft. This resulted in a rate of climb of 3,005 fpm and a transient Mach increase.
- The computed airspeed (CAS) increased about 6 kt from 256 to 262 kt.
- The Alpha Floor activated when the aircraft was on descent passing about FL 370, at a CAS of 226 kt, thrust levers just above the idle stop with autothrust disconnected, and the aircraft descending at about 4,500 fpm.

**Figure 3: Altitude, Mach, Wind speed and CAS**




**Source: ATSB**

## Pilot comments

### Captain comments:

The captain provided the following comments:

- The autothrust lags and the engines also take time to spool up after being selected to idle.
- He had used 'selected speed' mode during the cruise as the aircraft had encountered some minor turbulence and he would have been able to quickly select the turbulence penetration speed (of Mach 0.76) in the event of moderate turbulence.
- When the A320 encounters wind condition changes in the cruise similar to shear, the airspeed can increase quite quickly and this is not a rare event on the A320. During flights between Melbourne and Gold Coast/Brisbane airports, this windshear/wind speed change and potential overspeed situation is not uncommon as the aircraft transits the southern jetstream.
- FL 380 was selected to optimise fuel economy. The recommended maximum altitude was about FL 392, hence a significant buffer existed between the operating level and the maximum.

### First officer comments:

The first officer provided the following comments:

- The rate of things happening seemed much quicker than usual. The aircraft was light due to being a ferry flight (53,300 kg) and they were approaching FL 380. Although this was higher than the usual operating altitude, it was more than 1,000 ft below the maximum operating altitude for the aircraft.
- Prior to the captain leaving the cockpit, he had mentally rehearsed the depressurisation and engine failure checklists, however the situation that then unfolded was not one he had been prepared for.
- At the time of the incident, due to the rapidity of the changing conditions and the high workload, he believed that he may not have had time to action the overspeed checklist.
- In future when operating at high altitudes, he would leave the autopilot on.

## Weather

In a report provided to the ATSB by the Bureau of Meteorology, a significant change in wind direction and speed was forecast for the incident area. The wind was forecast to veer from 253° at 31 kt at FL 340, to 268° at 60 kt at FL 380.

## Flight crew operating manual (FCOM) and standard procedures

- Until mid 2013, there was only a descending aircraft overspeed prevention checklist. That checklist included disconnecting the autopilot and raising the aircraft nose. Use of that checklist in the cruise was inappropriate because it could result in a significant altitude exceedance at high speed and manually flying the aircraft at high speed and high altitude was not practiced often.
- Airbus published new flight crew operating manual (FCOM) procedures for overspeed prevention and recovery. Both checklists commence with AP (autopilot):KEEP ON. A newsletter distributed to company flight crew contained the new overspeed recovery FCOM but not the overspeed prevention FCOM.
- If the autopilot remained engaged during an aircraft overspeed, flight envelope speed protection is provided in the relevant AFS modes, resulting in a nose up order within the limit of the autopilot authority to reduce or stop the airspeed increase.
- In previous flight crew cyclic checks in the simulator, the aircraft was put into an upset to simulate a potential aircraft overspeed – a high speed spiral dive, and the crew had to recover the aircraft to normal flight.

# 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.

### *Operator of VH-VQY*

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

- The operator did not require two pilots to be on the flight deck for an enroute level change, however the FCOM has subsequently been amended as follows: 'During normal operations, altitude changes should normally be conducted with both pilots at the controls unless complying with an ATC requirement or for traffic separation'.
- In subsequent cyclic checks, a training scenario to emulate the conditions encountered in this incident, including a climb at high altitude may be included.

# Safety message

This incident provides a reminder to pilots of all aircraft types regarding the potential for an aerodynamic stall. The stall occurs at a critical angle of attack. The airspeed associated with the stall angle of attack varies depending on the aircraft weight and load factor (such as angle of bank), and the configuration of flaps, slats and spoilers.

The Golden Rules for Pilots article in *Safety First - The Airbus Safety Magazine*, Issue 15, January 2013, states that on highly automated and integrated aircraft, several levels of automation are available to perform a given task; and the 'appropriate' level of automation depends on the situation and task. It advises flight crew to understand the implication of the intended level of automation. Being able to anticipate the reaction of the automated response is important in deciding whether to proceed to rule 4 and change the level of automation.

In this incident, understanding the automated response to a potential overspeed situation may have given the first officer more time to analyse and resolve the situation. Disconnecting the autopilot and autothrust led to a rapid increase in workload and the aircraft changing from a potential overspeed to a slow speed state.

# General details

### *Occurrence details*

| | | |
|---|---|---|
| Date and time: | 12 March 2014 – 1017 EDT | |
| Occurrence category: | Serious incident | |
| Primary occurrence type: | Flight envelope protection event | |
| Location: | abeam Mildura, Victoria | |
| | Latitude: 34° 13.75' S | Longitude: 142° 05.13' E |

### *Aircraft details*

| | | |
|---|---|---|
| Manufacturer and model: | Airbus Industrie A320 | |
| Registration: | VH-VQY | |
| Operator: | Jetstar Airways | |
| Serial number: | 2299 | |
| Type of operation: | Air transport – ferry | |
| Persons on board: | Crew – 2 | Passengers – Nil |
| Injuries: | Crew – Nil | Passengers – Nil |
| Damage: | Nil | |

# Incorrect configuration involving an Airbus A320, VH-VGT

## What happened

On 31 March 2014, an Airbus A320 departed Auckland, New Zealand for a scheduled passenger flight to Gold Coast, Queensland. The first officer was designated as the pilot flying (PF) and the captain was designated as the pilot monitoring (PM).[1]

On departure from Auckland, the local barometric pressure (QNH) was 1025 hPa, and the crew had selected ‘STD’ for the standard atmospheric pressure of 1013 hPa[2] on the altimeters during climb to flight levels[3].

**A320 EFIS control panel**


**Source: EFB Desktop**

During the cruise, about 15 minutes prior to commencing the descent for the Gold Coast, the crew obtained the automatic terminal information service (ATIS) for Gold Coast and the captain wrote the details onto the take-off and landing data (TOLD) card, including: cloud, which was ‘scattered’ (3-4 oktas[4]) at ‘025’ (2,500 ft); temperature 25 °C; and barometric pressure (QNH) 1018 hPa. The crew then conducted the approach briefing in accordance with company standard operating procedures, including a review of this information, which was entered into the flight management guidance computer (FMGC) for the approach.

After receiving clearance from air traffic control (ATC), the first officer commenced the descent. ATC cleared the aircraft for track shortening on three segments of the planned track, and for a high speed descent. The aircraft therefore arrived at each waypoint slightly above the planned level. The first officer selected a speed of 320 kt, higher than the speed of 280 kt that had been entered into the FMGC, to regain the descent profile. ATC cleared the aircraft to descend to flight level (FL) 130, where the first officer briefly levelled the aircraft off prior to receiving clearance to descend to 9,000 ft AMSL.

On initial clearance to below the transition altitude, ATC provided the local QNH for Gold Coast of 1018 hPa, which the captain read back and confirmed that it matched the QNH entered into the FMGC. When passing about 11,500 ft AMSL on descent, the captain received further clearance from ATC.

The ‘transition’ checklist was normally initiated by the PM however he was communicating with ATC at that time. The first officer pointed to the barometric reference (BARO REF) push button on the electronic flight information system (EFIS), in an attempt to alert the captain to initiate the check. The company standard procedure was that the PM would call ‘transition’ and select the correct page on the FMGC with the approach QNH set. The PF would then read the QNH off that screen and enter it into the altimeter on the EFIS. The PM would then enter the value into the second altimeter, and the PF would enter the value into the standby altimeter. All three would then be cross-checked.

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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 In Australia, FL 110 is the ‘transition level’, at and above which all aircraft operate with the standard pressure altimeter setting of 1013.2 hPa. The ‘transition altitude’ is 10,000 ft above mean sea level (AMSL) and aircraft operating at or below that altitude use either the local current QNH or the current area forecast QNH.

3 At altitudes above 10,000 ft in Australia, an aircraft’s height above mean sea level is referred to as a flight level (FL). FL 130 equates to 13,000 ft.

4 Cloud coverage is reported by the number of 'oktas' (eighths) of the sky that is occupied by cloud.

Approaching transition altitude, the BARO REF warning light flashed and the first officer was cognisant of having the correct local QNH selected prior to passing the transition level of 10,000 ft AMSL to ensure separation with other aircraft. As the captain did not respond and initiate the transition check, the page in the FMGC with the QNH displayed had not been selected. The first officer glanced at the TOLD card, and entered 1025 into the altimeter, possibly inadvertently interpreting either the cloud (025) or the temperature (25) as the QNH, instead of 1018.

The captain then completed the communication with ATC and commenced the transition check by stating 'transition'. At this time the captain omitted to select the FMGC onto the flight plan page to display the QNH that had been entered. The first officer stated 'set QNH 1025' and the captain entered that into the second altimeter and the first officer entered the same value into the standby altimeter and a cross check confirmed that all three altimeters matched.

The crew then conducted the approach checks and continued the descent to 5,000 ft AMSL and subsequently joined the Required Navigation Performance (RNP) approach on a downwind leg at 2,500 ft AMSL. The first officer configured two stages of flap, reduced the airspeed to 160 kt and intercepted the vertical approach path for the RNP approach. The radio altimeter (RADALT) auto callout sounded at 2,500 ft AGL, as the aircraft flew over the sea, and the first officer cross-checked with the altimeter which was also reading about 2,500 ft AMSL. This check therefore did not alert the crew that an incorrect QNH was set. All cockpit instrument indications were normal and indicated the correct approach path based on the QNH that had been set on the altimeters.

Passing about 1,000 ft AMSL, as the first officer completed the turn onto final approach, he observed the T-VASIS[5] indicating a 'fly-up' profile. He asked the captain whether he thought the profile looked wrong and the captain advised that it may look different due to the local terrain. The captain checked the instruments and calculated the height against the distance remaining to the runway to verify the profile. The first officer continued the approach and selected the landing gear down and the third and fourth stages of flap. The RADALT callout of 500 ft sounded and the first officer realised that the approach path was incorrect. When at about 159 ft above ground level, the enhanced ground proximity warning system (EGPWS) 'terrain' warning sounded, and the first officer commenced a missed approach. The first officer checked the QNH on the TOLD card and realised an incorrect QNH had been set.

On the second approach, when again over water, with the QNH set to 1018, the first officer noted that when the RADALT indicated 2,500 ft, the altimeter indicated about 2,340 ft.

### *Crew comments*

The crew reported that in Australia, air traffic control provide the QNH for the arrival destination when providing the clearance through the transition altitude, which the crew read back and cross-check against the QNH entered in the FMGC. After setting the QNH, there are no further requirements for ATC to provide the QNH. In New Zealand, on first contact with approach, the crew are again given the QNH. This provides a cross check between the QNH that has been set in the altimeters with the actual QNH.

The first officer commented that having set the altimeter prior to the standard 'transition' check, and not in conformance with standard procedure, he should have identified that as a potential threat and advised the captain. He also reported that reducing the aircraft speed approaching transition, may have reduced the workload at the time.

The captain commented that if he had prioritised setting the QNH over communicating with ATC approaching the transition altitude, he may then have checked the QNH in the FMGC and set the correct QNH.

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5 A 'T' shaped Visual Approach Slope Indicating System that uses high intensity lighting to assist pilots identify the correct glidepath to the runway.

### *Airbus comments*

Airbus has advised the ATSB that they have commenced a design review to conduct an automated cross check between air data inertial reference system (ADIRS) and flight management system (FMS) QNH values. Such a feature may have alerted the crew to the fact that the QNH entered into the FMGC differed from the altimeter QNH setting.

## Safety message

The ATSB SafetyWatch highlights the broad safety concerns that come out of our investigation findings and from the occurrence data reported to us by industry. One of the safety concerns is data errors, such as the wrong figure being used as well as data being entered incorrectly, not being updated, or being excluded, www.atsb.gov.au/safetywatch/data-input-errors.aspx.

In this incident, the incorrect data was entered and there was a subsequent omission to check the data. Risk controls including procedures, systems, reference materials, crew management practices and training were assessed as being adequate, however local conditions of time pressure and distraction may have contributed to the incident.

This incident highlights the impact distractions can have on aircraft operations, particularly during a critical phase of flight. Research conducted by the ATSB found that distractions were a normal part of everyday flying and pilots generally responded to distractions quickly and efficiently. It also revealed that 13 per cent of accidents and incidents associated with pilot distraction between January 1997 and September 2004 occurred during the approach phase of flight. The study also identified four occurrences associated with checklists and suggested that, if a checklist is interrupted, pilots should consider returning to the beginning of the checklist to reduce the potential for error. *Dangerous Distraction: An examination of accidents and incidents involving pilot distraction in Australia between 1997 and 2004* is available at: www.atsb.gov.au/publications/2005/distraction_report.aspx.

## General details

### *Occurrence details*

| | | |
|---|---|---|
| Date and time: | 31 March 2014 – 0840 EST | |
| Occurrence category: | Serious incident | |
| Primary occurrence type: | Incorrect configuration | |
| Location: | near Gold Coast Airport, Queensland | |
| | Latitude: 28° 09.87' S | Longitude: 153° 30.28' E |

### *Aircraft details*

| | | |
|---|---|---|
| Manufacturer and model: | Airbus Industrie A320-232 | |
| Registration: | VH-VGT | |
| Operator: | Jetstar Airways | |
| Serial number: | 4178 | |
| Type of operation: | Air transport high capacity – passenger | |
| Injuries: | Crew – Nil | Passengers – Nil |
| Damage: | Nil | |

# Turboprop aircraft

# Runway excursion involving a Saab 340B, VH-ZRL

## What happened

**Propeller blade damage**

Source: Aircraft operator

On the evening of 22 February 2013, the crew of a Regional Express Saab 340B aircraft, registered VH-ZRL, were preparing for a scheduled passenger service from Sydney to Taree, New South Wales. The first officer (FO) was designated as the pilot flying.

Due to the inclement weather forecast at Taree and the surrounding area, the crew selected an alternate airport and elected to carry additional fuel in case conditions precluded a landing at Taree. The crew also determined that they would conduct a runway 22 area navigation global navigation satellite system (RNAV (GNSS)) approach at Taree.

At about 1815 Eastern Daylight-saving Time,[1] the flight departed Sydney with 34 passengers on board.

While enroute, the crew reported that the aircraft was in instrument meteorological conditions (IMC)[2] and heavy rain was experienced. Air traffic control provided regular updates on the weather conditions, which indicated a crosswind from the south-east would be expected at Taree.

When about 80 NM from Taree, the crew contacted the operator's ground agent at Taree, who provided updated information from the airport's automatic weather station (AWS). The crew determined that a 20 kt left crosswind would be expected for the landing. They also assessed that the braking action would be 'medium'[3] and that the conditions were acceptable for landing.

Prior to commencing the approach, the crew conducted a briefing and reviewed the missed approach procedure. During the approach, the crew continued to monitor the weather conditions. The crosswind was initially observed as 50 kts when at about 6,000 ft, although it decreased as the aircraft descended. To compensate for the crosswind, the aircraft was offset into wind.

At about 700-800 ft above ground level (AGL), the crew became visual with the runway. The crew assessed the approach and determined that it was suitable for landing. At that time, the crew reported that the wind was fluctuating and light rain was experienced.

At about 100 ft, the FO noted that the wind vector on the captain's horizontal situation indicator (HSI) display was showing a 17 kt crosswind.

During the landing flare, the FO applied right rudder and rolled the aircraft slightly to the left to align with the runway centreline. At about 1904, the aircraft touched down close to, or on the centreline. Immediately after, the crew reported that the aircraft was subjected to a wind gust, which caused the left wing to lift slightly and the aircraft to weathercock to the left, into wind. Reverse thrust had been selected after touchdown.

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1 Eastern Daylight-saving Time (EDT) was Coordinated Universal Time (UTC) + 11 hours.

2 Weather conditions that require pilots to fly primarily by reference to instruments, and therefore under instrument flight rules (IFR), rather than by outside visual references. Typically, this means flying in cloud or limited visibility.

3 The operator's flight crew operations manual (FCOM), provided guidance on the level of braking action to be expected during landing, taking into account the maximum crosswind component. 'Medium' braking action meant that the 'aircraft will use all of the scheduled distance and directional control may be impaired. The achievement of satisfactory performance requires precision and accurate control of speed.' The maximum allowable crosswind component for 'medium' braking action was 20 kt.

The aircraft veered left toward the runway edge and the captain assumed control of the aircraft. He applied right rudder, but the aircraft did not respond. As the aircraft's airspeed decreased, the captain also applied right brake, with no effect. He then simultaneously commenced nose wheel steering using the tiller. The nose wheel began to judder as it had been turned right, but the aircraft continued straight ahead. As the captain believed that the nose wheel steering was ineffective, he elected to apply asymmetric thrust by reducing the amount of reverse thrust on the left engine and increasing reverse thrust on the right engine. The aircraft commenced moving to the right.

The crew were unable to determine how far left the aircraft had veered due to the water spray from the application of reverse thrust, but believed the aircraft had not departed the runway. The aircraft slowed and was taxied to the parking area. By the time the aircraft was shut down and the passengers had disembarked, strong winds and heavy rain were experienced.

Using a torch, the FO then conducted a post flight inspection, which included examining the left landing gear and propellers. At the same time, refuelling of the aircraft commenced and the captain was completing paperwork. After finishing the post-flight inspection, the FO advised the captain that nil damage was found.

In preparation for the next flight to Grafton, the captain commenced an external inspection of the aircraft using a torch.[4] At that time, the captain reported that it was raining heavily. He examined the left landing gear and reported that no mud or grass was observed. As he continued toward the left propeller, he was interrupted by the refueller. The captain then went back into the cockpit with the refueller and was further distracted by the company's ground handling agent. As a result, the captain did not get the opportunity to inspect the left propeller blades.

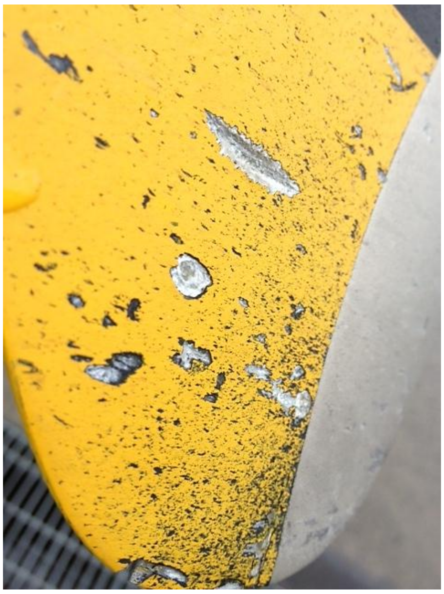
At that time, the captain decided to conduct a runway inspection to determine if the runway was contaminated and requested the ground handling agent drive him out to the runway to conduct the inspection. He also took the opportunity to see if there was any evidence of the aircraft having departed the runway. Nil evidence of markings or damage was noted to indicate that the aircraft had departed the runway.

The captain reported that there was a substantial amount of standing water on the runway and estimated that the crosswind was about 30 kt. The flight to Grafton was subsequently cancelled due to the weather conditions at Taree.

The next day the flight to Grafton was conducted, with the required external inspections of the aircraft conducted by the FO. The aircraft then returned to Sydney, at which time maintenance personnel conducted an inspection of the aircraft and observed damage to the left propeller blades. All four blades had sustained stone damage predominantly on the back (reverse) of the blades (Figure 1). Individual blade damage repairs may have been carried out with the blades remaining in place; however, the four blades were all replaced in order to allow effective repair processes to be completed.

[4] Company procedures did not require the captain to conduct a post/pre-flight inspection. The FO was responsible for conducting these inspections.

**Figure 1: Propeller blade damage**



Source: Aircraft operator

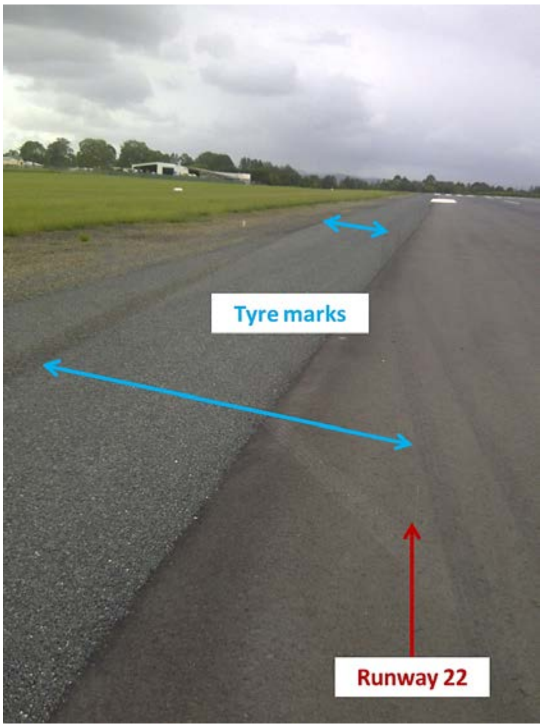
## *Runway inspection*

Runway 04/22 at Taree consisted of a 30 m wide runway with a 3-4m wide soil and gravel shoulder either side (Figure 2). A subsequent runway inspection during daylight hours determined that the aircraft had veered onto the runway shoulder (Figure 3).

**Figure 2: Runway surface**


Source: Aircraft operator

**Figure 3: Tyre marks on runway 22**




Source: Aircraft operator

## *Meteorological information*

### Aerodrome special weather reports (SPECI)[5]

The Bureau of Meteorology (BoM) automatic weather station (AWS) located at Taree generated aerodrome weather reports. The following SPECI reports were issued:

- At 1900: indicated that the wind was 160° (True) at 16 kt; broken cloud[6] at 1,000 ft and 1,400 ft above ground level (AGL), and overcast cloud at 2,500 ft; 0.8 mm of rain had fallen in the last 10 minutes and 29.2 mm had fallen since 0900.
- At 1912: indicated that the wind was 160° (True) at 16 kt gusting to 26 kt; broken cloud at 1,000 ft and overcast cloud at 1,600 ft; 0.2 mm of rain had fallen in the last 10 minutes and 29.6 mm had fallen since 0900.

The BoM subsequently provided the Australian Transport Safety Bureau (ATSB) with one-minute interval data recorded by the AWS. At 1904, that data indicated the wind was from 159° at 18 kt gusting to 26 kt.

## *Recorded information*

The aircraft was fitted with a flight data recorder (FDR) and following the incident, the data was downloaded and provided to the ATSB. The recorded data (Figure 4) showed that, during final approach, the aircraft's heading was less than the published runway heading, indicating that the aircraft was experiencing a crosswind from the left. When at about 800 ft, the calculated crosswind component was about 30 kts and decreased to about 13 kt when at about 100 ft.[7] At 1904:08, just prior to touchdown, the aircraft rolled left by about 8°and right rudder was applied. The aircraft rolled back to the wings level position.

As the aircraft touched down the weight on wheels parameter changed state several times before indicating the aircraft was firmly on the ground. The recorded lateral acceleration indicated that the aircraft was subjected to a side loading toward the left at touchdown.

After touchdown, reverse thrust was selected. As the aircraft's airspeed reduced through about 65 kt, the heading began to swing to the left. Right rudder was applied and the aircraft then turned toward the right at 1904:29, at an airspeed of 25 kt. The recorded lateral acceleration indicated that the aircraft was subjected to a side loading during the turn and rolled to about 2.5° left wing down. The rate of turn reduced, coincident with the left engine torque being reduced (a reduction in reverse thrust) to a lower value than the right engine torque.

After 1904:38, the rate of turn increased, but the lateral acceleration and roll attitude decreased. The right turn stopped at 1904:41 and with an airspeed of 21 kt, a left turn began. The left turn continued until 1905:06 when a heading of 213° was established and maintained until 1905:18 when a right turn onto the taxiway was commenced.

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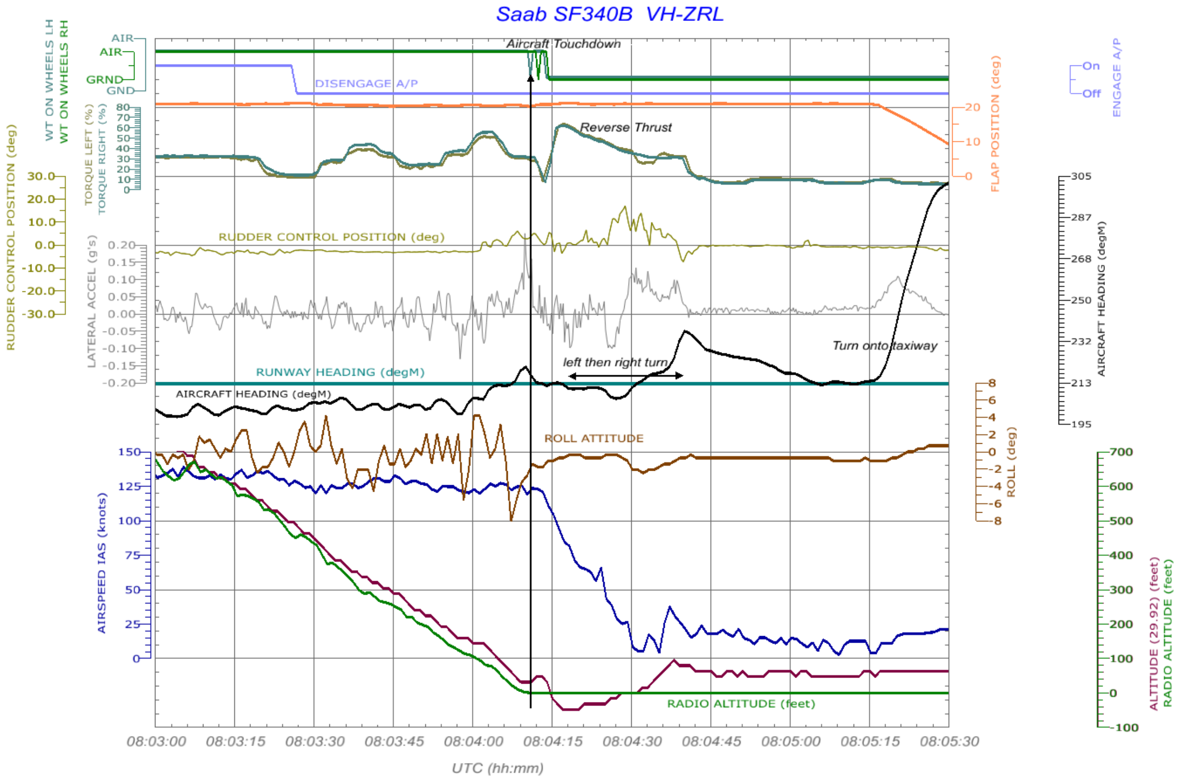
5 A special weather report used to identify when conditions are below specific levels of visibility and cloud base; when certain weather phenomena are present; and when temperature, pressure or wind change by defined amounts.

6 Cloud cover is normally reported using expressions that denote the extent of the cover. The expression few indicates that up to a quarter of the sky was covered, scattered indicates that cloud was covering between a quarter and a half of the sky. Broken indicates that more than half to almost all the sky was covered, while overcast means all the sky was covered.

7 A value for the crosswind component experienced during the approach was derived by calculation using the recorded airspeed and the difference between the recorded aircraft heading and the published runway heading.

**Figure 4: Summary of flight data**




Source: Australian Transport Safety Bureau

## *Pilot comments (captain)*

The captain provided the following comments regarding the incident:

- The approach was stabilised and the aircraft landed within the touchdown zone.
- If faced with a similar situation in the future, he would likely not continue to use reverse thrust, but rather, apply forward engine power until the aircraft deviation had been corrected and then re-apply reverse thrust.
- A tactile inspection of the left propeller blades may have identified the damage, however, given the poor weather conditions on the night, the damage would not have been easy to observe.
- His additional external inspection of the aircraft had been interrupted. In hindsight, he should have asked the persons to wait until the inspection had been completed.

## *Pilot comments (first officer)*

The first officer provided the following comments regarding the incident:

- The apron was floodlit on the terminal side. The aircraft had been parked parallel to the terminal, with the left side parked away from the lights. The first officer was required to use a torch to conduct his external inspection. At the time, it was very dark and raining heavily.
- He had conducted a thorough visual inspection of the left landing gear and top surface of the left propeller blades. When conducting his inspection, he stood facing the propellers and turned the blades in an anti-clockwise direction. This was suitable for sighting the front surface of the blades, but not the reverse side. He had also conducted a tactile inspection of the leading edge of the blades. He had got out of the habit of inspecting the surface of the reverse side of the blades and consequently did not see the damage.
- When looking at the blades afterwards with the engineers, he could not recall observing damage that he would have considered a huge amount of damage.

- If he had sighted the damage on the night, he would have sought the captain's advice.
- The propeller damage had no effect on the aircraft's performance; with no vibrations, sounds or abnormal indications noted.
- At the time of landing, the runway was not contaminated with water.

## Safety message

Weather can behave in an unpredictable manner, particularly when unfavourable conditions exist. While this incident highlights the adverse effects weather can have on aircraft operations, it also emphasises the impact of complacency and interruptions/distractions.

The FO commented that, in his opinion, when conducting a considerable number of flights within a short period of time, it was easy to become complacent when having to conduct a pre-flight and post-flight inspection for each flight. Complacency, the feeling of satisfaction or contentment with what is happening, may occur from a pilot's overconfidence in performing a task that has been previously conducted numerous times, without incident. This may result in a pilot inadvertently overlooking important information or responding to a situation inappropriately. The best defence against complacency is for pilots to remain vigilant and alert, and be mindful that even the most routine tasks must be conducted with care and concentration.[8]

Furthermore, when conducting an inspection, it is important for pilots to be aware of what constitutes propeller damage so that appropriate action can be taken.

An interruption/distraction can cause the crew to feel rushed and be confronted with competing tasks. The crew must then complete one task before performing another, which may result in poor results in one or more of the completed tasks. This may leave uncertainties unresolved, the omission of actions, and failing to detect and correct resulting abnormal conditions. Acknowledging that some distractions cannot be avoided, but others can be minimised or eliminated is the first step in developing preventative strategies and lines-of-defence. The Flight Safety Foundation suggests that after interruptions/distractions have been recognised and identified, the next priority is to re-establish situation awareness by conducting the following:[9]

- *Identify:* What was I doing?
- *Ask:* Where was I distracted?
- *Decide/act:* What decision or action shall I take to get 'back on track'?

## General details

### *Occurrence details*

| | | |
|---|---|---|
| Date and time: | 22 February 2013 – 1904 EDT | |
| Occurrence category: | Serious incident | |
| Primary occurrence type: | Runway excursion | |
| Location: | Taree Airport, New South Wales | |
| | Latitude: 31° 53.32' S | Longitude: 152° 30.83' E |

8 www.skybrary.aero/index.php/Discipline_(OGHFA_BN)

9 www.flightsafety.org/files/alar_bn2-4-distractions.pdf

## *Aircraft details*

| | | |
|---|---|---|
| Manufacturer and model: | Saab Aircraft Company 340B | |
| Registration: | VH-ZRL | |
| Operator: | Regional Express | |
| Serial number: | 340B-398 | |
| Type of operation: | Air transport – low capacity | |
| Persons on board: | Crew – 3 | Passengers – 34 |
| Injuries: | Crew – Nil | Passengers – Nil |
| Damage: | Minor | |

# Runway incursion involving an ATR 72, VH-FVI and a vehicle

## What happened

**Moranbah Airport**

**Source: Google earth**

On 5 March 2014 at about 1044 Eastern Standard Time (EST), an ATR 72 aircraft, registered VH-FVI (FVI), operated by Virgin Australia Regional Airlines, was about 25 NM southeast of Moranbah, Queensland on descent to the airport.

The captain of FVI, as pilot non-flying, broadcast on the common traffic advisory frequency (CTAF), advising that the aircraft was inbound and planned to conduct a non-directional beacon (NDB) approach, with an estimated arrival time of 1049 overhead the airport. At about 1047, the captain broadcast when 10 NM SE tracking NW to conduct an NDB approach. At 1049, the captain broadcast tracking outbound in the approach and that they 'should be turning straight in for a landing runway 16'. At about the same time, another passenger aircraft landed at Moranbah.

At about 1050, following the report of a suspected birdstrike by the aircraft that had just landed, the aerodrome reporting officer (ARO) on duty was in the airport terminal when asked by airport ground staff to conduct a runway inspection. The ARO walked about 200 m to the safety vehicle, which was fitted with a flashing orange beacon, and then drove to the holding point for runway 16/34. At about 1052, the ARO broadcast on the CTAF advising that the vehicle was preparing to enter the runway for a runway inspection. The ARO heard a beep-back, confirming that he had made the call on the correct frequency, but no other response was heard on the CTAF.

The CTAF broadcasts an automatic voice-back response if no calls have been made on the frequency for 5 minutes, otherwise a beep-back is broadcast. The ARO assumed that he received a beep-back rather than a voice-back, due to the calls made by the crew of the aircraft that had just landed.

The ARO then conducted a thorough lookout for aircraft approaching and on the runway with no aircraft sighted. He then broadcast that he was entering the runway and commenced driving north along the runway. When at the northern threshold, the vehicle turned and drove south along the runway with no evidence of a birdstrike found.

The crew of FVI did not hear either broadcast from the ARO. The aircraft was in cloud during the NDB approach, with the cloud base at about 2,600 ft. The aircraft encountered some turbulence on final, with a crosswind of about 12 kt. At about 1055, when at about 20 ft above ground level (AGL), the captain looked up out of the cockpit along the runway and sighted the safety vehicle on the white runway aiming point markings near the far end of the runway. The captain immediately broadcast 'car vacate'. The first officer sighted the orange beacon when at about 10 ft AGL, but was not immediately aware that it indicated the presence of a vehicle on the runway.

When about 100 m from the southern end of the runway, facing south, the ARO heard 'car vacate' broadcast on the CTAF and sighted the aircraft landing on the far end of the runway in the rear-view mirror of the vehicle. The ARO immediately drove the vehicle off the runway and once clear, broadcast that the safety vehicle had now vacated all runways.

### *Pilot comments*

The captain reported that his decision to continue with the landing after he sighted the car when at about 20 ft AGL was based on a quick assessment of the situation: the car was beyond the braking distance required by the aircraft; as the pilot non-flying, he would have to take over control of the aircraft from the first officer; he would potentially have to conduct a touchdown-go-around; and the car may remain on the runway and the aircraft would then be required to achieve sufficient climb gradient to pass above it. He considered there to be less of a safety risk to proceed with the landing.

The first officer reported that he did not perceive the beacon to represent an immediate threat to the aircraft, and that the aircraft was at about 10 ft AGL, below approach and go-around speeds, with the power levers set to flight idle, and within 1 second of touchdown when he sighted it.

### *Communications with the ARO*

The ARO had a handheld VHF radio and a VHF radio was fitted in the safety vehicle. When in the vehicle, the ARO switched off the handheld radio to avoid interference with the fitted radio. The ARO could alternatively be contacted via mobile phone. The ARO also had a UHF radio which was used to communicate with aerodrome ground staff. All normal communications between flight crew and the ARO are on the CTAF via VHF radio. The ARO reported that inside the terminal building there was a 'black spot' for VHF reception.

The ATSB was provided with the CTAF recordings. Both of the broadcasts made by the ARO included the standard phraseology of prefixing and suffixing each call with 'Traffic Moranbah' to alert aircraft to the location of the caller.

### *Runway inspections at Moranbah*

Runway inspections were conducted every 3 hours from 0700 to 1900 daily and on request by flight crew or when birds were observed in the area.

### *Discrete CTAF*

From May 2014, Moranbah Airport will have a discrete common traffic advisory frequency.

## ATSB comment

The ARO was in the airport compound for the duration of the calls broadcast at 25 NM, 10 NM and overhead by FVI, hence he did not have an awareness that the aircraft was in the vicinity. The recording of the CTAF obtained by the ATSB verified all calls made by the crew of FVI and the ARO. The ARO calls were audible but less clear than the aircraft calls, however it could not be determined why the crew of FVI did not hear the ARO broadcasts. There was no requirement for the ARO to maintain a continuous listening watch on the CTAF. Six minutes elapsed between the broadcast from the captain of FVI overhead the aerodrome, to the call to the car to vacate.

## Safety message

The ATSB SafetyWatch highlights the broad safety concerns that come out of our investigation findings and from the occurrence data reported to us by industry. One of the safety concerns is safety around non-controlled aerodromes www.atsb.gov.au/safetywatch/safety-around-aeros.aspx.

Research conducted by the ATSB found that, between 2003 and 2008, 32 runway incursions were recorded at non-towered aerodromes. Broadcasting on and monitoring of the CTAF is the key way for pilots to establish situational and traffic awareness. The ATSB *Limitations of the see-and-avoid principle* study found that the effectiveness of a search for other traffic is eight times greater when a radio is used effectively in combination with a visual lookout, than when no radio is used. *A pilot's guide to staying safe in the vicinity of non-towered aerodromes* is available at www.atsb.gov.au/publications/2008/avoidable-1-ar-2008-044(1).aspx.

# General details

## *Occurrence details*

| | | |
|---|---|---|
| Date and time: | 5 March 2014 – 1100 EST | |
| Occurrence category: | Serious incident | |
| Primary occurrence type: | Runway incursion | |
| Location: | Moranbah Airport, Queensland | |
| | Latitude: 22° 03.47' S | Longitude: 148° 04.65' E |

## *Aircraft details*

| | | |
|---|---|---|
| Manufacturer and model: | ATR – GIE Avions de Transport Regional ATR72-212A | |
| Registration: | VH-FVI | |
| Operator: | Virgin Australia Regional Airlines | |
| Serial number: | 955 | |
| Type of operation: | Air transport - passenger | |
| Persons on board: | Crew – 4 | Passengers – 45 |
| Injuries: | Crew – Nil | Passengers – Nil |
| Damage: | Nil | |

# Piston aircraft

# Engine power loss involving a SOCATA TB-10, VH-YTT

## What happened

**SOCATA TB-10 aircraft, VH-YTT**


Source: Ryan Hothersall

At about 2015 Central Summer Time (CSuT) on 26 November 2013, a SOCATA TB-10 aircraft, registered VH-YTT, departed runway 21R at Parafield Airport, South Australia, for solo night circuits in visual meteorological conditions. After 1 hour of flying circuits the student pilot conducted a touch and go landing prior to a final full stop circuit. At about 200 feet above the ground (AGL) after take-off the student noticed a vibration with a loss of power from the engine. The student lowered the nose of the aircraft to regain airspeed. The engine power increased and the student raised the nose of the aircraft to the climb attitude. Severe vibration returned at about 400 feet AGL and the engine power reduced again, the nose of the aircraft lowered. The student looked ahead and down and was unable to see a clear block of dark ground. The student reported that the aircraft was over a heavily built up area. The aircraft engine was still producing some power, although level flight could not be maintained. The student initiated a gradual turn to the right until the large dark area of Parafield airport could be seen. The student navigated toward the airport. At about 2120, just passing over the airport fence the student broadcast on the CTAF that the engine had failed. There were about three other aircraft in the Parafield circuit. The student could see the white lights of the duty runway 21R/03L and the green lights of Bravo taxiway. The aircraft was at about 50 feet AGL and with partial engine power navigated toward the duty runway. The student broadcast on the CTAF at about 2121 the intention to land on the active runway. There were no other aircraft on final or landing on runway 21R. The engine power was cutting in and out as the aircraft touched down on runway 03L at about a 30 degree angle, the aircraft remained on the runway, rolled through and turned off onto taxiway B5 where the engine lost all power and the aircraft stopped on the taxiway. The student broadcast on the CTAF that the aircraft was clear of the runway. The student pilot was uninjured and the aircraft was not damaged.

### *Student pilot comment*

The student reported that the engine run up prior to commencing circuits was all normal and there were no issues with any of the previous circuits. A take-off safety brief was conducted before take-off, including an engine failure or fire;

- prior to take-off,
- after takeoff with remaining runway,
- after take-off with no remaining runway and
- at night.

The student reported that when the engine initially lost power, a safe landing location could not be found ahead in the time available. The training received did not include turning back.

The student reported hearing the stall warning horn sounding at various stages of the flight. The student was aware that the other aircraft in the circuit were manoeuvring clear of YTT.

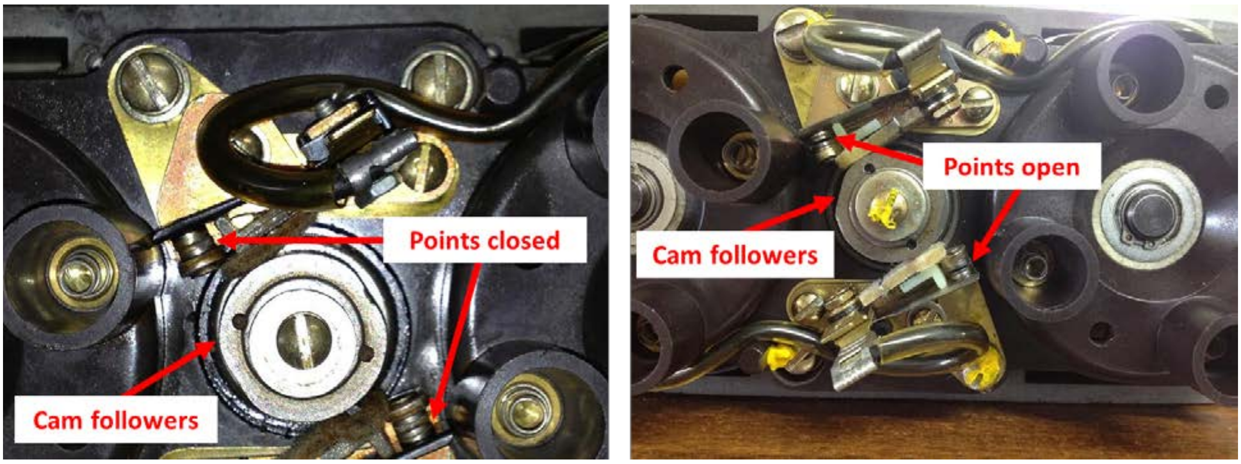
### *Operator investigation*

The operator's investigation determined that the aircraft had tracked upwind about 1,000 meters and was approaching Mawson Lakes, which is a densely populated residential area with very few options for a safe landing, so the student decided to turn back towards the airport, avoiding a forced landing at night in a densely populated area.

The student flew back to the runway at an angle of about 30 degrees while remaining clear of obstacles, and touched down about 980 meters along runway 03L, stopping in the remaining 470 meters. The flying school duty night supervisor was heard broadcasting on the CTAF instructing all other circuit traffic not to land and to continue circling.

An examination was conducted of the aircraft engine and the magneto cam followers were found damaged, resulting in the left and right magneto breaker points being failed closed (Figure 1). The operator found that the magneto cap was not grounded and suspected faulty magneto capacitors, resulting in the aircraft engine power loss and subsequent failure. The operator reported that the magneto was installed on the new engine by the manufacturer and at the time of the incident the engine had operated for 283 hours.

**Figure 1: YTT magneto with points failed closed New magneto showing the points open**




Source: Aircraft operator

## 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:

- The program of maintenance for the TB10 aircraft will include a visual inspection of the magneto 'cam followers' at more regular intervals.
- The TOSB "Take-off Safety Brief" should not only consider an engine failure, but also possible actions if a partial power loss is experienced.
- Two other TB10 aircraft with new engines had similar components; these aircraft were subsequently removed from service and the magnetos were replaced. There was no evidence to suggest that the components removed from either of these aircraft had a similar defect or problem.

## Safety message

Partial engine power loss is when the engine provides less power than commanded by the pilot, but more power than idle thrust. This kind of power loss is more complex than a complete failure, and it can be much harder to stay ahead of the aircraft. The pilot is thrust into a situation where the engine is still providing some power; however, the power may be unreliable and the reliability may be difficult to assess. As a result, pilots are uncertain about the capabilities of their aircraft, and what their options are-a situation that has led to loss of aircraft control at heights close to the ground, and fatal outcomes. And because it's not a substantial part of flight training, pilots tend not to think about it beforehand. Compared to the scenario of total power loss after take-off, they don't think about how they would react in such a scenario. As a result, when it does happen, it can turn into disaster very easily.

Partial power loss occurrences have a very broad range of characteristics by nature. The most effective risk control method for managing these occurrences may be significantly different between pilots of varying experience and training, aircraft models and the environmental conditions.

The ATSB booklet *Avoidable Accidents No. 3 - Managing partial power loss after take-off in single-engine aircraft* (available at www.atsb.gov.au/publications/2010/avoidable-3-ar-2010-055.aspx ) aims to increase awareness among flying instructors and pilots of the issues relating to partial power loss after takeoff in single-engine aircraft. Accident investigations have shown that a significant number of occurrences result in fatalities or serious injury due to the aircraft stalling and subsequent loss of control resulting in a collision with the ground or water.

Historically, the simulated total loss of power and subsequent practice forced landing has been the core of a pilot’s emergency training. The data has shown that during and after take-off, a partial power loss is three times more likely in today’s light single-engine aircraft than a complete engine failure.

While acknowledging the difficulty of attempting to train pilots for a partial power loss event which has an almost infinite variability of residual power and reliability, analysis of the occurrences supports the need to raise greater awareness of the hazards associated with partial power loss and to better train pilots for this eventuality.

The booklet highlights the importance of:

- pre-flight decision making and planning for emergencies and abnormal situations for the particular aerodrome
- conducting a thorough pre-flight and engine ground run to reduce the risk of a partial power loss occurring
- taking positive action and maintaining aircraft control either when turning back to the aerodrome or conducting a forced landing until on the ground, while being aware of flare energy and aircraft stall speeds.

## General details

### *Occurrence details*

| | | |
|---|---|---|
| Date and time: | 26 November 2013 – 2121 CSuT | |
| Occurrence category: | Incident | |
| Primary occurrence type: | Engine power loss | |
| Location: | Parafield Airport, South Australia | |
| | Latitude: 34° 47.78'S | Longitude: 138° 38.12' E |

## *Aircraft details*

| | | |
|---|---|---|
| Manufacturer and model: | SOCATA.- Groupe Aerospatiale TB-10 | |
| Registration: | VH-YTT | |
| Serial number: | 1602 | |
| Type of operation: | Flying training - Solo | |
| Persons on board: | Crew – 1 | Passengers – Nil |
| Injuries: | Crew – Nil | Passengers – Nil |
| Damage: | Nil | |

# Loss of control during initial climb, involving a Cessna 150, VH-RXM

## What happened

**VH-RXM damage**

Source: Operator

On 18 February 2014, an instructor from a local flying school prepared a Cessna 150 aircraft, registered VH-RXM (RXM) for a local trial instructional flight (TIF) at Moorabbin Airport, Victoria.

When the student, who had no previous flying experience, arrived at the flying school, he was shown a 15 minutes video, highlighting some of the basic principles of flight, and an overview of emergency procedures.

Once the instructor had completed the pre-flight inspection of RXM, he demonstrated the emergency procedures to the student who occupied the left seat in the aircraft.

The instructor then taxied RXM to the run-up bay, conducted the pre-take-off checks and re-briefed the student on his required actions during the take-off. These actions included the student slowly advancing the throttle control to attain full power; then manipulating the aircraft elevator control during the rotation and initial climb phases. These actions would be monitored by the instructor. However to enhance the 'flight experience' for the student, the instructor planned to have minimal input during this process. The instructor would however, maintain full control of the rudder pedals and take control of the throttle lever once the student had applied full power.

As the aircraft taxied to the runway holding point, air traffic control (ATC) advised there was a 3-4 kt tailwind on the duty runway, 35 Left (L). The instructor noted the windsock now showed a southerly wind; however, he advised ATC he would accept a departure on that runway. ATC then gave RXM a clearance to enter runway 35L and line-up.

After being cleared for take-off, the student, as briefed, used his right hand to slowly push the throttle in to obtain full power, while his left hand remained on the control column. Once the throttle was fully open, he placed his right hand back on the control column, allowing the instructor full control of both the throttle and rudder pedals. When RXM attained 60 kt, the student gently pulled back on the control column allowing the aircraft to rotate and commence a climb. Initially, the aircraft achieved a rate of climb of about 150 feet per minute.

Although the aircraft was achieving a suitable climb profile, the student continued to apply back pressure to the control column. This resulted in a reduction of the optimal airspeed, and a higher than normal aircraft nose attitude. The instructor applied some forward pressure to the control column to normalise the climb. As he applied the forward pressure, the aircraft commenced a roll to the left. The instructor noted the lowered left wing, and attempted to level the wings by neutralizing the ailerons. Almost immediately, the right wing unexpectedly dropped[1]. The instructor responded by applying left aileron to raise the right wing. The aircraft commenced a rapid descent, with the right wing remaining low.

The instructor realised the student's hands were still on the control column, and asked him to remove them. However he reported the student may not have heard the instruction, and did not respond. The instructor realised the right wing had now stalled and applied left rudder and full

[1] An unintentional wing drop at low airspeed typically indicates an exceedence of the critical angle of attack for that wing. Although many factors such as airspeed, aircraft profile and wing shape all contribute, it occurs when there is insufficient airflow over the wing to support the aircraft's weight. This is termed an aerodynamic stall.

power in an attempt to recover. By now, the aircraft nose had lowered, and a high rate of descent had developed.

Realising impact was imminent, the instructor made every effort to straighten the aircraft with rudder, and pulled gently back on the controls to try and lessen the impact with the ground.

The aircraft hit the ground hard, and bounced before coming to a stop on its left side. It came to rest just off the sealed section of the runway. The instructor closed the mixture control then exited through the right door. As the left door was jammed, he also assisted the student through the right side of the aircraft. They then moved a safe distance away.

Soon after, emergency services arrived. The pilot and passenger sustained minor injuries, and the aircraft was substantially damaged.

**Figure 1: VH-RXM side view of damage**


Source: Flying school

### *Instructor comments and experience*

The instructor held a Senior Grade 3 instructor rating and had in excess of 660 flying hours.

He had completed many similar TIF flights during the past 2 years.

Although he had checked the stall warning operation during the aircraft pre-flight, he reported it did not sound at any time throughout the accident sequence.

He also commented that RXM characteristically had a more pronounced wing drop to the right.

### *Student pilot comments*

The student pilot reported, he concentrated on keeping the control column neutral during the take-off, and did not use the ailerons. He recalls the instructor asked him to release back pressure on the control column, which he did, but did not recall any further instructions.

## 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.

### Flying school

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

#### Change of procedure for trial instructional flights

Instructors are now to conduct the take-off and initial climb, without any student pilot input. This rule applies until the aircraft has reached at least 300 ft above ground level.

The flying school is also reviewing the standard video presentation to check the content relevance.

## General details

### Occurrence details

| | | |
|---|---|---|
| Date and time: | 18 February 2014 – 1120 EDT | |
| Occurrence category: | Accident | |
| Primary occurrence type: | Loss of control | |
| Location: | Moorabbin Airport, Victoria | |
| | Latitude: 37° 58.55’ S | Longitude: 145° 06.13’ E |

### Aircraft details

| | | |
|---|---|---|
| Manufacturer and model: | Cessna Aircraft Company 150G | |
| Registration: | VH-RXM | |
| Serial number: | 15065186 | |
| Type of operation: | Flying training | |
| Persons on board: | Crew – 1 | Passengers – 1 |
| Injuries: | Crew – 1 (Minor) | Passengers – 1 (Minor) |
| Damage: | Substantial | |

# Collision with terrain involving a Cessna 210, VH-HGZ

## What happened

**Accident site**

**Source: Rescue crew**

On 28 March 2014, the pilot conducted a daily inspection of a Cessna 210 aircraft, registered VH-HGZ (HGZ), at Tindal Airport, Northern Territory. No defects or abnormalities were observed. The pilot added 1 litre of oil as the oil dipstick indicated about 8.5 quarts (8 L).

The company pilots had been advised to plan flights at an altitude that would permit a manifold pressure (MP) setting of about 23 inches Hg, due to the aircraft burning slightly more oil than normal, but within serviceable tolerances.

The pilot then conducted a flight from Tindal to Numbulwar, Northern Territory, at 5,500 ft above mean sea level (AMSL) and reported that all indications and aircraft performance during the flight were normal. The right front and rear seats had been removed for the flight to accommodate the transportation of cargo.

After arriving at Numbulwar, the pilot collected a passenger for the return flight to Tindal. The passenger was seated in the left rear seat and the pilot gave the passenger a safety briefing and ear plugs to reduce the noise. There was 110 L of fuel in the left tank and 130 L in the right tank prior to departure.

At about 1130 Central Standard Time (CST), the aircraft departed Numbulwar on climb to a planned cruising altitude of 4,500 ft AMSL. When about 22 NM west of Numbulwar, the passenger felt a bump and detected smoke emanating from the floor area beside the pilot. The pilot broadcast a 'MAYDAY'[1] on the common traffic advisory frequency (CTAF) advising of an engine failure and that there were no roads in sight on which to conduct a forced landing, only trees. The MAYDAY call was heard by a company pilot in an aircraft on the reciprocal track, who relayed the message to Brisbane Centre air traffic control (ATC).

The pilot of HGZ then asked the passenger to retrieve the fire extinguisher, which the passenger passed to the pilot. The passenger reported that the smoke stopped very quickly. The aircraft descended and the pilot retrieved the portable emergency locator transmitter (ELT) from the front compartment, extended the antenna and activated it. The pilot advised the passenger to brace for landing.

The passenger reported that the aircraft landed heavily, skidded, and collided with two trees prior to coming to rest at an angle, but upright. The pilot confirmed the portable ELT was beeping and threw it out of the right window. The passenger quickly undid her seatbelt and assisted the pilot to exit the aircraft through the open right door, noticing that the right wing was on fire. The passenger and the pilot moved about 10 m from the aircraft, prior to multiple explosions occurring.

The pilot and passenger were rescued about 3 hours later by a helicopter crew. Both sustained serious injuries and the aircraft was destroyed (Figure 1). Due to memory loss incurred as a result of the accident, the pilot had limited recollection of the events.

1 Mayday is an internationally recognised radio call for urgent assistance.

**Figure 1: Accident site and aircraft wreckage**

Source: Rescue crew

### *Aircraft engine and maintenance*

The day prior to the accident, the aircraft had been fitted with a replacement alternator with a new exchange drive clutch. At that time, the aircraft total time in service was 4003.3 hours, and it had completed about 30 hours since the last 100-hourly inspection.

The engine had been converted from a turbo-charged engine to a normally aspirated engine and therefore, a complete overhaul would be required following 2,000 hours of service since the change. The engine had about 112.7 hours remaining until the overhaul.

The engineer reported that, although the aircraft had been using oil at a higher rate than previously, the compression testing performed at the last 100-hourly inspection indicated that compression was within tolerances.

The engineer had advised company pilots that, rather than flying at higher altitudes, with higher engine revolutions per minute (RPM) settings and a MP of about 21 inches Hg, it was more desirable to remain at a lower altitude where 23 inches Hg could be achieved.

## ATSB comment

From the photographs provided by the operator (Figure 2), the ATSB assessed that a connecting rod appeared to have broken and separated from the crankshaft, resulting in a hole in the crankcase. This precipitated a catastrophic engine failure. The smoke entering the cockpit was likely to have been from burning oil.

**Figure 2: Engine damage to VH-HGZ**

Source: Operator

# General details

## *Occurrence details*

| | | |
|---|---|---|
| Date and time: | 28 March 2014 – 1150 CST | |
| Occurrence category: | Accident | |
| Primary occurrence type: | Engine failure or malfunction | |
| Location: | Numbulwar aerodrome, Northern Territory | |
| | Latitude: 14° 14.23' S | Longitude: 135° 15.28' E |

## *Aircraft details*

| | | |
|---|---|---|
| Manufacturer and model: | Cessna Aircraft Company 210 | |
| Registration: | VH-HGZ | |
| Serial number: | 21060430 | |
| Type of operation: | Charter – passenger | |
| Persons on board: | Crew – 1 | Passengers – 1 |
| Injuries: | Crew – 1 (Serious) | Passengers – 1 (Serious) |
| Damage: | Destroyed | |

# Helicopters

# Weather-related event involving a Eurocopter AS350B3, VH-VTX

## What happened

On 19 January 2014, at about 0824 Eastern Daylight-savings Time (EDT) a Eurocopter AS350B3 helicopter, registered VH-VTX departed Hobart (Cambridge aerodrome), Tasmania, for Camden, New South Wales, with a planned refuelling stop at a Helicopter Landing Site (HLS) near Orbost, Victoria. The flight was planned under the visual flight rules (VFR).[1]

The pilot reviewed the forecast weather during pre-flight planning, noting that forecast low cloud and precipitation may affect the flight, particularly over Bass Strait north of Flinders Island. Although the forecast raised some concerns, the pilot elected to depart, planning to review the weather en route and land at Flinders Island for additional fuel if necessary. Full fuel on departure (which included an auxiliary fuel tank), provided an endurance[2] of over 3.5 hours for an estimated flight time to the HLS near Orbost of about 2.6 hours.

At the time the flight was planned, forecast weather for the flight across Bass Strait north of Flinders Island included several layers of cloud and isolated showers. The lowest cloud forecast was broken[3] stratus cloud with a base at 800 ft, contracting to precipitation by 1100. Visibility was forecast to reduce to 3,000 m in heavy showers, and 5,000 m in showers. During flight planning, the pilot also reviewed the aerodrome forecast (TAF)[4] for Flinders Island (no TAF was available for the destination), which confirmed that Flinders Island was a suitable diversion aerodrome.

An amended forecast for the area over Bass Strait north of Flinders Island was issued after the pilot departed Hobart, to take effect from 1000. Among several changes, the lowest forecast cloud base was amended to 1,200 ft, reducing to 800 ft in showers. The pilot was advised of the amended forecast by Air Traffic Control (ATC) while en route and although unable to recall the details of the amended forecast, the pilot was satisfied at the time that nothing in the amended forecast was operationally significant.

The weather was clear for the departure from Hobart, but patches of low cloud and areas of reduced visibility over inland Tasmania forced the pilot to divert to the east of the planned track. From a point near the north-east coast of Tasmania, the pilot was able to proceed north in relatively clear conditions toward Cape Barren Island and the south-east coast of Flinders Island.

Leaving the north-east coast of Tasmania, the pilot contacted the company refuelling agent at Orbost to gain an appreciation of the weather at the intended landing site. The refuelling agent indicated that there were patches of drizzle in the Orbost area, but the cloud was reasonably high and the visibility to the south over Bass Strait was estimated to be 10 km.

Passing the south-east coast of Flinders Island, the pilot determined that sufficient fuel was available to continue to the intended landing site near Orbost with 30 minutes fixed fuel reserve intact, plus about 40 minutes additional fuel reserve. Based upon the information provided earlier by the refuelling agent and the available endurance, the pilot elected to continue across Bass Strait without landing at Flinders Island. The pilot also commented during the investigation that the

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1 VFR is a set of regulations that allow a pilot to only operate an aircraft in weather conditions generally clear enough to allow the pilot to see where the aircraft is going.

2 Endurance refers to available flight time, without refuelling.

3 Cloud cover is normally forecast using expressions that denote the forecast extent of the cover. The expression ‘broken’ indicates that more than half to almost all the sky was forecast to be covered.

4 A TAF is an aerodrome forecast that provides a statement of meteorological conditions expected for a specific period of time, in the airspace within a radius of 5 NM (9 km) of the aerodrome.

weather ahead at that time appeared relatively clear, and that there was no significant weather near Flinders Island.

The flight proceeded normally over Bass Strait until about 40 NM south of the intended destination when the pilot encountered rapidly deteriorating weather, including patches of low cloud and areas of reduced visibility. The pilot attempted to manoeuvre around the weather by diverting in a generally north-westerly direction, using a number of offshore resource platforms in the area to assist with assessment of available visibility. After about 15 or 20 minutes of manoeuvring and assessing the weather, the pilot realised that the conditions in the area were worsening and that continuation to the intended destination may not be possible. The pilot also contacted the crew of another helicopter operating in the area to build a better appreciation of the conditions further north. The crew of the other helicopter informed the pilot that conditions to the north were poor, and deteriorating.

In view of the conditions, the pilot contacted a senior company representative to discuss the circumstances and agreed that the best course of action was to divert back to Flinders Island. As the pilot turned south toward Flinders Island however, it became apparent that the wind, which was from a southerly direction, had increased in strength from about 10 to 15 kt (experienced earlier in the flight) to about 20 to 25 kt. Noting the increase in wind strength, the pilot was concerned that there may be insufficient fuel to safely reach Flinders Island.

In view of the poor weather ahead and concerned that there was insufficient fuel to safely reach Flinders Island, the pilot elected to make a precautionary landing on a nearby offshore resource platform. The pilot informed ATC and a company representative accordingly, and although the pilot did not declare an emergency, ATC initiated an INCERFA[5] as a precaution, and the company representative informed search and rescue authorities of the situation. The pilot landed on the platform without incident with a remaining endurance of about 55 minutes.

When the weather cleared, the pilot was able to continue to the planned destination and land with required fuel reserves intact.

## ATSB comment

The pilot indicated that with the benefit of hindsight, it would have been prudent to either delay departure from Hobart until more favourable conditions were forecast, or land at Flinders Island en route to refuel and further assess the weather before setting out across Bass Strait. The pilot also commented to the effect that being in visual contact with offshore resource platforms probably encouraged continued attempts to negotiate the poor weather, because they provided a reference to assist with continuous assessment of the prevailing visibility. Again with the benefit of hindsight, the pilot indicated that it would have been prudent to divert back to Flinders Island at the first indication of poor weather.

A company review of the incident concluded that had the pilot diverted to Flinders Island as soon as deteriorating weather was encountered, sufficient fuel was available to land safely (assuming that the en route weather back to Flinders Island remained suitable for flight under the VFR). In effect, attempting to manoeuvre around the poor weather eliminated the option the pilot had intended to use in the event that poor weather was encountered.

Importantly however, irrespective of how the pilot ended up in a position where landing on an offshore resource platform seemed the only option, the pilot made a very sound decision not to continue into deteriorating weather. Numerous incidents and accidents have resulted when flights conducted under the VFR encounter instrument meteorological conditions (IMC). [6]

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5 INCERFA is a phase where uncertainty exists as to the safety of an aircraft and its occupants.

6 Instrument Meteorological Conditions (IMC) describes weather conditions that require pilots to fly primarily by reference to instruments, and therefore under Instrument Flight Rules (IFR), rather than by outside visual references. Typically, this means flying in cloud or limited visibility.

The ATSB recently published a research booklet *Avoidable Accidents No. 4 - Accidents involving pilots in Instrument Meteorological Conditions*. The A key message included in the report was:

> *Avoiding deteriorating weather or IMC required thorough pre-flight planning, having alternate plans in case of unexpected deterioration in the weather, and making timely decisions to turn back or divert.*

The report highlights a number of lessons learnt from weather-related accidents. Those lessons include:

> *Even though you may have decided on a course of action, decision making is a dynamic process, particularly when it comes to weather, and requires continuous assessment of conditions en route. Make decisions early – when in doubt, turn about.*

A copy of the booklet is available on the ATSB website at
www.atsb.gov.au/publications/2011/avoidable-4-ar-2011-050.aspx

***Offshore resource platform operations.*** The safe conduct of helicopter operations onto offshore resource platforms demands a comprehensive understanding of the complex hazards involved, many of which are not apparent without appropriate knowledge, training and experience. Offshore resource platform operators deal with these hazards through careful risk assessment and extensive crew training programs. A precautionary landing on an offshore resource platform should only be considered under exceptional circumstances. Having made a decision to conduct a precautionary landing, pilots should endeavour to contact platform operations staff to obtain appropriate clearance prior to landing.

## 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.

### *Operator*

In response to this occurrence, the aircraft operator advised the ATSB that the following safety actions are being undertaken or considered:

- Communication to company pilots regarding weather considerations during flight planning.
- Review of the company Operations Manual with a view to adding specific instructions dealing with Bass Strait crossings.

## Safety message

Two key safety messages emerge from this incident:

- This incident serves as a reminder of the need for conservative and thorough planning when intending to proceed into an area where poor weather is forecast.
- If poor weather is encountered en route, options for continued safe flight can quickly diminish. Timely and conservative decision making is often critical to a safe outcome.

# General details

## Occurrence details

| | | |
|---|---|---|
| Date and time: | 19 January 2014 – 1127 EDT | |
| Occurrence category: | Incident | |
| Primary occurrence type: | Weather-related event | |
| Location: | 74 km SW of Orbost aerodrome, Victoria | |
| | Latitude: 38° 24’ S | Longitude: 148° 19’ E |

## Aircraft details

| | | |
|---|---|---|
| Manufacturer and model: | Eurocopter AS350B3 | |
| Registration: | VH-VTX | |
| Serial number: | 4753 | |
| Type of operation: | Private | |
| Persons on board: | Crew – 1 | Passengers – Nil |
| Injuries: | Crew – Nil | Passengers – Nil |
| Damage: | None | |

# Hard landing involving a Robinson R22, VH-YZO

## What happened

**VH-YZO**

Source: Operator

On 20 February 2014, at about 1600 Eastern Standard Time (EST), a Robinson R22 helicopter, registered VH-YZO, lifted off at Toowoomba Airport, Queensland, for a local training flight with an instructor and student pilot on board.

The training sequence included conducting a simulated tail rotor failure in the hover. Prior to take-off, the instructor demonstrated to the student, the use of the override spring to disconnect the throttle correlator. Once disconnected, the throttle does not automatically increase and decrease as the collective[1] is raised and lowered.

The instructor established the helicopter in the hover at about 3 ft above ground level (AGL). He demonstrated applying right pedal and allowing the helicopter to yaw. He then demonstrated use of the cyclic[2] to control the helicopter in one position over the ground. The instructor then demonstrated the simulated tail rotor failure sequence, applying right pedal to cause the helicopter to yaw, closing the throttle, allowing the helicopter to sink, and then gently raising collective to allow it to settle onto the ground.

The instructor then established the helicopter in the hover at about 3 ft AGL and announced 'practice tail rotor failure, 3 2 1', and applied right pedal. The student completed the sequence as demonstrated. The instructor then counted the student into a second attempt and as he applied right pedal, the student lowered the collective very quickly. The instructor recovered control of the helicopter and raised the collective, however the helicopter landed hard.

The instructor then conducted a walk-around inspection of the helicopter to assess for any damage. He observed that there was no evidence of damage compatible with a hard landing, such as marking on the top of the cabin or near the tail cone.

The student then practiced the sequence for the third time. After establishing the hover and counting the student in, the instructor applied right pedal, and ensured that he covered the throttle detent and placed his hand so as to prevent the student from rapidly lowering the collective. On this attempt, the student rolled the throttle off and rapidly raised the collective. The helicopter ballooned, to about 8 ft AGL, landed heavily, bounced once and subsequently landed on the left skid before settling level on both skids.

The instructor again exited the helicopter and conducted a walk-around inspection with no damage observed. After a further demonstration by the instructor, the student completed the sequence twice more. The instructor and student then conducted further training exercises and subsequently concluded the flight. After landing, the instructor detected that the helicopter was leaning to the right. He exited the helicopter and observed that the landing skid was damaged (Figure 1). The instructor then taxied the helicopter to the hangar for an engineering inspection.

1 The collective pitch control, or collective, is a primary flight control used to change the pitch angle of the main rotor blades. Collective input is the main control for vertical velocity.

2 The cyclic pitch control, or cyclic, is a primary flight control that allows the pilot to fly the helicopter in any direction of travel: forward, rearward, left and right.

**Figure 1: Damage to VH-YZO**

Source: Operator

## 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.

### *Helicopter operator*

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

The chief flying instructor has recommended company flight instructors commence the sequence at about 2 ft AGL, in line with the Robinson R22 Flight Training Guide for simulated engine failures in the hover. A specific guide for tail rotor failures, the accompanying student brief, and instructor patter for the sequence have been amended in the company Flight Instructor Guide.

Company flight instructors have been advised that following a suspected hard landing or other possible damage to an aircraft, the aircraft is to be shut down. If damage is suspected, the aircraft should not be flown or relocated until a qualified engineer has deemed the aircraft to be airworthy.

## Safety message

This incident highlights the importance of a flight instructor understanding the possible ways a student may respond to a training scenario. The instructor can then guard the controls in anticipation of incorrect control input by the student.

## General details

### *Occurrence details*

| | | |
|---|---|---|
| Date and time: | 20 February 2014 – 2245 EST | |
| Occurrence category: | Incident | |
| Primary occurrence type: | Hard landing | |
| Location: | Toowoomba Airport, Queensland | |
| | Latitude: 27° 32.48' S | Longitude: 151° 54.75' E |

### *Helicopter details*

| | | |
|---|---|---|
| Manufacturer and model: | Robinson Helicopter Company R22 | |
| Registration: | VH-YZO | |
| Serial number: | 4289 | |
| Type of operation: | Flying training – dual | |
| Persons on board: | Crew – 2 | Passengers – Nil |
| Injuries: | Crew – Nil | Passengers – Nil |
| Damage: | Minor | |

# Australian Transport Safety Bureau

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The Bureau 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 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 fare-paying passenger operations.

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 safety factors related to the transport safety matter being investigated. The terms the ATSB uses to refer to key safety and risk concepts are set out in the next section: Terminology Used in this Report.

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 Bulletin

The ATSB receives around 15,000 notifications of Aviation occurrences each year, 8,000 of which are accidents, serious incidents and incidents. It also receives a lesser number of similar occurrences in the Rail and Marine transport sectors. It is from the information provided in these notifications that the ATSB makes a decision on whether or not to investigate. While some further information is sought in some cases to assist in making those decisions, resource constraints dictate that a significant amount of professional judgement is needed to be exercised.

There are times when more detailed information about the circumstances of the occurrence allows the ATSB to make a more informed decision both about whether to investigate at all and, if so, what necessary resources are required (investigation level). In addition, further publically available information on accidents and serious incidents increases safety awareness in the industry and enables improved research activities and analysis of safety trends, leading to more targeted safety education.

The Short Investigation Team gathers additional factual information on aviation accidents and serious incidents (with the exception of 'high risk operations), and similar Rail and Marine occurrences, where the initial decision has been not to commence a 'full' (level 1 to 4) investigation.

The primary objective of the team is to undertake limited-scope, fact gathering investigations, which result in a short summary report. The summary report is a compilation of the information the ATSB has gathered, sourced from individuals or organisations involved in the occurrences, on the circumstances surrounding the occurrence and what safety action may have been taken or identified as a result of the occurrence.

These reports are released publically. In the aviation transport context, the reports are released periodically in a Bulletin format.

Conducting these Short investigations has a number of benefits:

- Publication of the circumstances surrounding a larger number of occurrences enables greater industry awareness of potential safety issues and possible safety action.
- The additional information gathered results in a richer source of information for research and statistical analysis purposes that can be used both by ATSB research staff as well as other stakeholders, including the portfolio agencies and research institutions.
- Reviewing the additional information serves as a screening process to allow decisions to be made about whether a full investigation is warranted. This addresses the issue of 'not knowing what we don't know' and ensures that the ATSB does not miss opportunities to identify safety issues and facilitate safety action.
- In cases where the initial decision was to conduct a full investigation, but which, after the preliminary evidence collection and review phase, later suggested that further resources are not warranted, the investigation may be finalised with a short factual report.
- It assists Australia to more fully comply with its obligations under ICAO Annex 13 to investigate all aviation accidents and serious incidents.
- Publicises ***Safety Messages*** aimed at improving awareness of issues and good safety practices to both the transport industries and the travelling public.

**Australian Transport Safety Bureau**

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Investigation

**ATSB Transport Safety Report**
Aviation Short Investigations
Aviation Short Investigations Bulletin Issue 31
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