Australian Government

Australian Transport Safety Bureau

Aviation Short Investigations Bulletin

Issue 30

Investigation

ATSB Transport Safety Report

Aviation Short Investigations

AB-2014-064

Final – 26 May 2014

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

Publishing information

Published by: Australian Transport Safety Bureau
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Operational event involving a Boeing 737, VH-VUZ

What happened

Soon after 0600 Eastern Daylight-saving Time[1] on 4 January 2013, a Boeing 737-800, registered VH-VUZ, departed Launceston, Tasmania for Melbourne, Victoria. The flight was a scheduled passenger service, with a planned flight time of 48 minutes. The first officer (FO) was the pilot flying (PF).

During the departure, as the aircraft climbed through about 3,900 ft, the FO selected level change (LVL CHG) as the vertical auto-flight mode and an airspeed of 250 kt, with the intention of later selecting vertical navigation (VNAV) mode. During the investigation, both crew commented that VNAV mode is normally selected to manage aircraft airspeed and vertical profile during departure, but on this occasion the FO elected to use LVL CHG mode. The FO could not recall why LVL CHG mode was used on this occasion, but the captain recalled that it was probably used to expedite climb through a layer of cloud and/or turbulence. Both crew members overlooked the intended subsequent selection of VNAV mode, so the aircraft continued to climb in LVL CHG mode at a constant 250 kt. The characteristics of each relevant vertical auto-flight mode are outlined later in the report.

As the aircraft climbed at a constant airspeed, the aircraft Mach number[2] was steadily increasing. Passing about flight level (FL)[3] 260, the auto-flight system sequenced automatically from climb at a constant airspeed of 250 kt, to climb at a constant Mach 0.62, which was the Mach number corresponding to 250 kt at the point that the changeover occurred. As the aircraft then continued to climb at a constant Mach 0.62, the airspeed slowly reduced.[4] The changeover from a constant airspeed to a constant Mach number during the climb went unnoticed by the crew, as did the gradually reducing airspeed as climb continued beyond the changeover altitude.

Approaching FL 350, about 20 minutes after departure, the FO noticed a ‘buffet alert’ caution appear in the scratchpad of the control display unit (CDU).[5] At about the same time, the captain recalled that the aircraft auto-flight system made a small but noticeable pitch attitude reduction. Both pilots immediately directed their attention to the primary flight display and noticed that airspeed had reduced to the point that it was near the top of the amber bar on the airspeed indicator. The top of the amber bar represents the aircraft minimum manoeuvre airspeed (described in detail later in the report).

In responding to the low airspeed condition and attempting to accelerate, the crew reduced the aircraft pitch attitude to the point that the aircraft entered a shallow descent. Soon after, the crew was able to establish an accelerated climb to the intended cruising level.

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

2 Mach number is the ratio of true airspeed to the speed of sound in the surrounding air.

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 260 equates to 26,000 ft.

4 The relationship between Mach number and airspeed is temperature dependent. In this case, as the aircraft climbed at a constant Mach number and temperature decreased, airspeed also decreased.

5 Two identical CDUs (one available to each pilot) are used by flight crew to enter data and control the flight management computer, and display flight management computer data and messages. The scratchpad refers to the bottom line of the CDU screen, used among other things to display a range of flight management computer advisory messages. One such advisory message is ‘buffet alert’. When an advisory message appears, a message light on both CDUs also illuminates, to draw the crew’s attention to the message. The operator’s Flight Crew Operations Manual states that the ‘buffet alert’ message informs the crew that the aircraft manoeuvre margin is ‘less than specified’.

Recorded data indicates that the aircraft reached a minimum airspeed of 201 kt computed airspeed[6] which was about 6 kt below the minimum manoeuvre airspeed at that moment.

Relevant auto-flight modes

The B737 auto-flight system consists of an auto-pilot flight director system (AFDS) and the auto-throttle system. The AFDS and auto-throttles are controlled using the mode control panel (MCP) and the flight management computer (FMC).[7] Crew inputs to the FMC are made using one of the two CDUs. The auto-flight system operates in various vertical modes according to the phase of flight, operating environment and crew requirements. Two commonly used vertical modes relevant to this occurrence are VNAV mode and LVL CHG mode.

VNAV mode

In VNAV mode the auto-flight system guides the aircraft along FMC-computed vertical profile selected by the crew on the CDU. During normal operations when economy climb speed schedule is selected,[8] the FMC airspeed profile holds the airspeed at 250 kt up to 10,000 ft (normal procedural requirement in Australian airspace) followed by acceleration to the FMC-computed economy climb airspeed. As climb continues at a constant airspeed, Mach number increases given a falling outside air temperature.[9] Climb normally continues at the economy-optimised climb airspeed until the Mach number reaches the FMC-computed economy-optimised Mach number. Climb then continues at the economy-optimised Mach number to the planned cruise altitude. Other climb speed modes selectable on the CDU include maximum angle climb and maximum rate climb.[10]

Recorded data indicates that during this occurrence had the crew climbed in VNAV mode and selected the economy climb speed schedule, the aircraft would have maintained 250 kt to 10,000 ft before accelerating to about 290 kt. The aircraft would have climbed at about 290 kt to almost FL 300, from which point climb would have continued at a constant Mach 0.75 to the planned cruising altitude of FL 360.

VNAV mode is selected by pressing the VNAV pushbutton on the MCP (Figure 1). When selected, a green bar on the VNAV pushbutton illuminates. During a climb in VNAV mode, the flight mode annunciator (FMA)[11] indication at the top of each pilot's primary flight display indicates N1[12] as the auto-throttle mode and VNAV SPD (speed) as the vertical auto-flight mode (Figure 2).[13] During a climb in VNAV mode, the indicated airspeed/Mach number (IAS/MACH) window on the MCP is blank, while the FMC target speed is displayed on the primary flight display airspeed indicator.

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6 Computed airspeed referred to in this report is the same as the airspeed displayed on the captain's airspeed indicator, and referred to in the Flight Crew Operations Manual as calibrated airspeed. Calibrated airspeed accounts for airspeed indication system errors.

7 The FMC performs a range of navigation and performance-related functions based upon crew-entered data, aircraft system data, and navigational and performance databases. The FMC provides auto-flight and auto-throttle guidance and control.

8 The economy climb speed schedule is computed by the FMC to minimise operating costs. The speed schedule is based upon a cost index entered by the crew and other performance-related parameters.

9 In the standard atmosphere, temperature decreases with altitude at a rate of 1.98^{o} C per 1,000 ft, up to the tropopause (36, 089 ft in the standard atmosphere).

10 Maximum angle climb can be used for obstacle clearance purposes, or to reach a required altitude over minimum distance. Maximum rate climb can be used when a high rate of climb is required, and to minimise the time required to climb to the planned cruise altitude.

11 Auto-flight modes are displayed on the FMA at the top of each pilot's primary flight display. Engaged modes are displayed at the top of the FMA in green letters. Armed modes are displayed in smaller white letters beneath the engaged modes. The mode annunciations, from left to right, are auto-throttle, roll (or lateral) mode, and pitch (or vertical) mode.

12 N1 auto-throttle mode engages automatically when LVL CHG or VNAV modes are engaged during climb. The auto-throttles then maintain engine speed at the N1 limit selected on the CDU.

13 Note that VNAV SPD will change to VNAV PTH (path) and N1 will change to FMC SPD during a level segment of a VNAV climb.

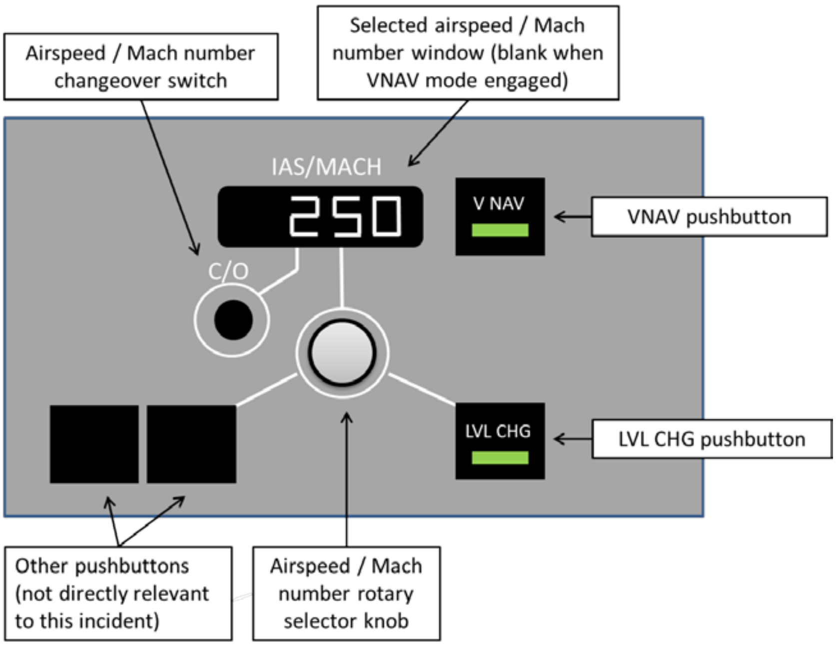
LVL CHG mode

In LVL CHG mode, the auto-flight system guides the aircraft vertically at the airspeed selected by the crew on the MCP. LVL CHG mode is sometimes used during a climb to allow a more active and typically short-term approach to vertical profile management. For example, rather than allowing the aircraft to accelerate in VNAV mode in accordance with the FMC-computed speed profile, the crew may elect to temporarily retard acceleration or reduce airspeed using LVL CHG mode. Temporarily retarding acceleration or reducing speed may generate a higher short-term rate of climb, thereby facilitating an expedited climb through a layer of cloud or turbulence.

LVL CHG mode is selected by pressing the LVL CHG pushbutton on the MCP (Figure 1). As with the VNAV pushbutton, a green bar illuminates on the pushbutton when LVL CHG is selected. The airspeed control knob on the MCP is then used to select the required climb airspeed or Mach number, which is displayed in the corresponding IAS/MACH window. The changeover (C/O) switch on the MCP is pushed to cycle the IAS/MACH display between indicated airspeed and Mach number. During this occurrence, the switch from indicated airspeed (250 kts) to Mach number (Mach 0.62) occurred automatically at about FL 260 as the aircraft climbed.

When LVG CHG mode is selected, the FMA indicates N1 as the auto-throttle mode and MCP SPD (speed) as the vertical auto-flight mode (Figure 2).

Figure 1: Representation of relevant part of MCP



Source: ATSB

Figure 2: Representation of the FMA during climb in VNAV and LVL CHG modes

Example of FMA annunciations during a climb in VNAV mode. In this case, VNAV SPD indicates that the auto-flight system is following the FMC-computed speed profile. N1 indicates that the auto-throttle system is commanding a set engine speed limit and LNAV (lateral navigation) indicates that the auto-flight system is following a programmed lateral track.

Example of FMA annunciations during a climb in LVL CHG mode. In this case, MCP SPD indicates that the auto-flight system is in LVL CHG mode maintaining the speed set on the MCP. As above, N1 indicates that the auto-throttle system is commanding a set engine speed limit and LNAV indicates that the auto-flight system is following a programmed lateral track .

Source: ATSB

Minimum manoeuvre airspeed

The minimum manoeuvre airspeed is represented as the top of an amber bar on the primary flight display airspeed indicator. Minimum manoeuvre speed is defined in the operator's Flight Crew Operations Manual (FCOM) as the airspeed that provides:

- 1.3g[14] manoeuvre capability to the stick shaker below approximately 20,000 ft.
- 1.3g manoeuvre capability to the low airspeed buffet (or the approved manoeuvre capability entered into the Flight Management Computer maintenance pages) above approximately 20,000 ft.[15]

The FCOM adds the following caution:

> *Reduced maneuver [sic] capability exists when operating within the amber regions below the minimum maneuver [sic] airspeed or above the maximum maneuver [sic] airspeed. During non-normal conditions the target airspeed may be below the minimum maneuver [sic] airspeed.*

System alerts and levels of protection reduce the likelihood of continued unintended deceleration below minimum manoeuvre airspeed. During this occurrence, the crew responded to the 'buffet alert' message on the CDU scratchpad and a small auto-flight system pitch attitude reduction, which were the first indications that effectively captured the attention of the crew. Had the airspeed

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[14] 1.3g represents 1.3 times the force of gravity. In this context, 1.3g means that the aircraft can be manoeuvred at up to 1.3g without activating the stick shaker or generating a low airspeed buffet. Approximately 1.3g will be experienced during a level turn at 40 degrees angle of bank.

[15] The operator involved in this occurrence used manufacturer FMC settings with respect to the low airspeed buffet manoeuvre margin.

continued to reduce, other more salient alerts would have been triggered. For example, under the existing conditions, an 'airspeed low, airspeed low' voice alert would have been triggered at about 194 kt, and the stick-shaker[16] would have activated at about 162 kt.

Crew comments

The crew commented that the effectiveness of their instrument scan and auto-flight system mode awareness was probably compromised to some degree by the distractions sometimes associated with relatively short sectors. While the aircraft was climbing, each pilot consumed a meal before commencing preparations for their arrival into Melbourne. While the crew were broadly scanning aircraft instruments throughout the climb, nothing specifically drew their attention to the unintended auto-flight climb mode or the gradually reducing airspeed (beyond the changeover altitude). The crew commented that the occurrence provided a salient reminder regarding the importance of maintaining auto-flight system mode awareness.

ATSB comment

The ATSB commends the flight crew and operator for submitting a report in relation to this occurrence, noting that the occurrence was not reportable under the definitions provided in *Transport Safety Investigation Regulations 2003*. The report was submitted in the interest of aviation safety and to provide an opportunity for others to learn from the occurrence.

When auto-flight system mode awareness is compromised, continued operation in an unintended mode is sometimes the result. Such scenarios often lead to unintentional non-compliance with operational or procedural requirements. Other recent occurrences investigated by the ATSB with similarities to this occurrence include:

- ***AO-2012-040 Descent below minimum safe altitude involving Boeing 737-476, VH-TJS, 21 km south of Canberra Airport, ACT, 12 February 2012.*** The ATSB found that at the time of the occurrence the auto-flight system was in LVL CHG mode rather than the VNAV mode (specified by the operator for the phase of the approach being flown). Engagement of LVL CHG mode resulted in descent through minimum safe altitude to the altitude selected by the crew on the MCP. While this occurrence relates to altitude management rather than speed profile management, the lessons with respect to auto-flight system mode awareness are similar. A copy of the ATSB report dealing with this occurrence can be found on the ATSB website at www.atsb.gov.au/publications/investigation_reports/2012/aair/ao-2012-040.aspx
- ***AO-2012-103 Descent below segment minimum safe altitudes involving Airbus A320-232, VH-VQA, near Queenstown, New Zealand, 16 July 2012.*** In this occurrence, the ATSB found that the crew intended to switch auto-flight system modes during descent, but inadvertently overlooked that selection. As a result, descent continued in an unintended mode that did not prevent infringement of procedure altitude constraints. This occurrence highlighted the importance of attention to active and armed auto-flight system modes. A copy of the ATSB report dealing with this occurrence can also be found on the ATSB website at www.atsb.gov.au/publications/investigation_reports/2012/aair/ao-2012-103.aspx

Since the introduction of highly automated aircraft auto-flight systems, numerous studies have examined the effectiveness of the human-machine interface and the role of flight crew in manipulating and monitoring these systems. Reports associated with such studies of relevance to this occurrence include the following:

- A 1996 report by the Federal Aviation Administration (FAA) Human Factors Team looked at the interface between flight crew and highly automated auto-flight systems. While avionics technology may have advanced since the report was prepared, many issues addressed in the

[16] The stick shaker is a device that physically shakes the control column (through a small angle in the fore and aft plane) providing artificial warning of an approaching aerodynamic stall.

report remain highly relevant. The report devotes considerable attention to flight crew situation awareness, including the issues surrounding auto-flight system mode and aircraft energy state awareness. This report can be accessed on the FAA website at www.faa.gov/aircraft/air_cert/design_approvals/csta/publications

- A recent report by the FAA Performance-based operations Aviation Rulemaking Committee Flight Deck Automation Working Group titled *Operational Use of Flight Path Management Systems* addresses the safety and efficiency of modern flight deck systems for flight path management (including energy-state management). Among other things, the report recommends better training and flight crew procedures to improve auto-flight system mode awareness '… as part of an emphasis on flight path management.' This report can be accessed on the FAA website at www.faa.gov/about/office_org/headquarters_offices/avs/offices/afs/afs400/parc/parc_reco/
- In 2010, the European Aviation Safety Agency (EASA) issued Safety Information Bulletin 2010-33 *Flight Deck Automation Policy – Mode Awareness and Energy State Management* to '… remind air operators of the importance of air crews continuing to be aware of the automation mode under which the aircraft is operating ...' The bulletin also comments:

  > *Critically, in complex and highly automated aircraft, flight crews can lose situational awareness of the automation mode under which the aircraft is operating … lead to the mismanagement of the energy state of the aircraft or to the aircraft deviating from the intended flight path.*

  This bulletin can be accessed on the EASA website at http://ad.easa.europa.eu/ad/2010-33.

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

Since this occurrence, the operator has introduced a policy requiring that FMA changes be announced by the PF (with some exceptions), and that the pilot monitoring should announce any FMA changes missed by the PF. While this action may not directly address the possibility of continued operation in an unintended mode, it is likely to have a positive impact on overall flight mode awareness, and lead to improved crew communication with respect to the status of the auto-flight system. The operator also included auto-flight system mode awareness as a briefing item during a subsequent recurrent training program during 2013, to further highlight the importance of mode awareness to all flight crew.

Safety message

This occurrence highlights the importance of consistent attention to auto-flight system modes and aircraft energy state. Operation of the auto-flight system in an unintended or inappropriate mode can lead to an undesirable energy state, or in other cases, unintended operational or procedural non-compliance.

General details

Occurrence details

Date and time:	04 January 2013 – 0620 EDT	
Occurrence category:	Incident	
Primary occurrence type:	Aircraft control	
Location:	142 km north west of Launceston Airport, Tasmania	
	Latitude: 40° 21.9' S	Longitude: 146° 34.8' E

Aircraft details

Manufacturer and model:	Boeing Company 737-8FE	
Registration:	VH-VUZ	
Operator:	Virgin Australia	
Serial number:	39921	
Type of operation:	Air transport – high capacity	
Persons on board:	Crew – Unknown	Passengers – Unknown
Injuries:	Crew – Nil	Passengers – Nil
Damage:	None	

Turboprop aircraft

Decompression event involving Fairchild SA227DC, VH-ANW

What happened

On 7 March 2014, at about 1100 Western Standard Time, a Fairchild SA227DC, registered VH-ANW, with a crew of two and 18 passengers departed Truscott-Mungalalu aerodrome and was on climb passing through FL 125 when the cabin altitude annunciator illuminated.

The pressurisation system was checked by the crew and the cabin altitude was observed to be climbing at around a 1,000 feet per minute. While the flight crew were fitting (donning) their oxygen masks the CARGO DOOR warning light also illuminated. They then completed the checklist items which included turning off the engine air bleeds.

As part of the depressurisation drill the first officer made a passenger announcement (PA) requiring all passengers to don oxygen masks. This PA could not be heard by any of the passengers in the cabin. After approximately 5 minutes, a passenger seated in the front of the cabin noted that the crew had donned their masks so went forward to ask if the passengers needed to do the same. This message was then passed throughout the cabin.

As the aircraft was above the maximum landing weight for a return to Truscott, the crew made the decision to continue on to Darwin and, due to the lower cruise altitude required when unpressurised, deviations from the track were necessary in order to avoid any significant weather.

The crew reported that after an uneventful landing in Darwin and engine shutdown, they debriefed the passengers.

They also reported that there were no issues experienced when closing the door at Truscott and that prior to engine start an additional confirmation check was made that the cargo door warning lights were extinguished. It was noted however, that there had been issues with that door in the previous weeks, including being hard to lock and a loss of cabin pressure.

Aircraft operator investigation

Maintenance examination of the aircraft found that several of the ten locking pins on the cargo door were worn. As a precaution, seven of these pins were replaced. The pilot's oxygen mask microphone was tested as serviceable and the first officer's microphone was found to be faulty and was also replaced.

Safety action

The operator has introduced amendments to the aircraft type PA and safety procedures checklists in order to confirm safety related PA announcements to passengers in these low capacity aircraft are understood and complied with.

Safety message

SafetyWatch

The incident highlights the need, in lower capacity passenger aircraft without flight attendants, to assist in the cabin to confirm compliance with safety related announcements for the flight crew to confirm that the passengers have understood and complied with any safety message. broadcasts.

General details

Occurrence details

Date and time:	7 March 2014 – 1100 WST	
Occurrence category:	Incident	
Primary occurrence type:	Depressurisation	
Location:	NE M 56km Truscott-Mungalalu Aerodrome, WA	
	Latitude: 13° 45.13’ S	Longitude: 126° 45.68’ E

Aircraft details

Manufacturer and model:	Fairchild DA227DC	
Registration:	VH-ANW	
Operator:	Airnorth	
Serial number:	DC-873B	
Type of operation:	RPT	
Persons on board:	Crew – 2	Passengers – 18
Injuries:	Crew – Nil	Passengers – Nil
Damage:	None	

Piston aircraft

Wheels up landing involving a Rockwell 114, VH-AYH

What happened

Rockwell 114

Source: George Canciani

On 27 October 2013, the pilot of a Rockwell 114 aircraft, registered VH-AYH, departed Camden Airport, New South Wales in visual meteorological conditions on a flight to the designated training area located near Camden. The pilot was the only person on board.

About 5 minutes after departure the pilot became concerned about the level of smoke from a bush fire in the area affecting visibility. The pilot elected to return to Camden and to conduct circuits.

Due to the reducing visibility from the smoke the pilot conducted low level circuits and continued to monitor the visibility during the circuits. The first touch-and-go was conducted without incident. The pilot configured the aircraft for a second touch-and-go on runway 06. As the aircraft touched down at about 0745 Australian Eastern Daylight Time the pilot reported hearing a scraping sound and noticed that the landing gear was not selected down. The aircraft came to rest about a third of the way down the runway. The pilot was not injured.

The pilot indicated he did not remember hearing the aircraft's landing gear warning horn at any stage during the 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.

Aircraft operator

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

- develop written checklists for the aircraft
- ensure the maintenance organisation inspects the aircraft landing gear warning system for correct operation.

Safety message

Research conducted by the Australian Transport Safety Bureau (ATSB) defined distraction as a process, condition or activity that takes a pilot's attention away from the task of flying. The research highlighted that, distractions were a normal part of everyday flying and that pilots generally responded to distractions quickly and efficiently, interspersing novel events with habitual, well-practiced sequences of actions. As a result of this, the impact of distraction on performance and aviation safety generally goes unnoticed. However, studies have also shown that pilots are vulnerable to distraction-related errors. This accident highlights the impact distractions can have on aircraft operations and the need to develop systems for managing distractions.

The following provide additional information on pilot distraction and check lists:

- ATSB *Dangerous Distraction: An examination of accidents and incidents involving pilot distraction in Australia between 1997 and 2004*: www.atsb.gov.au/publications/2005/distraction_report.aspx.
- The United States Federal Aviation Administration (FAA) *On Landings Part III* pamphlet: www.faasafety.gov/gslac/ALC/libview_normal.aspx?id=56411.
- YouTube video of an unintentional wheels up landing: www.flight.org/blog/2012/04/22/gear-up-landings-and-pilot-error/.
- Civil Aviation Safety Authority Draft Advisory Circular *AC 91-100(0) - Flight check systems* www.casa.gov.au/newrules/parts/091/download/ac091-100.pdf.

General details

Occurrence details

Date and time:	27 October 2013 – 0745 AEDT	
Occurrence category:	Accident	
Primary occurrence type:	Wheels up landing	
Location:	Camden Airport, New South Wales	
	Latitude: 34° 02.35' S	Longitude: 150° 41.05' E

Aircraft details

Manufacturer and model:	Rockwell 114	
Registration:	VH-AYH	
Serial number:	14210	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Substantial	

Near collision involving Cessna 404, VH-VEC and Piper PA-28, VH-UNW

What happened

On 10 January, 2014 the pilot of a Cessna 404 aircraft registered VH-VEC (Figure 1), (VEC) planned to conduct a number of aerial survey flights throughout Victoria. On the evening of 9 January, the pilot received a copy of the survey tasks for the following day from his company. These tasks included a relatively short survey flight of about thirty minutes in the Mangalore Aerodrome area. The pilot received specific latitude and longitude coordinates, and a defined radius of 10 NM for the flight.

As all the flights were to be conducted under instrument flight rules (IFR), the pilot liaised closely with ATC, to arrange the most appropriate start and finish time for those tasks scheduled to operate in Melbourne controlled airspace. As VEC was fitted with specialised camera equipment, the pilot also discussed the suitable timing of each task with the camera operator. Survey flights involving camera work are reliant of factors such as the angle of the sun, cloud shadow, visibility and turbulence. The Mangalore flight was planned at 2,000 ft above mean sea level (AMSL). As the elevation of Mangalore Aerodrome is 467 ft AMSL the aircraft would be flying about 1,500 ft above ground level. On this day, it was decided to conduct the shorter Mangalore survey first, and the aircraft departed Essendon for Mangalore with the pilot and camera operator on board.

Approaching Mangalore, the pilot commenced a listening watch on the common traffic aerodrome frequency (CTAF). Just prior to 10 NM from Mangalore Airport, he broadcast the aircraft's position and intentions. There was no reply.

He commenced the survey work which was centralised north-east of the aerodrome. This placed VEC slightly east of the runway 36 extended centreline, (Figure 3). The survey runs were predominantly north south with an east west run and procedure turns over the airport to calibrate the camera.

Figure 1: VH-VEC (in foreground)

Source: Steven Viegel

Figure 2: A PA28 aircraft (Piper Warrior)

Source: Daniel Tanner

Shortly after commencing the runs, the pilot of VEC heard broadcasts on the CTAF from several aircraft taxiing for a runway 36 departure. A group of students from the Mangalore based flying school were conducting navigation exercises that day.

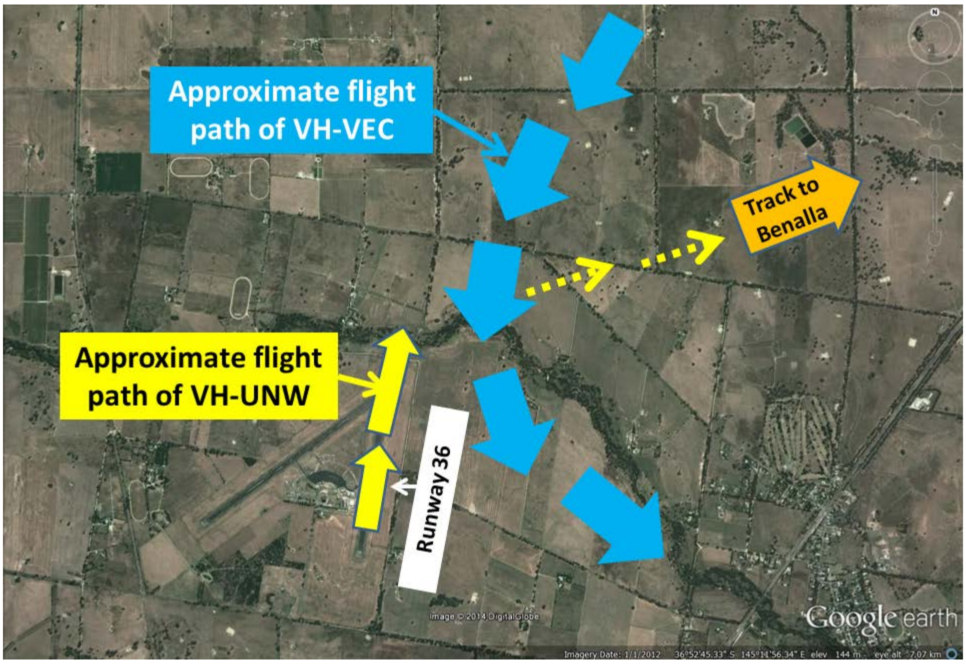
Table 1: Aircraft airborne during VH-VEC survey

Aircraft	Aircraft Type	Exercise	First sector
VH-IPO	PA28	PPL[1] Solo navigation	Mangalore-Shepparton, Victoria
VH-UNW	PA28	PPL Solo navigation	Mangalore-Benalla, Victoria
VH-VLG	PA28R	CPL[2] Dual navigation	Mangalore – Albury, New South Wales

The first of the flying school aircraft to depart was a PA28 aircraft, (Figure 2), registered VH-IPO (IPO). The pilot of VEC and the pilot of IPO had a brief exchange on the radio. The pilot of VEC then advised his aircraft's position, level and intentions which put him 8 NM north at 2,000 ft, turning back toward the field. He did not receive a reply to this transmission.

The second aircraft to depart was VH-UNW (UNW). As UNW was taxiing, the solo student pilot heard an 'ALL TRAFFIC' broadcast from VEC placing the aircraft 10 NM to the north-east at 2,000 ft AMSL and returning to the field. From the broadcast, the student pilot misunderstood the intentions of VEC, thinking he was inbound to land at Mangalore. He thus did not expect any conflict between the two aircraft. Also, as the broadcast had been to all aircraft, and not specifically UNW, he did not respond.

Figure 3: Approximate flight path of VH-VEC and VH-UNW



Source: Google earth

As UNW commenced the take-off, the student made an advisory broadcast that his aircraft was rolling on runway 36. He then, as per his training, focussed on flying the aircraft during the take-off and initial climb phases until the aircraft reached about 1,200 ft AMSL, where he lowered the aircraft's nose to check the airspace for any traffic

As he lowered the nose, he saw VEC to the right, heading south-westerly, at about 200 ft above and about 100 m laterally. He thought that VEC was descending slightly, but still thinking the aircraft was intending to land, he did not foresee any conflict. The pilot of VEC called UNW with an updated position and intentions call, but did not receive a reply.

The student maintained level flight in UNW, and turned about 50-60 degrees to the right to intercept the track to Benalla. Shortly after, VEC passed over UNW, conducting a climbing turn to the right.

[1] PPL – Private Pilot Licence
[2] CPL – Commercial Pilot Licence

There was a short exchange on the radio, then the student continued with his flight to Benalla, and VEC returned to re-fly that particular run.

The third aircraft to depart was VH-VLG (VLG). Shortly after giving a broadcast to advise VLG was rolling on runway 36, the instructor and student received a call from the pilot in VEC. However, as they were in the take-off and initial climb phase, they delayed the response until VLG passed through 1,000 ft AMSL. The instructor on board VLG advised VEC that VLG would maintain 1,500 ft AMSL until VEC was clear. They sighted VEC pass and when the aircraft was clear of any conflict, they continued with the climb and set course for Albury.

Comments – Operator of VH-VEC

The operator believed the PIC of VEC made every effort to continually communicate the aircraft's position and intention throughout the entire operation in the CTAF. The pilot was concerned at the lack of response from the pilots in the flying school aircraft.

Comments – Chief Pilot / Chief Flying Instructor Mangalore based flying school

The Chief Pilot/Chief Flying Instructor advised that the school encourages their instructors and students to aviate, navigate and then communicate. They particularly encourage this through the take-off and initial climb phase to 500 ft AGL. This is to keep the pilots focussed on the aircraft during this time of higher workload.

He also advised that although the ERSA entry for Mangalore has several compliance notes under the Local Traffic Regulations section, it does not include a requirement for prior permission to be obtained. He reported that the majority of operators using Mangalore are aware of the magnitude of ab initio training conducted by the flying school and make prior contact for any non-standard operation.

He suggested that a Fly Neighbourly policy as listed for high density traffic areas in the General – Special Procedures section of the ERSA would be an excellent safety addition for operations in the Mangalore area. High density training areas such as Moorabbin, Victoria have a dedicated section to assist with separation of the high volume of aircraft.

At the time of publication, the CP reported the flying school is continuing to pursue the Fly Neighbourly and related airspace issues through the RAPAC[3] forum.

Extract from the En Route Supplement Australia (ERSA)

Note 6: Local Traffic Regulations:

The minimum radio broadcasts are taxiing, entering, departing: Inbound, Joining, Base and Final with position, altitude and intentions.

NOTE: Pilots must respond to radio requests from other traffic for their intentions, position or altitude.

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.

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3 Regional Airspace and Procedures Advisory Committee

Operator – VH-VEC

After discussions with the Chief Pilot/ CFI of the Mangalore based Flying School, the operator advised, they will make prior contact with the flying school for any future operations in the Mangalore area.

- The company have issued a notice to their operational staff detailing the above safety action.

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.

The ATSB has issued a publication called *A pilot's guide to staying safe in the vicinity of non-towered aerodromes*, which outlines many of the common problems that occur at non-controlled aerodromes, and offers useful strategies to keep yourself and other pilots safe. The report found that insufficient communication between pilots and breakdowns in situational awareness were the most common contributors to safety incidents in the vicinity of non-controlled aerodromes.

Also important is to understand the issues associated with unalerted see-and-avoid as detailed in the ATSB's research report Limitations of the See-and-Avoid Principles. Communication on the CTAF is more likely to be successful, as knowing where to look, greatly increases the chances of sighting traffic. The report can be found at: www.atsb.gov.au/publications/2009/see-and-avoid-aspx.

General details

Occurrence details

Date and time:	10 January, 2014 – 0940 EDT	
Occurrence category:	Serious incident	
Primary occurrence type:	Near collision	
Location:	Near Mangalore Aerodrome	
	Latitude: 36° 53.30' S	Longitude: 145° 11.05' E

Aircraft details VH-VEC

Manufacturer and model:	Cessna Aircraft Company 404 (Titan)	
Registration:	VH-VEC	
Serial number:	4040217	
Type of operation:	Aerial survey	
Persons on board:	Crew – 1	Passengers –1
Injuries:	Crew – Nil	Passengers – Nil
Damage:	None	

Aircraft details VH-UNW

Manufacturer and model:	Piper Aircraft Corporation PA28 (Warrior)	
Registration:	VH-UNW	
Serial number:	28-7716225	
Type of operation:	Flying training - solo	
Persons on board:	Crew – 1	Passengers –Nil
Injuries:	Crew – Nil	Passengers – N/A
Damage:	None	

Loss of control involving Grob G 115, VH-BFW

What happened

VH-BFW at accident site

Source: Flying school

On 4 February 2014, at about 0700 Western Standard Time a student pilot departed Merredin Aerodrome, Western Australia for his first solo flight to the training area. He was flying a Grob G-115 aircraft, registered VH-BFW (BFW).

The wind was a light easterly when he departed to the north from runway 10. As briefed by his instructor, he conducted steep turns, stalls and practice forced landings prior to returning to the aerodrome.

After about an hour and a quarter he returned to the aerodrome using the correct inbound procedure of overflying the field at 3500 ft above mean sea level, prior to joining the circuit. Due to the density of traffic in the circuit, he conducted about three orbits at this level prior to descending and joining crosswind for runway 10. He noted the windsock now indicated a left crosswind, but as there was already an aircraft landing on runway 10, he elected to continue and join for this runway. The student reported the crosswind, downwind and base legs of the circuit all went according to plan and he was anticipating a good landing.

After completing the pre-landing checks he configured the aircraft for the final approach, including selecting full flap. Once over the runway, he commenced the round out, but soon realised the aircraft was about 15-20 ft above the ground, and too high to continue with the landing. In the next few seconds, he commenced a go around. He applied full power and a small amount of right rudder, but mindful of a previous instruction not to move the elevator forward while close to the ground, did not make any other changes to the aircraft configuration. The application of power caused the nose of the aircraft to rise. It then encountered a gust of wind, which pushed the nose even higher, with a resultant loss of airspeed.

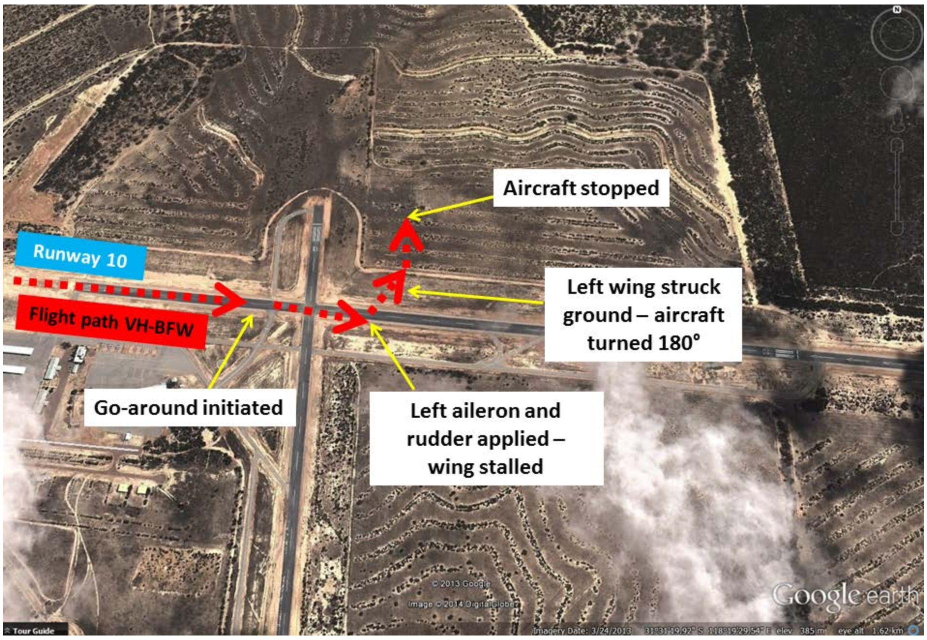
The stall warning started to sound, the aircraft began to sink and the left wing dropped. In an attempt to arrest the sink, the student applied back pressure to the elevator control, and may have applied some aileron and rudder in an attempt to counter the wing drop. With the reduced airspeed, the crosswind moved the aircraft further to the left of the runway. With the stall warning still sounding, the left wing struck the ground and the aircraft spun around pointing south. It then bounced back into the air maintaining its high nose attitude. It struck the ground again and came to rest about 144 metres north of runway10/28 still facing south (Figure 1).

The student exited the aircraft and walked to the main building. The duty platform instructor activated the crash alarm. An instructor who was flying in the circuit landed and attended the scene. He switched off the magnetos and master switch in the damaged aircraft. Staff and emergency services attended soon after. The student was not injured, but the aircraft sustained substantial damage.

Aircraft details

The aircraft had a valid maintenance release at the time of the accident. There had been two recent defects recorded, one concerning the engine, but both had been attended to and signed off by an engineer.

Figure 1: Approximate flight path of VH-BFW



Source: Google earth

Meteorological Information

The flying school provided the following meteorological information.

At the time of the accident the wind velocity at the aerodrome was 070-100 °T at 15 knots with an outside air temperature of 22°C. Visibility was in excess of 10 km and there was no significant cloud. The area 60 forecast which covers Merredin, had a forecast wind at 3000 ft of 050°T at 35 knots until 1100 WST.

The student reported the aircraft encountered light turbulence and some gusts on late final approach to runway 10.

Student pilot comments

Throughout the approach and landing, the student had tried to comply with a previous instruction not to lower the aircraft nose at low level, to avoid damaging the nose wheel.

Operator report

The flying school management provided the ATSB with a report on the accident. The main points are listed below:

1. The student's previous lesson had been a dual session revising glide approaches. These approaches use a higher profile than a normal approach, and this may have influenced the student's perception of how high the aircraft was on that day
2. Turbulence was present which would have affected aircraft controllability
3. The student was concerned about a nose-wheel strike, and did not adjust the aircraft profile during the attempted go-around. This instruction had been issued to counter any tendency to pitch forward with the elevator during the flare and landing phases.
4. The student had flown with a number of different instructors during his training. This lack of continuity, coupled with the student having English as a second language, may have led to confusion with the instruction he was given regarding the aircraft configuration during a round out and landing, and the profile required for a go-around.

Figure 2: Aircraft damage

Source: Flying school

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 – Flying school

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

Procedure enhancements:

The position of Safety and Quality Manager will now be split into two distinct positions. The incumbent of each position will work separately to maximise safety at the flying school.

A review is also being undertaken of all previously issued organisational Notices to Aircrew (NOTAC) to ensure they are clear and correct.

Management have briefed all flight instructors on the importance of using correct phraseology when briefing and teaching students; as well as the importance of their role to ensure a safe environment for the students.

General details

Occurrence details

Date and time:	4 February 2014 – 0840 WST	
Occurrence category:	Accident	
Primary occurrence type:	Loss of aircraft control	
Location:	Merredin ALA Western Australia	
	Latitude: 31° 31.40' S	Longitude: 118° 19.23' E

Aircraft details

Manufacturer and model:	Grob - Burkhaart Flugzeubau	
Registration:	VH-BFW	
Serial number:	82042/C2	
Type of operation:	Flying training - solo	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – Minor	Passengers – Nil
Damage:	Substantial	

Engine failure involving an amateur built Pitts S1S, VH-URP

What happened

VH-URP

Source: Pilot

On 1 March 2014, the pilot of an amateur built Pitts S1S, registered VH-URP, completed preparations for a world record attempt for the number of continuous rolls, to raise funds for medical research.

Due to low cloud in the area, the pilot elected to delay the initial departure time and to conduct the aerobatic flight in the local training area about 3 NM from Lethbridge aeroplane landing area (ALA), Victoria.

After successfully completing 987 rolls to the left, at about 2,000 ft above ground level (AGL), the pilot elected to return to Lethbridge. About 2 minutes later, when in the cruise, the engine spluttered and lost power. The pilot assumed the aircraft had a partial engine failure, and aimed to return to Lethbridge which was about 1 NM away. He completed the ‘trouble’ checklist, with no success in restoring engine power.

The aircraft was rapidly losing altitude and the pilot selected a paddock for a forced landing. After turning into wind, the aircraft was sinking quickly and the pilot realised it was unlikely to reach the selected paddock. He revised the aiming point for the landing to a closer field.

During the landing roll, the aircraft collided with a rock and nosed over, coming to rest inverted. The aircraft was substantially damaged (Figure 1).

Pilot comments

The pilot reported that the ‘flop tube’ may have become stuck. It supplies the engine with fuel from the top of the tank when the aircraft is inverted. This may have been resolved by rolling the aircraft inverted. However, this was not a safe option at low altitude, with a partial or complete engine failure.

The damage to the aircraft was assessed as being greater than the replacement cost therefore no post-accident engineering inspection was conducted to determine the cause of the engine failure.

Figure 1: Damage to VH-URP

Source: Pilot

Safety message

The pilot reported that the original plan was to conduct the manoeuvres overhead the airfield; a known safe landing area in case of engine failure. This incident highlights the importance of selecting a suitable landing field as soon as a forced landing appears necessary.

Once a suitable landing area has been selected, within easy gliding distance, the pilot should then plan the approach to the field. Once the plan has been commenced, the pilot can then attempt to rectify the cause of the engine malfunction.

General details

Occurrence details

Date and time:	1 March 2014 – 1400 EST	
Occurrence category:	Accident	
Primary occurrence type:	Engine failure or malfunction	
Location:	6 km S Lethbridge Airport (ALA), Victoria	
	Latitude: 37° 58.08' S	Longitude: 144° 05.33' E

Aircraft details

Manufacturer and model:	Amateur built Pitts S1S	
Registration:	VH-URP	
Serial number:	001	
Type of operation:	Aerobatics	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Substantial	

Runway excursion involving a Cessna 150M, VH-EAV

What happened

On 19 March 2014, the pilot of a Cessna 150M aircraft, registered VH-EAV, conducted a local flight from Tyabb aeroplane landing area (ALA), Victoria, with one passenger on board.

At about 1545 Eastern Daylight-savings Time (EDT), the aircraft returned to Tyabb. The pilot overflew the aerodrome and observed that the windsock was indicating a south-easterly wind at about 15 kt, and elected to use the grass runway parallel to, and to the left of, runway 17.

VH-EAV

Source: Victoria Police

The pilot reported that the aircraft was slightly higher than usual on approach and it encountered some minor turbulence. When at about 100 ft above ground level, the aircraft drifted and yawed sharply to the right. The pilot used left rudder to align the aircraft with the runway centreline. The aircraft touched down about 300 m beyond the runway threshold.

The aircraft veered off the runway to the left, rolled down the slope to the eastern side, and collided with a tyre marking the location of a drain. The aircraft continued into the culvert and the nose landing gear subsequently collapsed. The propeller struck the ground, resulting in substantial damage (Figure 1) and the aircraft came to rest on the grass.

After the accident, the pilot observed the windsock veering in an arc from the south-south-east to south-south-west and reported that windshear may have contributed to the incident.

Figure 1: Damage to VH-EAV

Source: Victoria Police

Bureau of Meteorology report

The Bureau of Meteorology provided a report to the ATSB of the wind recorded at the Cerberus Automatic Weather Station (AWS), about 5 NM from Tyabb. During the period between 1530 and 1600, the wind varied from 209 degrees through 145 degrees and between 6 and 11 kt.

Safety message

The pilot reported that there were a number of clues indicating a possible go-around situation: the aircraft was high and long on the approach; the aircraft moved to the right prior to the flare for landing; and the aircraft was not aligned with the runway centreline prior to touchdown.

This incident is a reminder to pilots to be go-around ready. A go-around, the procedure for discontinuing an approach to land, is a standard manoeuvre performed when a pilot is not completely satisfied that the requirements for a safe landing have been met. The need to conduct a go-around may occur at any point in the approach and landing phase, but the most critical go-around is one initiated close to the ground.

This incident highlights the importance of conducting a go-around as soon as landing conditions appear unfavourable. The following link provides some useful information on go-arounds: *Aviation safety explained – Go-arounds* www.casa.gov.au/scripts/nc.dll?WCMS:STANDARD:1001:pc=PC_91481.

General details

Occurrence details

Date and time:	19 March 2014 – 1545 EDT	
Occurrence category:	Accident	
Primary occurrence type:	Runway excursion	
Location:	Tyabb aerodrome (ALA), Victoria	
	Latitude: 38° 16.00' S	Longitude: 145° 10.50' E

Aircraft details

Manufacturer and model:	Cessna Aircraft Company C150M	
Registration:	VH-EAV	
Serial number:	15079384	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – 1
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Substantial	

Helicopters

Loss of control involving a Bell 206B, VH-SMI

What happened

On 31 July 2013, at about 1045 Eastern Standard Time, a Bell 206B helicopter, registered VH-SMI, departed Horn Island, Queensland for an aerial filming flight about 5 NM to the north-east, at the Tuesday Islets (Figure 1). On board the helicopter were the pilot, camera operator and director.

The purpose of the flight was to film a 20 metre vessel travelling back and forth along a channel in between the Islets. A digital camera system was mounted under the nose of the helicopter and controlled remotely by the camera operator from within the cabin. The pilot also had a view finder positioned in the cockpit so that he could monitor the camera view.

Figure 1: Approximate path of vessel and VH-SMI

Source: Google earth

After having completed four passes over the vessel, above 500 ft above sea level, the pilot positioned the helicopter for the next pass. Maintaining 200 ft, and with an airspeed of about 55 kt, the helicopter approached the vessel from behind and to the left (Figure 2). The vessel was travelling into wind.

As the helicopter flew abeam the vessel, the pilot initiated a climb and selected about 95% engine torque and then commenced a right turn, to pass in front (Figure 3). The helicopter passed in front of the vessel at about 300-400 ft. At that time, the pilot was monitoring the view finder to ensure that the helicopter's skids did not impede the film shot. The pilot reported that the wind direction was then 280° relative to the helicopter.

Figure 2: Approaching

Source: Camera operator

Figure 3: Passing in front

Source: Camera operator

Figure 4: Prior to LTE

Source: Camera operator

After having completed the film shot (Figure 4), when at about 450 ft, the helicopter entered an uncommanded yaw right by about 25-30° and started to experience a loss of tail rotor effectiveness (LTE). In response, the pilot attempted to manoeuvre the helicopter into wind by applying forward and left cyclic.[1] The pilot reported that the helicopter rotation stopped, but shortly after, it began to yaw right again. The pilot believed that he was not going to be able to recover from the situation.

The pilot lowered the collective[2] and applied forward cyclic in an attempt to place the helicopter into a crosswind situation, with the intent of then turning into wind once the airspeed had increased. At that time, they were at about 400-450 ft, with an airspeed of 20 kt.

However, the helicopter did not respond to the pilot's actions and it rapidly yawed right and began to descend. The pilot had expected the helicopter to respond as it had been performing well and they only had a 20 kt wind.

When at about 200 ft, the pilot attempted to arrest the descent, but the helicopter did not respond and continued to yaw.

When below 100 ft, with neutral cyclic applied, the pilot determined that he was unable to recover and he prepared for a forced landing onto the water. The pilot raised the collective and activated the emergency flotation system, and the helicopter landed on the water.

During the landing, the left rear float was damaged and deflated. Consequently, the helicopter sat left rear skid low on the water. The main rotor blades and mast became separated, the tail rotor assembly sustained damage, and the oil reservoir fractured (Figure 5).

The occupants exited the helicopter and received nil injuries.[3] Shortly after, the vessel arrived and provided assistance.

Camera footage

A review of the camera footage indicated that, when the helicopter was in a downwind position, the helicopter yawed 270° to the right. The helicopter stopped yawing momentarily for several seconds before rapidly yawing to the right again. The helicopter rotated about four to five times before landing on the water.

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1 A primary helicopter flight control that is similar to an aircraft control column. Cyclic input tilts the main rotor disc varying the attitude of the helicopter and hence the lateral direction.

2 A primary helicopter flight control that simultaneously affects the pitch of all blades of a lifting rotor. Collective input is the main control for vertical velocity.

3 All occupants were wearing lifejackets, but they were not inflated.

Figure 5: VH-SMI

Source: Camera operator

Pilot comments

The pilot provided the following comments:

- During the climb, with a high power setting selected, the helicopter's forward airspeed reduced. At that time, the pilot was focusing on the view finder and did not observe the airspeed decline.
- The helicopter may not have responded to his actions as he may not have lowered the collective quickly enough.
- Throughout the event, he believed that the helicopter would recover from the situation.
- The Bell 206 was more susceptible to LTE than some other helicopter types.
- Additional training on identifying and responding to an LTE event would be beneficial.

Meteorological information

Bureau of Meteorology weather observations at Horn Island indicated that, at about 1130, the wind was from the east-south-east at 18 kt gusting to 23 kt.

Loss of tail rotor effectiveness (LTE)

The United Stated (US) Federal Aviation Administration (FAA) Advisory Circular 90-95 defined LTE as a critical low-speed aerodynamic flight characteristic, not related to a mechanical failure. It can result in an uncommanded rapid yaw rate that does not subside on its own accord, and if not corrected, can result in a loss of control. LTE may occur in all single main rotor helicopters at airspeeds less than 30 kt.

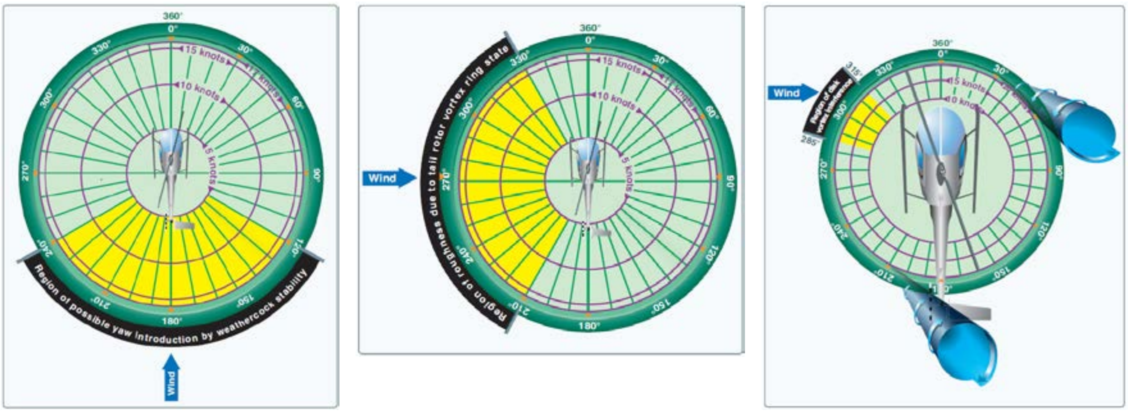
Any manoeuvre that required the pilot to operate in a high-power, low-airspeed situation with a left crosswind or tailwind, created an environment conducive to LTE. The susceptibility for LTE was also greater in right turns for US designed helicopters such as the Bell 206B, particularly during low airspeed flight where the pilot may not be able to stop the yaw. Flight and wind tunnel tests had identified four relative wind azimuth regions and aircraft characteristics that could, singularly or in combination, result in LTE (Bell Helicopter Information Letter 206-84-41) (Figure 6).

- *Weathercock stability (120° to 240°):* the helicopter will attempt to weathercock its nose into the relative wind. The helicopter will then make an uncommanded turn to the right or left, depending on the wind direction.
- *Tail rotor vortex ring state (210° to 330°):* the vortex ring state will cause tail rotor thurst variations, which result in yaw rates.

- *Main rotor disc vortex interference (285° to 315°):* main rotor vortex passes the tail rotor, reducing the tail rotor angle of attack. This causes a reduction in thrust and a right yaw acceleration will commence.
- *Loss of translational lift (all azimuths):* results in increased power demand and additional anti-torque requirements. If this occurs during a right turn, the turn will be accelerated as power is increased unless corrective action is taken.

Figure 6: Relative wind azimuth regions

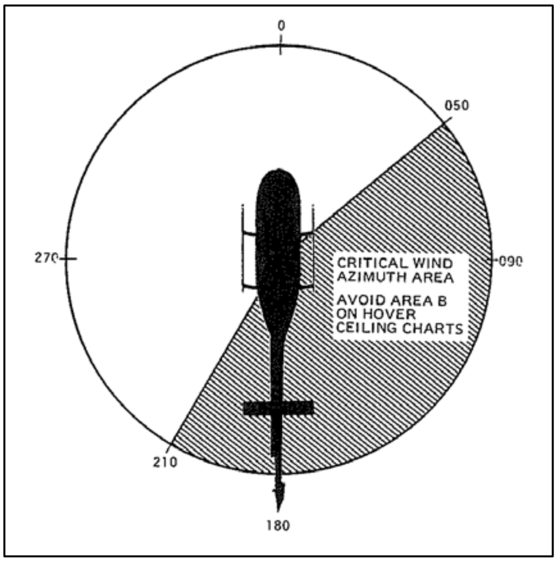
Weathercock stability *Tail rotor vortex ring state* *Main rotor disk vortex interference*



Source: Federal Aviation Administration

The Bell Information Letter also emphasised that the helicopter could be operated in all of the above conditions if suitable attention was given to controlling the helicopter. However, if the pilot's attention was diverted and a right yaw rate commenced, the rate may increase unless appropriate corrective action was taken. It further noted that the above did not replace the critical relative wind azimuth chart located in the helicopter's flight manual (Figure 7).

Figure 7: Critical relative wind azimuth area



Source: Bell Helicopter Company

If LTE occurs, the recommended recovery technique detailed in the Bell Information Letter was to:

- Simultanously apply full left anti-torque pedal and forward cyclic to increase airspeed.
- As a recovery is achieved, adjust the controls for normal forward flight.

  Caution: Lowering the collective will aid in arresting the yaw rate, but may increase the rate of descent.

- If helicopter rotation cannot be stopped and ground contact is imminent, an autorotation (forced landing) may be required. Maintain full left anti-torque pedal until the rotation stops, then adjust to maintain heading.

An ATSB investigation (200003293)[4] into an LTE accident involving a Bell 206B, registered VH-TMR, on 6 August 2000, also highlighted that:

> There is greater susceptibility for LTE on United States designed helicopters in right turns and more so in right turns overwater. This is especially true during flight at low airspeeds when the pilot is looking out the right window (not viewing the instrument panel) and is unaware of the airspeed dropping to a low value. The turn is commonly done with reference to the ground where the pilot attempts to keep a constant groundspeed by referencing ground cues. Flying overwater, the pilot does not have the visual cues available as when flying overland.

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 all company pilots will be required to demonstrate their ability to recover from an LTE event during regular flight checks with the Chief Pilot.

Safety message

Certain operations, such as low speed aerial filming/photography flights, lend themselves to being more at risk to LTE than others; where visual cues can be misleading, and pilot attention to airspeed, height and orientation to local wind conditions is critically important. If a helicopter was placed in conditions conducive to LTE, it is crucial that pilots not only recognise the onset of LTE, but respond immediately and appropriately before the situation develops.

Furthermore, the FAA recognised that, while the design of main and tail rotor blades and the tail boom assembly can affect the characteristics and susceptibility of a helicopter to LTE, it will not nullify the event completely. Consequently, pilots should be aware of the specific characteristics of each helicopter type flown and the particular requirements for operating in different flight conditions.

The following provide additional information on LTE:

- ATSB investigation AO-2013-016:
  www.atsb.gov.au/publications/investigation_reports/2013/aair/ao-2013-016.aspx
- Bell Information Letter 206-84-41:
  http://218.6.160.231/dl/Bell206_2012_10/Data/docs/206/IL/206-IL-84-41.pdf
- Bell Operations Safety Notice 206-83-10:
  http://218.6.160.231/dl/Bell206_2012_10/Data/docs/206/OSN/206-OSN-83-10.pdf
- FAA Advisory Circular 90-95:
  www.faa.gov/documentLibrary/media/Advisory_Circular/ac90-95.pdf
- FAA Helicopter Flying Handbook:
  http://www.faa.gov/regulations_policies/handbooks_manuals/aviation/helicopter_flying_handbook/

[4] www.atsb.gov.au/publications/investigation_reports/2000/aair/aair200003293.aspx

General details

Occurrence details

Date and time:	31 July 2013 – 1130 EST	
Occurrence category:	Accident	
Primary occurrence type:	Loss of control	
Location:	7 km NE of Horn Island, Queensland	
	Latitude: 10° 32.90' S	Longitude: 142° 20.73' E

Helicopter details

Manufacturer and model:	Bell Helicopter Company 206B	
Registration:	VH-SMI	
Serial number:	4271	
Type of operation:	Aerial work	
Persons on board:	Crew – 1	Passengers – 2
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Destroyed	

Loss of control involving a Robinson R44, VH-YYS

What happened

On 2 March 2014, at about 1300 Eastern Standard Time (EST), the pilot of a Robinson R44 helicopter, registered VH-YYS, prepared for a private flight from Mareeba, Queensland.

Damage to VH-YYS

Source: Owner

The helicopter lifted off and the pilot reported all engine indications were normal and the blades appeared to be tracking normally. During the translation from hover to forward flight, the helicopter yawed to the left. The pilot raised collective[1] and rolled the throttle on and the helicopter then spun quickly about 90 degrees to the right. The pilot heard an increase in engine noise as a loud buzz. The helicopter then pitched up and down, and as he attempted to control it with the cyclic,[2] the helicopter yawed about 180 degrees to the left. The helicopter rolled to the left and the pilot noticed the main rotor blades flapping.

The pilot eased the collective into the ground and as the helicopter touched down, it started to roll to the left. He moved the cyclic right, reduced the throttle and the helicopter rocked from side to side and then settled. During the event, the rotor blades contacted the tail boom resulting in substantial damage (Figure 1).

Engineering report

A post-accident engineering inspection did not find any defects other than those resulting from the incident.

Figure 1: Damage to VH-YYS

Source: Owner

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[1] The collective pitch control, or collective, is a primary flight control used to make change to 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.

ATSB comment

The helicopter was appropriately maintained and no defects were found. The helicopter was loaded within the normal operating weight and balance limits. The pilot was trained and qualified for the flight. No local environmental or other factors were identified which may have contributed to the incident. The ATSB was unable to determine the factors contributing to the loss of control.

A representative from the Robinson Helicopter Company advised the ATSB that the R44 is an agile aircraft and the controllability of the tail rotor is excellent. However it does require the pilot to be proficient when operating the helicopter. During low speed flight and at hover, changes to one control (collective, cyclic and/or tail rotor), will require secondary inputs on the other controls which can easily lead to over-controlling of the aircraft. He reported that similar incidents have occurred when a pilot is concentrating on manoeuvring the helicopter close to the ground and no mechanical or aerodynamic failures have been found. While training does not appear to be a contributing factor, pilot experience and recency on type may have been relevant.

General details

Occurrence details

Date and time:	2 March 2014 – 1300 EST	
Occurrence category:	Accident	
Primary occurrence type:	Loss of control	
Location:	near Mareeba aerodrome, Queensland	
	Latitude: 17° 04.15' S	Longitude: 145° 25.15' E

Helicopter details

Manufacturer and model:	Robinson Helicopter Company R44	
Registration:	VH-YYS	
Serial number:	1801	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Substantial	

Collision with terrain involving a Robinson R22, VH-YPS

What happened

Damage to VH-YPS

Source: Owner

On 22 March 2014, the pilot of a Robinson R22 helicopter, registered VH-YPS, was conducting aerial mustering on a property about 28 km east of Fitzroy Crossing aerodrome, Western Australia. The pilot had refuelled the helicopter from a jerry can and then secured the empty can in the passenger seat using the seatbelt.

At about 1530 Western Standard Time (WST), the pilot manoeuvred the helicopter to the rear of a mob of cattle. From about 300 ft above ground level (AGL), the pilot conducted a balanced descending turn.

When at about 10 ft AGL, he applied right pedal and as he raised collective[1] to climb away, a gust of wind blew through the left door opening and dislodged the jerry can from the seatbelt. The can became wedged between the seat and the cyclic[2] control. The pilot applied forward cyclic and the nose of the helicopter lowered. As he then attempted to apply aft cyclic to raise the nose, he realised the cyclic was jammed. As a result of the low nose attitude and minimal height above the ground, the pilot used collective in an attempt to flare the helicopter. The front of the landing skids collided with the ground and the helicopter rotated forwards. The main rotor blades chopped through the tail boom and the helicopter continued rotating forwards and bounced back up to about 50 ft AGL before coming to rest inverted.

The pilot reported that the impact dislodged the top of the front dash board and struck his helmet. He was uninjured and the helicopter sustained substantial damage (Figure 1).

Figure 1: Damage to VH-YPS

Source: Owner

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.

Safety action

The pilot reported that following this incident, the property manager has advised pilots that jerry cans are not to be carried in the helicopters during mustering operations.

Safety message

This incident highlights the importance of ensuring all items are securely stowed. It also provides a timely reminder to pilots of the benefits of safety equipment such as a helmet.

General details

Occurrence details

Date and time:	22 March 2014 – 1530 WST	
Occurrence category:	Accident	
Primary occurrence type:	Collision with terrain	
Location:	28 km E Fitzroy Crossing aerodrome, Western Australia	
	Latitude: 18° 11.67' S	Longitude: 125° 49.25' E

Helicopter details

Manufacturer and model:	Robinson Helicopter Company R22	
Registration:	VH-YPS	
Serial number:	4509	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Substantial	

Unmanned aerial systems

Near collision between an unknown object and a De Havilland DHC-8

What happened

On 19 March 2014, at about 0913 Western Standard Time (WST), a De Havilland DHC-8, registered VH-XFX, was on approach to Perth Airport from Kambalda, Western Australia. When about 23 km north-northeast of Perth, at about 3,800 ft above mean sea level (AMSL), the crew sighted a bright strobe light directly in front of the aircraft.

The light appeared to track towards the aircraft and the crew realised that the light was on an unknown object, possibly an unmanned aerial vehicle (UAV). The pilot took evasive action turning towards the west to avoid a collision with the object. The object passed about 20 m horizontally and 100 ft vertically from the aircraft.

The pilot reported that the object was cylindrical in shape and grey in colour. It was at about 3,700 ft AMSL and in controlled airspace. The crew did not receive a traffic collision avoidance system (TCAS) alert. The airspace below 3,500 ft AMSL was military restricted airspace and the Australian Defence Force was not operating UAVs and was not aware of any UAV operations in the area at the time of the incident. The ATSB was not able to confirm the details of the object or identify any UAV operator in the area at that time.

General details

Occurrence details

Date and time:	19 March 2014 – 0913 WST	
Occurrence category:	Serious incident	
Primary occurrence type:	Interference from the ground	
Location:	23 km NNE Perth Airport, Western Australia	
	Latitude: 31° 44.62' S	Longitude: 116° 02.60' E

Aircraft details

Manufacturer and model:	De Havilland Canada DHC-8-314	
Registration:	VH-XFX	
Serial number:	313	
Type of operation:	Charter – passenger	
Persons on board:	Crew – 4	Passengers – Unknown
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

Near collision involving an unmanned aerial vehicle and a Bell 412, VH-WSR

What happened

On 22 March 2014, at about 2200 Eastern Daylight-savings Time (EDT), a Bell 412 helicopter, registered VH-WSR (WSR), lifted off from John Hunter Hospital in Newcastle for a flight of about 2 NM to the Newcastle Westpac helipad, New South Wales, with five crew members on board (Figure 1).

The pilot broadcast his intentions on the common traffic advisory frequency (CTAF) and did not receive a response. Heading to the north-east and on climb to 1,200 ft above ground level (AGL), the pilot observed a steady white light that initially appeared to be an aircraft in the vicinity of Williamtown Airport, about 10 NM away. After reaching 1,200 ft AGL, the pilot commenced a descent towards the helipad.

The light appeared to cross very quickly from the pilot’s left to right and the helicopter crew realised that it was actually about overhead the Hunter Stadium in Newcastle. It then made an abrupt turn to the left of about 30-40 degrees and commenced tracking to the south-east and away from the helicopter. As he had thought the light was on an aircraft, the pilot again broadcast on the CTAF and again received no response.

The pilot continued to monitor the light during the descent and about 10 to 15 seconds later, he observed the light make an abrupt right turn and track towards the helicopter. The rate and radius of the turn indicated to the pilot that it was not an aircraft and was more likely to be a small unmanned aerial vehicle (UAV).

As the helicopter descended through about 1,000 ft AGL and banked to the left, the pilot observed the UAV about 100 m away and at about the same level as the helicopter. The pilot then commenced a turn to the right and observed the UAV hovering in position just above the helicopter. The pilot continued the turn through 360 degrees and landed at the helipad. The pilot did not receive any alerts on the traffic collision avoidance system (TCAS).

Figure 1: Westpac Rescue Helicopter

Source: Operator

A football match had been played at the Hunter Stadium that evening however no official aerial photography was conducted. The venue operators did not have any knowledge of a UAV operating in the vicinity. The official broadcaster of the event did not take any aerial footage and did not have a UAV approved to operate within the stadium at that time. A Notice to Airmen (NOTAM) would have to be issued for approved operations of a UAV at 1,000 ft AGL and there were no relevant NOTAMs current for the area at the time of the incident.

CASA comment

The following information was provided to the ATSB by CASA.

It appears the Unmanned Aerial Vehicle (UAV) in this incident was a First Person View (FPV) UAV. Over 90% of complaints received about UAV's relate to such FPV UAV's, which have a video fixed either inside or outside the UAV which enables the operator to fly it remotely whilst looking through either a pair of goggles or at a screen. The picture transmitted back in real time gives the impression to the operator that they are actually sitting inside and looking out of it. Use of these goggles does not provide line of sight vision of the UAV.

All UAV's are restricted to operations below 400 ft AGL unless the operator has been granted explicit approval, as per Civil Aviation Safety Regulation 1998 (CASR) 101.085. Any unmanned vehicle, whether a UAV or model aircraft, is subject to the general requirements of CASR Subpart 101.C.

General details

Occurrence details

Date and time:	22 March 2014 – 2208 EDT	
Occurrence category:	Serious incident	
Primary occurrence type:	Interference from ground	
Location:	near Newcastle Westpac Base (HLS), New South Wales	
	Latitude: 32° 55.20' S	Longitude: 151° 43.80' E

Aircraft details

Manufacturer and model:	Bell Helicopter Textron Canada 412EP	
Registration:	VH-WSR	
Serial number:	36233	
Type of operation:	Aerial work – emergency medical services	
Persons on board:	Crew – 5	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

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 30
AB-2014-064
Final – 26 May 2014