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Published by: Australian Transport Safety Bureau
Postal address: PO Box 967, Civic Square ACT 2608
Office: 62 Northbourne Avenue Canberra, Australian Capital Territory 2601
Telephone: 1800 020 616, from overseas +61 2 6257 4150 (24 hours)
Accident and incident notification: 1800 011 034 (24 hours)
Facsimile: 02 6247 3117, from overseas +61 2 6247 3117
Email: atsbinfo@atsb.gov.au
Internet: www.atsb.gov.au

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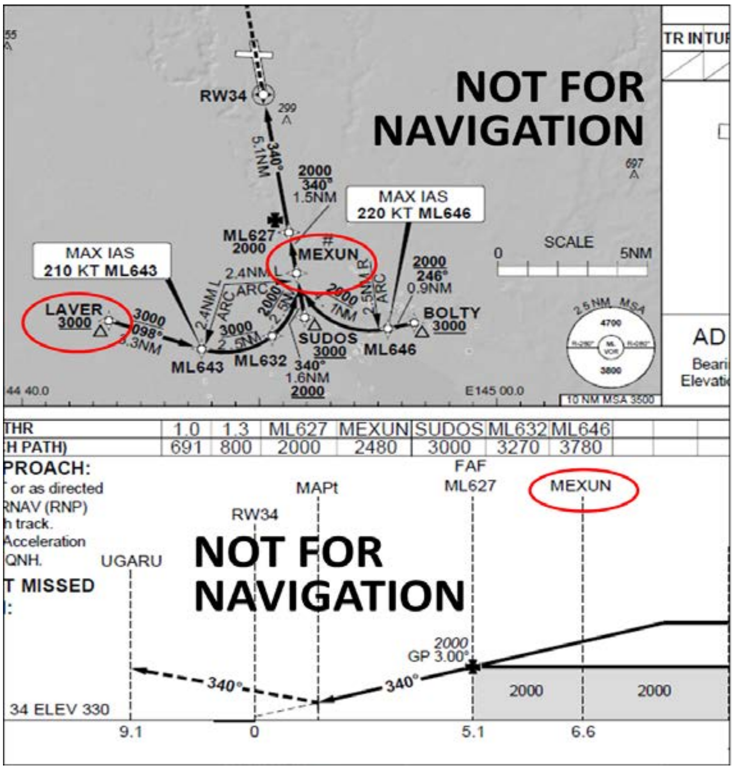
Operational non-compliance involving an Airbus A320, VH-VGU

What happened

During the afternoon of 1 January 2014, an Airbus A320 aircraft, registered VH-VGU, was operating a scheduled passenger service from the Sunshine Coast, Queensland to Melbourne, Victoria. Prior to descent, the crew was cleared by Air Traffic Control (ATC) to conduct the ARBEY 4P standard arrival route (STAR), and was expecting to continue from the STAR to the RNAV-P (RNP)[1] approach to runway 34. The ARBEY 4P procedure for runway 34 takes the aircraft to the south-west of Melbourne to waypoint LAVER, which is one of the initial approach fixes for the RNAV-P (RNP) approach to runway 34 (Figure 1). The crew briefed the arrival procedure and noted heavy showers and strong winds in the area, but there were no unusual or specific threats identified that may affect their arrival.

The STAR was cancelled by ATC before the aircraft reached LAVER to allow ATC to sequence VH-VGU with other aircraft arriving into Melbourne. Descent continued in a southerly direction under radar vectors. The descent was stepped to 4,000 ft, followed soon after by a speed reduction and advice that the crew could expect radar vectors to join the RNAV-P (RNP) procedure at waypoint MEXUN (Figure 1). The approach procedure identified MEXUN as the latest point at which an aircraft could join the procedure.

Figure 1: Excerpt from RNAV-P (RNP) runway 34 approach procedure[2]



Source: Airservices Australia – modified by the ATSB

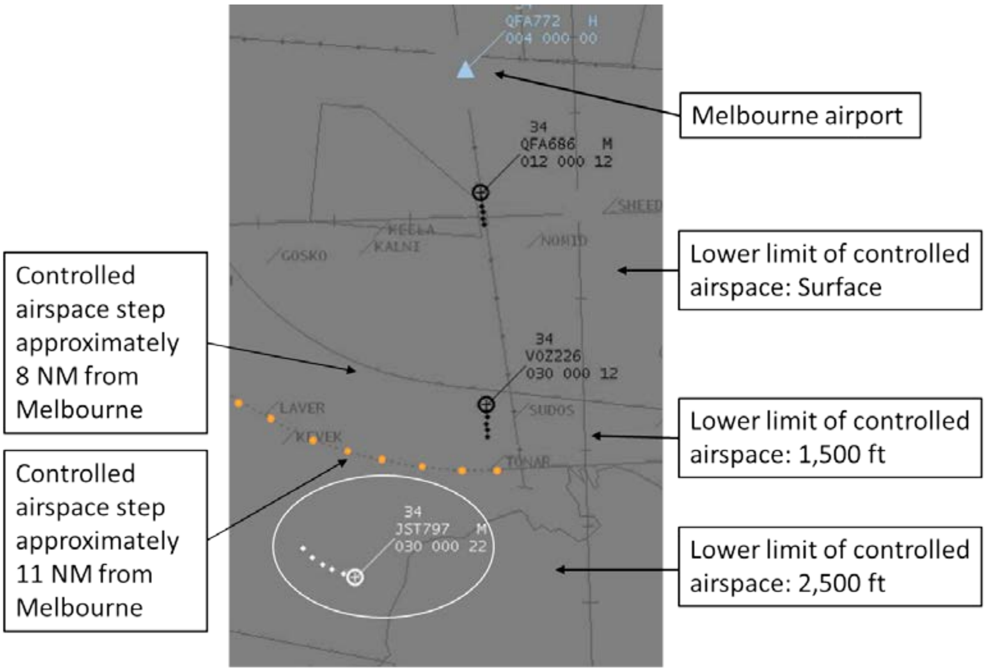
[1] RNAV (RNP) refers to an Area Navigation (Required Navigation Performance) approach.

[2] Figure 1 is an excerpt from the Airservices Australia RNAV – P (RNP) runway 34 approach chart. The crew involved in this incident were using a chart provided by Jeppesen, but relevant details are identical.

As the radar vectoring to the south continued, ATC cleared the aircraft to descend to 3,000 ft and applied a further speed restriction to ensure that appropriate spacing was maintained with other aircraft in the arrival sequence. About 12 NM south-west of Melbourne, the aircraft was turned from a southerly to a south-easterly heading, then an easterly heading. Soon after, as the aircraft was nearing the assigned altitude of 3,000 ft, about 14 NM south of Melbourne, ATC cleared the crew to track direct to waypoint MEXUN to join the RNAV-P (RNP) approach.

The crew read back the clearance to track direct to MEXUN, which was followed almost immediately by an ATC clearance to conduct the RNAV-P (RNP) approach to runway 34. ATC did not issue further descent instructions with that clearance. The position of the aircraft at 3,000 ft, soon after being cleared for the RNAV-P (RNP) approach, is depicted on an ATC radar image at Figure 2. When cleared to track direct to MEXUN, the crew entered MEXUN as the next waypoint on the flight management guidance system (FMGS) flight plan. When cleared for the approach, the crew armed final approach mode[3] which engaged almost immediately.

Figure 2: Aircraft position soon after being cleared for the RNAV-P (RNP) approach



Source: Airservices Australia - modified by ATSB

Tracking direct to MEXUN with final approach mode engaged, the aircraft continued descent from 3,000 ft. The auto-flight system was descending the aircraft in final approach mode towards 2,000 ft which was the next altitude constraint or ‘hard altitude’ identified in the FMGS navigation database (corresponding to waypoint ML627 – the approach procedure final approach fix).[4] The crew were aware that the final approach mode had engaged and descent was continuing, but were not initially aware that continued descent would take the aircraft outside controlled airspace.

As the aircraft descended through about 2,700 ft there was a 14 second dialogue with ATC regarding further speed reduction due to slower traffic ahead in the sequence. Immediately

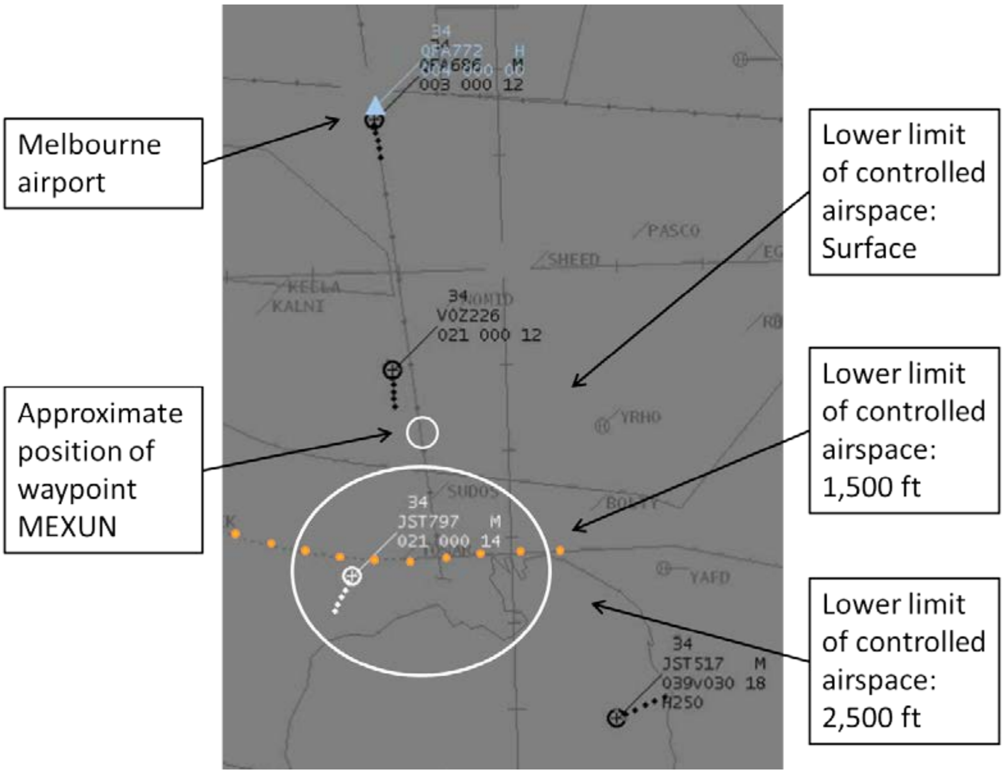
3 Arming final approach mode sets the auto-flight system to capture and track the final approach lateral and vertical flight paths. Final approach is armed by pressing the approach (APPR) pushbutton on the flight control unit.

4 The approach procedure includes a table (Figure 1) that provides recommended altitudes at specific distances from the runway threshold and approach waypoints, to provide guidance with respect to a constant descent path. An aircraft flying a constant ‘on profile’ descent would normally pass over MEXUN at 2,480 ft as the table indicates, but that altitude does not represent a minimum safe altitude or altitude constraint.

following that dialogue, the aircraft descended through 2,500 ft which was the lower limit of controlled airspace at that point.

Soon after, as the aircraft passed about 2,400 ft, ATC cautioned the crew to the effect that they were nearing the lowest safe altitude in their immediate area, and then updated that information as the aircraft continued toward MEXUN. Responding to the advice from ATC, the crew stopped the descent at 2,100 ft and continued towards MEXUN at that altitude. The point at which descent was stopped at 2,100 ft is depicted on an ATC radar image at Figure 3.

Figure 3: Aircraft position at 2,100 ft tracking toward waypoint MEXUN



Source: Airservices Australia - modified by the ATSB

When the aircraft left 3,000 ft on descent, it entered the 500 ft buffer between the aircraft and the lower limit of controlled airspace,[5] then when it passed 2,500 ft, the aircraft left controlled airspace. Controlled airspace was re-entered as the aircraft reached the airspace with a lower limit 1,500 ft, 11 NM south of Melbourne. The elapsed time from the point the aircraft left 3,000 ft to the point it re-entered controlled airspace was about 1 minute and 15 seconds. The aircraft was outside controlled airspace for about 45 seconds. There was no conflict with other known air traffic and the approach continued normally from 2,100 ft following intercept of the intended descent profile.

5 ATC apply a 500 ft buffer between an aircraft and the limit of controlled airspace beneath, to ensure separation from other air traffic that may be operating outside but near the vertical boundary of controlled airspace.

Operator's investigation

The operator's investigation into the incident found that by arming final approach mode as soon as they were cleared for the approach, the crew established a condition whereby the auto-flight system continued descent and the aircraft proceeded temporarily outside of controlled airspace. The operator identified a number of factors that, in combination, may have distracted the crew to some degree at the time of the incident. These factors included:

- The crew were required to comply with a number of ATC-imposed speed restrictions to facilitate separation with other arriving traffic.
- Weather considerations - there were strong winds, heavy showers and moderate turbulence in the area at the time of the incident.
- The conditions prompted the captain to make a relatively late decision to change the intended landing configuration from a flap FULL landing to a flap 3 landing - the crew were required to enter corrected data into the FMGS, review performance information and brief the changes.

The operator identified a number of procedural issues surrounding the incident, including:

- The operator's procedures stated that if an aircraft is joining a procedure at the latest intercept point (which in this case was waypoint MEXUN), the assigned altitude should be the minimum vector altitude or the 'not below' altitude specified for the latest intercept point. In this case, there was conflicting altitude requirements - cleared altitude versus the altitude from which the aircraft could continue the approach at waypoint MEXUN. The crew may have been able to resolve this conflict by requesting further descent clearance from ATC, or seeking to join the procedure at another waypoint prior to MEXUN.
- The operator's procedures include limitations with respect to the engagement of final approach mode. One limitation is that 'the approach is defined in the navigation database'. In this case, the aircraft was not established on an approach defined in the navigation database, until reaching waypoint MEXUN.

The operator also made an observation with respect to the ATC clearance for the approach, noting that the clearance seemed incomplete without an instruction regarding further descent. Nonetheless, the operator identified that it remains a crew responsibility to seek clarification if they believe that an ATC clearance is incomplete.

Airservices Australia comment

Airservices Australia commented that under the circumstances that existed during this incident, ATC expect an aircraft to maintain the last assigned altitude until the aircraft is established on the published approach procedure (which in this incident, would have been when the aircraft reached MEXUN). Airservices Australia therefore considers that clearance for the approach (without any further descent instruction) was complete on this occasion, at the time the clearance was issued.

Noting that in this case, the aircraft would have been high on profile had it arrived at MEXUN at 3,000 ft, Airservices Australia also commented that if the assigned level is above that required for a successful intercept of the approach, the expectation is that ATC will assign a lower level (when possible). In this case, ATC could have cleared the aircraft to descent to 2,000 ft once it passed inside 11 NM from Melbourne. ATC also expect flight crew to request a lower level if the assigned level is above that from which a successful intercept of the approach procedure can be made.

ATSB comment

A recent amendment to the Manual of Air Traffic Services (subsequent to this occurrence) requires that ATC qualify clearance for an RNAV (RNP) approach (when an aircraft is tracking directly to the initial approach fix or to the procedure latest intercept point) with the requirement to be 'established'. While this change relates to transfer of responsibility with respect to terrain clearance, the change will probably assist in reducing the likelihood of similar occurrences.

Safety action

Aircraft operator

In response to this incident, the aircraft operator has reminded flight crew of the importance of assessing the nature of ATC instructions before continuing descent. The operator has also reminded flight crew of the importance of maintaining airspace awareness.

Safety message

This incident highlights the need for clear procedural guidance and careful auto-flight system management under conditions where the transition from a STAR to an instrument approach procedure is interrupted. Furthermore, under these conditions, awareness of the position of the aircraft relative to the intended vertical profile, relevant controlled airspace boundaries and lowest safe altitudes assumes elevated significance. The incident also highlights the importance of seeking clarification if an ATC instruction or clearance appears incomplete.

General details

Occurrence details

Date and time:	01 January 2014 – 1540 EDT	
Occurrence category:	Incident	
Primary occurrence type:	Operational non-compliance	
Location:	26 km S of Melbourne, Victoria	
	Latitude: 37° 54.13' S	Longitude: 144° 47.08' E

Aircraft details

Manufacturer and model:	Airbus A320	
Registration:	VH-VGU	
Operator:	Jetstar Airways	
Serial number:	4245	
Type of operation:	Air Transport – High Capacity	
Injuries:	Crew – nil	Passengers – nil
Damage:	None	

Flight control system event involving a Fokker 100, VH-FZO

What happened

On 7 March 2014, at about 1000 Western Standard Time (WST), a Fokker 100 aircraft, registered VH-FZO, operated by Virgin Australia Regional Airlines, departed Perth on a scheduled passenger flight to Argyle, Western Australia. On board was a captain operating as the pilot in command under supervision (ICUS) and designated as the pilot flying (PF),[1] and a training captain who was the pilot in command of the flight, seated in the right seat, designated as the pilot monitoring (PM).

At about 1210, the training captain detected the aircraft commence an uncommanded descent. The primary flight director (PFD) displays were normal and there were no warnings or alerts.

The aircraft pitched down and the training captain reported that it was as if the flight directors were commanding the aircraft to descend and the autopilot was following, rather than an autopilot failure. Both thrust levers came back towards idle to maintain the selected speed during the descent. The PF changed the mode on the automatic flight control and augmentation system (AFCAS) to allow manual control of the descent, however the PM observed that the aircraft was continuing to descend and he pushed the altitude hold to arrest the descent. The rate of descent reached about 1,700 feet per minute (fpm) and the aircraft descended about 300 ft.

The PF then disconnected autopilot 1 and connected autopilot 2. The PM notified air traffic control of the altitude deviation and advised of a system malfunction. The aircraft continued to Argyle and the crew commenced descent to the aerodrome.

At about 1308, the crew conducted a visual approach to Argyle and established the aircraft on final for a straight in approach about 10 NM from the runway. When at about 1,000 ft above ground level (AGL) and about 3 NM from the runway threshold, the PF stated that the thrust levers were stuck. He assumed that the aircraft had entered Alpha Floor mode, and immediately held both auto-disconnect buttons and pushed the thrust levers forward to disconnect the thrust lock. The levers remained stuck and the PM then tried to move the thrust levers, also attempted to disconnect the autothrottle, and confirmed that the levers were stuck. The PFD showed that the thrust was in manual mode and the autothrottle had disconnected.

The PM noticed the airspeed trend indicator move below the target speed and advised the PF that he would take control of the thrust levers and the PF could continue to fly the approach. The PM applied force with both hands on the thrust levers and they jerked forwards, resulting in about a quarter of the normal available thrust. The resultant lever position obtained by this movement was appropriate for the phase of flight without any reduction in speed below the nominal approach speed. The increase in thrust caused the aircraft to pitch up slightly and the airspeed to increase to about 15 kt above the target speed. The PM directed the PF to get the aircraft back onto the normal profile and the PF extended full flap.

Just prior to touchdown, the PM extended the speed brake and, when at about 10 ft AGL, he applied sufficient force to move the thrust levers to the idle position. The aircraft landed smoothly and the PM applied reverse thrust to assist in slowing the aircraft down. The flight crew then resumed their normal duties until the aircraft was parked and the engines shut down.

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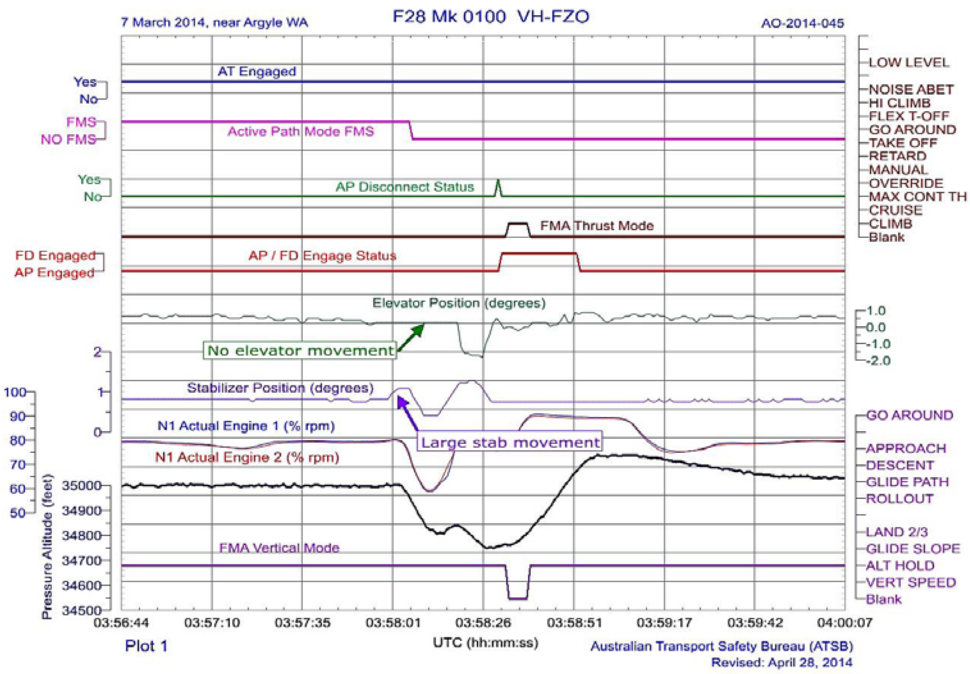
[1] The pilot flying (PF) does most of the flying, except in defined circumstances, such as during the planning and preparation for descent, approach and landing. Pilot monitoring (PM) duties include crosschecking the actions of the PF, monitoring the aircraft’s progress and conducting the radio communications.

Figure 1: Flight data for VH-FZO



Source: ATSB

Flight data

The ATSB analysed the flight data and determined the following with regard to the stuck thrust lever (Figure 1):

- There is no thrust lever parameter from which to derive what position it was stuck. At 1,081 ft AGL, the autothrottle disconnected and the aircraft reverted to manual speed mode.
- The lowest airspeed in this section of the flight was 129 kt calibrated airspeed (CAS) at about 1,008 ft AGL. This then increased gently to 154 kt at about 687 ft AGL. The final approach was flown at between 140 kt and 125 kt in a generally descending trend. The V_{ref} speed was 120 kt and V_{app} 130 kt and therefore the approach was conducted within normal parameters.

In relation to the uncommanded descent:

- The data indicated that the uncommanded descent was caused by a stuck elevator.
- The recorded altitude deviation in the descent was 253 ft and maximum vertical speed about 1,400 fpm, based on pressure altitude changes.

Fokker also analysed the flight data in relation to the uncommanded descent and found that the elevator had become stuck for about 20 seconds. Immediately prior to the loss of altitude, autopilot 1 was engaged but there was no elevator movement. At the same moment there was stabilizer deflection. The elevator servo was unable to deflect the elevator, thus current continued to run through the elevator servo motor because the autopilot continuously tried to correct the flight path. The automatic trim function steered the stabilizer to minimize the current running through the elevator servo motor.

Engineering inspection

The aircraft was de-energised when engineers arrived and the right thrust lever remained stuck. An engineer used large force until the lever came free and suspected the servo was not disengaging. Engineers subsequently replaced the autothrottle No. 2 servo which rectified the fault. Following the incident flight, no fault was found with autopilot No. 1, which was assumed to have been the cause of the uncommanded descent.

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, Virgin Australia Regional Airlines (VARA) sent a memo to all flight crew regarding uncommanded pitch events. Immediately after the incident flight, engineers were unable to find any fault with the autopilot and the aircraft was returned to service. Two similar occurrences with autopilot No. 1 engaged were reported on the same aircraft via maintenance log entries on the 9 March and 12 March 2014. After the event on 12 March, engineers replaced the elevator No. 1 servo. The memo reminds flight crew that an Air Safety Incident Report should be lodged for a malfunction of an aircraft system and for a recurring aircraft fault.

A number of similar incidents have subsequently been reported across the VARA Fokker 100 fleet. VARA is reviewing whether this is a direct result of the memo distributed to company flight crew.

The Fokker 100s are fitted with six identical servos: two elevator servos, two aileron servos and two in the thrust control quadrant. In this incident flight, an elevator servo and a thrust lever servo failed in the same sector.

The VARA Fokker 100 fleet was inspected in accordance with the Fokker inspection regime, to determine whether the servos fitted were serviceable. An aircraft that was included in this inspection had a servo fail on a subsequent flight, indicating that the inspection had not predicted the failure. The same check is conducted as scheduled every 500 hours on each aircraft in the fleet.

VARA established that the replacement rate of the servos is about 9,600 cycles. They have immediately implemented a replacement life of 8,000 hours and will incrementally replace all six servos in all the aircraft in the fleet when this life has been exceeded.

VARA has asked Fokker whether the servos are all of the same batch number and the average number of cycles that the servos fail at worldwide. They have also requested that Fokker review the service life of the elevator servo as there is currently no limit.

A further memo has been issued to VARA flight crew advising pilots not to reengage the autopilot that was in use following and uncommanded pitch change, but to swap to the other autopilot for the remainder of the flight.

Aircraft manufacturer

Fokker released Service Bulletin 70/100, to upgrade to a new servomotor and servomount for the elevator position, to solve the pitch oscillations. The associated Service Experience Digest stated that the most probable cause of a temporary stuck elevator servo (elevator ‘stiction’) was ice accretion on the elevator servo-mount capstan or elevator servo-drive cables when the aircraft was flown into a humid environment such as cloud. A lubrication task was advised to prevent ‘stiction’.

Safety message

This incident provides an excellent example of how an experienced flight crew faced with a novel and unanticipated threat, were able to modify their roles and work together to safely complete the flight. Once on the ground, the crew reverted to their normal duties to ensure all operations and checks were completed normally until the aircraft engines were shut down.

General details

Occurrence details

Date and time:	11 March 2014 – 1210 WST	
Occurrence category:	Incident	
Primary occurrence type:	Flight control systems event	
Location:	near Argyle aerodrome, Western Australia	
	Latitude: 16° 38.22' S	Longitude: 128° 27.08' E

Aircraft details

Manufacturer and model:	Fokker B.V. F28 MK 0100	
Registration:	VH-FZO	
Operator:	Virgin Australia Regional Airlines	
Serial number:	11305	
Type of operation:	Air transport – passenger	
Persons on board:	Crew – 5	Passengers – 10
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

Turboprop aircraft

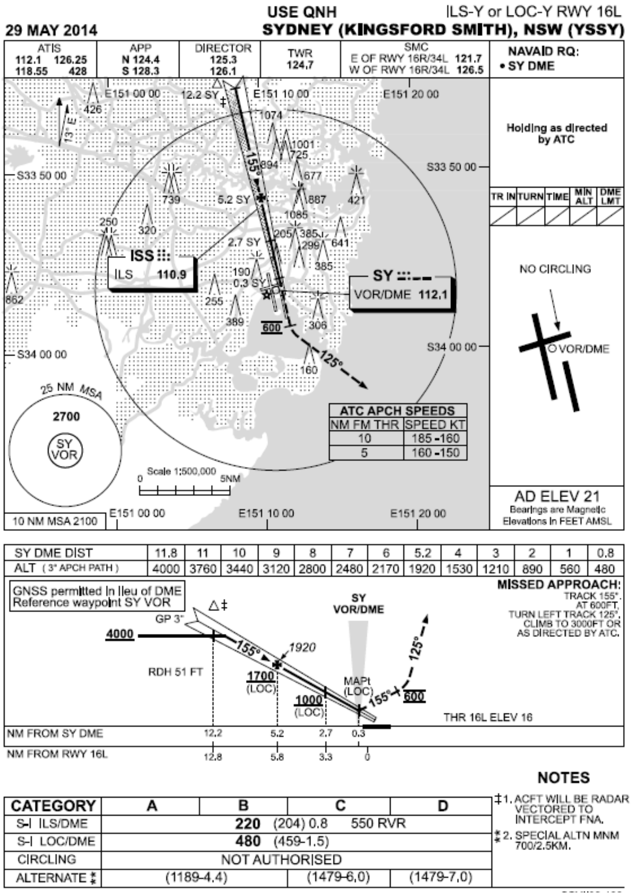
Flight below minimum altitude involving a Beechcraft 200, VH-NMW

What happened

On 5 June 2014, the pilot of a Beechcraft 200 aircraft, registered VH-NMW, conducted a private flight from Narrabri to Sydney Airport, New South Wales, with two passengers on board.

During the cruise, when in the vicinity of Scone, the pilot received a clearance from air traffic control (ATC) for a standard arrival route to Sydney, and entered the arrival and approach into the flight management computer. There were showers in the vicinity of Sydney airport and the pilot requested runway 16 Right (16 R) due to thunderstorm cells to the east, however ATC advised the pilot to expect an instrument landing system (ILS) approach to runway 16 Left (16 L) (Figure 1).

Figure 1: Sydney ILS-Y or LOC-Y RWY 16L



Source: Airservices Australia

The pilot was cleared by ATC to descend to 3,000 ft and, while on descent, was given radar vectors to intercept the localiser for runway 16 L. The pilot selected approach (‘APP’) mode on the flight guidance panel (FGP) and confirmed that the aircraft had intercepted the localiser. About 2 minutes later, the aircraft was cleared for the instrument landing system (ILS) approach on 16 L however the pilot did not observe that at this stage, the aircraft was below the glideslope.

The pilot was then temporarily distracted by explaining the multi-function display to the passenger seated in the front right seat. The controller queried whether the aircraft was on the glideslope and the pilot realised that the aircraft was below the glideslope. The pilot then selected altitude mode (‘ALT’) on the FGP to maintain the current altitude and continue level flight until the aircraft intercepted the glideslope. Prior to intercepting the glideslope, ATC issued a safety alert[1] and advised the pilot that the aircraft was at 1,500 ft and below the lowest safe altitude.

Weather

The aerodrome terminal information service (ATIS) current at the time of the incident indicated that the visibility was 6 km, reducing to 3 km in passing showers; the cloud was scattered 400 ft, few at 1,000 ft and broken at 2,500 ft;[2] and there were thunderstorms to the east and south-east of the airport.

Pilot comments

The pilot provided the following comments

- The company's standard pre-flight briefing to passengers included advising that below 10,000 ft AMSL, a sterile cockpit was required. Had he adhered to that requirement, and not engaged in interaction with the passenger, his attention would have been focused on the glideslope.
- The absence of an outer marker for the 16 L approach, may have contributed to his omission to check the glideslope.

Safety message

This incident highlights the importance of continuously monitoring aircraft and approach parameters and the impact distractions can have on maintaining a stable approach profile.

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 handling approach to land, www.atsb.gov.au/safetywatch/handling-approach-to-land.aspx.

Research conducted by the ATSB found that distractions, or a change in routine, were an everyday part of flying and that pilots generally responded 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 report, *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:	5 June 2014 – 0938 EST	
Occurrence category:	Incident	
Primary occurrence type:	Flight below minimum altitude	
Location:	near Sydney Airport, New South Wales	
	Latitude: 33° 56.77' S	Longitude: 151° 10.63' E

[1] The provision of advice to an aircraft when an air traffic services officer becomes aware that an aircraft is in a position which is considered to place it in unsafe proximity to terrain, obstructions or another aircraft.

[2] 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.

Aircraft details

Manufacturer and model:	Hawker Beechcraft Corporation	
Registration:	VH-NMW	
Serial number:	BY-196	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – 2
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

Piston aircraft

Engine failure involving a Cessna C206, VH-YOT

What happened

VH-YOT

Source: Aircraft operator

On 17 February 2014, a Cessna C206 aircraft, registered VH-YOT, departed runway 05 at Newman Airport, Western Australia, at about 0526 Western Standard Time (WST) for a charter flight to Cotton Creek in visual meteorological conditions. The pilot was the only occupant.

About 3 minutes after take-off, while in the climb and at about 1,500 feet above ground level, the pilot conducted a scan of the aircraft instruments and noticed that the engine oil pressure gauge was indicating zero. All the other engine instrument indications were in the normal range and the pilot tapped the oil pressure gauge but the indicator did not move. The pilot turned the aircraft back towards Newman airport. About 1 minute later, the pilot observed sparks coming from the engine cowling near the propeller, the engine power decreased and a severe vibration was felt through the airframe. The pilot pulled the mixture control to lean cut off to stop fuel flowing to the engine as he was concerned about an inflight fire and the propeller stopped rotating.

The pilot determined that he would not be able to glide to runway 23 and began a scan to locate a suitable landing area that was away from power lines in the area. The pilot located a paddock that was about 4 km from the airport that appeared to be a suitable landing area and was near a dirt road. As the aircraft got closer to the landing area, the pilot could see what he initially thought was small shrubs, was actually medium sized trees. Prior to landing, the pilot shut down all non-essential aircraft systems.

On landing, the left wing impacted a tree and the aircraft spun around 180 degrees. The left wing was bent obstructing the only cockpit exit door. The fuel system had been disrupted and fuel was quickly entering the cockpit area. The pilot shut down all remaining systems and climbed into the rear section of the aircraft. The forward section of the cargo door was obstructed by the flaps in the full down position. The pilot exited the aircraft through the rear section of the cargo door and was not injured. The aircraft was substantially damaged (Figure 1).

Figure 1: Accident site

Source: Western Australia Police Force

Pilot comment

The pilot reported that there was nothing abnormal prior to noticing the engine oil pressure was indicating zero and all other engine gauge indicators were in the normal range.

Prior to take-off, the pilot conducted a 'captain's brief' covering actions to be taken in the event of an engine failure after take-off.

Engine examination[1]

A subsequent examination of the engine found that there were two holes in the engine crankcase halves (Figure 2). An internal inspection revealed that the number four cylinder connecting rod had failed. The engine had been overhauled by the manufacturer and the engine had failed at about 1016 hours since overhaul. It was also found that there was no major maintenance conducted on the engine or any history of operational issues.

[1] The examination was not conducted by the ATSB.

Figure 2: Damaged engine

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:

A reminder to all company pilots how extremely important, as was shown in this accident, it is to perform the below actions and self-briefs before all flights, so as to expect the unexpected which will free up valuable decision making time in the event of an emergency at the most critical phases of flight and/or low level flight:

- pre-flight self-brief covering the different emergency scenarios for that particular aerodrome.
- conducting a thorough pre-flight and engine ground run as per the pilots operating handbook/aircraft flight manual and standard operating procedures.
- maintaining aircraft control in all abnormal flight conditions.

Safety message

Pilots should consider the effect an in-flight engine failure at low altitude has on the time available to manage that failure and identify a suitable forced landing area. In this instance, the pilot was able to complete some emergency checks that may have prevented a post-impact fire.

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) contains information that is also relevant to a complete engine power loss.

The booklet highlights the importance of:

- pre-flight decision making and planning for emergencies and abnormal situations for the particular aerodrome including a thorough pre-flight self-brief covering the different emergency scenarios.
- conducting a thorough pre-flight and engine ground run to identify any issues that may lead to an engine failure.
- 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:	17 February 2014 – 0540 WST	
Occurrence category:	Accident	
Primary occurrence type:	Engine failure	
Location:	4 km ENE Newman Airport, Western Australia	
	Latitude: 23° 24.32' S	Longitude: 119° 50.52' E

Aircraft details

Manufacturer and model:	Cessna C206	
Registration:	VH-YOT	
Serial number:	U20605045	
Type of operation:	Charter	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Substantial	

Controlled flight into terrain, involving PA34, VH-COU

What happened

Sunset

Source: Google

On 13 March 2014, at about 1715 western standard time (WST), a Piper Seneca aircraft, registered VH-COU, departed Jandakot, on a private, visual flight rules (VFR) flight to the Denmark aircraft landing area (ALA), Western Australia. The pilot was the sole person on board.

The departure from Jandakot and subsequent flight were uneventful. There is no meteorological service available for Denmark, so as the aircraft approached the ALA, the pilot requested a weather report for nearby Albany. The report gave the Albany weather as broken low cloud, with a west-south-westerly wind of about 10 knots.

The runways at Denmark ALA are parallel with an inlet, which is positioned less than 2 NM from the ocean. There are also hills around the ALA and tall trees along the edge of the runways. As a consequence, the weather, and particularly the wind, is often different from that at Albany. Hence, the pilot used the Albany weather report as a guide only.

At about 1820, COU arrived over the top of Denmark, and the pilot noted a westerly wind of about 15 knots. The wind was blowing straight down runway 27. The pilot regularly flies to Denmark, and knows that at this time of day, the setting sun can restrict visibility when landing on 27. However, to land to the east on runway 09 would have meant accepting a significant tailwind.

Due to the strength of the wind, the pilot elected to land on runway 27. He knew from previous experience that once you get under the sun line on approach, the visibility returns to normal.

The pilot joined the circuit for 27. When on final approach, with the aircraft configured for landing with the landing gear extended and two stages of flap selected, the visibility was normal. A few seconds later, as the aircraft descended below 700 ft, the visibility both inside and outside the aircraft went instantaneously to zero. Totally blinded by the sun glare, the pilot applied full power to initiate a go-around. A few moments later, the aircraft struck the canopy of the rainforest along the right side of the runway.

Still unable to see outside, the pilot was unaware of what the aircraft had struck, or the resultant damage to the aircraft, so conducted some checks. He assessed the handling characteristics of the aircraft as being normal. He noted there was no engine vibration, so elected not to shut down either engine. He also decided to leave both the landing gear and flaps in the current configuration and, as he regained normal visibility, joined for a left downwind, low level circuit onto runway 09.

After completing a normal landing, the pilot shut down the aircraft then egressed safely. The pilot was not injured; however, the aircraft was substantially damaged.

Pilot experience and comments

The pilot had extensive charter and aeromedical flying experience, and had accrued over 11,000 flying hours. He held the position of Chief Pilot for his company, and had been in a similar role for two previous organisations.

In hindsight, he realised that many factors probably contributed to the outcome.

In particular:

- Had he departed Jandakot about 15 minutes earlier, the sun would not have been an issue
- He had been influenced by a successful landing on runway 27 at Denmark about two weeks earlier, but had not made an allowance for the sun being lower on the horizon
- His decision to land on runway 27 was influenced by considering it poor airmanship to land with such an excessive tailwind
- He felt the decision not to do an early go-around was affected by always successfully landing at Denmark into the sun: usually, once he descends below the sunline, visibility returns to normal
- He was at a loss to explain why he did not maintain the runway centreline during the go-around. He felt he may have instinctively tried to move his head to the right, out of the blinding sun. Perhaps such an extensive background of charter flying had conditioned him to think of time as money; rather than hold for fifteen minutes while the sun set, he continued with the approach.

Figure 1 and 2: VH-COU damage

Source: Pilot

Safety message

The ATSB conducted a database review of reported occurrences involving sun glare as a contributing safety factor. There were a range of outcomes where sun glare from a rising or setting sun was involved. These included:

- airborne collisions with terrain and objects such as fences, trees, and other aircraft
- difficulty for pilots correctly selecting and setting various switches and controls on the instrument panel; this includes entering incorrect data into the flight management computer
- near collisions, where one or more pilots could not clearly sight another aircraft, and
- ground collisions.

The US Federal Aviation Administration (FAA) has conducted research into sunlight and its association with aviation accidents. This research queried the database over a ten year period from 1988 to 1998 and found 130 accidents in which glare from natural sunlight was found to be a contributing factor. The majority of the events occurred during clear weather, and 55 percent were associated with the approach / landing and take-off / departure phases of flight.

The article is available at:

- www.hf.faa.gov/docs/508/docs/cami/0306.pdf

General details

Occurrence details

Date and time:	13 March 2014 – 1820 WST	
Occurrence category:	Accident	
Primary occurrence type:	Collision with terrain	
Location:	Denmark ALA, Western Australia	
	Latitude: S 34° 56.75’ S	Longitude: 117° 23.83’ E

Aircraft details

Manufacturer and model:	Piper Aircraft Corporation	
Registration:	VH-COU	
Serial number:	34-7870273	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Substantial	

Landing on a closed runway, involving PA28 VH-FEZ

What happened

Jet model aircraft

Source: www.vjaa.org.au

On 12 April 2014, a PA-28 aircraft, registered VH-FEZ (FEZ) departed Mangalore airport, Victoria, at 1043 Eastern Standard Time, to conduct a dual navigation training flight. The planned route was Mangalore to Shepparton, Tocumwal, Wangaratta and back to Mangalore. Landings were planned for Shepparton and Wangaratta.

On board were an instructor, a student pilot acting as pilot flying, and another student pilot to be dropped off at Shepparton airport.

After departing Shepparton for Tocumwal, the instructor requested the student divert directly to Wangaratta Airport. The aircraft approached Wangaratta from the northwest and, when at about 10 NM, descended to about 2,000 ft to join the circuit for a touch and go.[1] The student broadcast all mandatory radio calls on the Wangaratta common traffic advisory frequency (CTAF). The instructor also crosschecked the frequencies the student had selected.

At the time, there was a jet model aircraft group event in progress, and Wangaratta airport was closed. The closure had been advised by NOTAM[2]. The model aircraft group had obtained the required CASA permit to conduct the event and, as per required procedures,[3] had placed a white cross near the primary windsock, indicating that the airport was closed.

Although the student had broadcast all mandatory calls, the model aircraft ground controller, monitoring a UNICOM[4] did not hear anything, and therefore was not aware of the aircraft's intentions. There were at least 3 jet model aircraft airborne at the time. These model aircraft have a wing spans up to 3 meters and operate up to 1500 feet above ground level and at speeds of up to 230 knots.

As FEZ approached the circuit, the student flew the aircraft parallel to runway 18 for a short time, before turning crosswind. Neither the instructor nor student noticed the white cross near the windsock (Figure 1).

The model aircraft flight line director heard the engine sound of FEZ as it approached the circuit, and watched it continue to the east. He assumed that the pilots had seen the barricades and the group of 20-30 trailers and tents, and had therefore departed the area. Shortly after, he was advised that the aircraft was now on final approach for runway 18. The flight line director quickly coordinated all personnel to move back the barricades, and clear the runway. He also arranged the three airborne model aircraft to hold to the east, well clear of the runway.

FEZ touched down near the threshold on runway 18 (Figure 2). As FEZ became airborne following the touch and go, the instructor then noticed some barricades off the right side of the

1 Touch and go is a manoeuvre that is common when learning to fly a fixed-wing aircraft. It involves landing on a runway and taking off again without coming to a full stop. Usually the pilot then circles the airport in a defined pattern known as a circuit and repeats the manoeuvre. This allows many landings to be practiced in a short time.

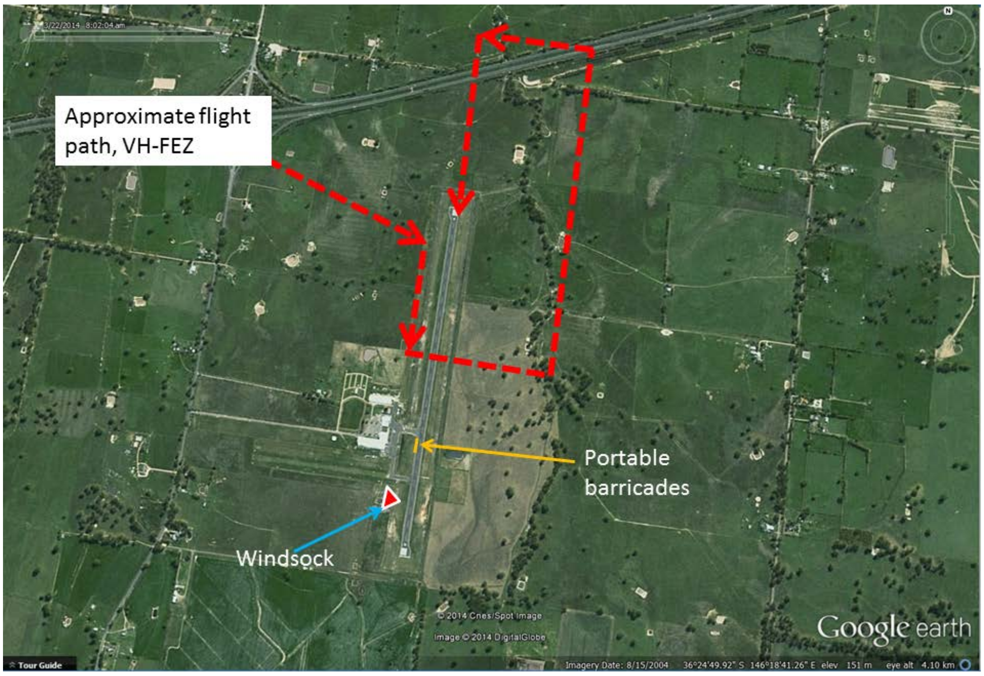
2 NOTAM is A Notice To Airmen advises personnel concerned with flight operations of information concerning the establishment, condition or change in any aeronautical facility, service, procedure, or hazard, the timely knowledge of which is essential to safe flight.

3 Manual of Standards Part 139 – Aerodromes

4 Unicom is a non-Air Traffic Service communications service provided to enhance the value of information normally available regarding a non-towered aerodrome

runway (Figure 3). The instructor took over control of the aircraft and vacated the area, departing to Mangalore.

Figure 1: FEZ approach profile at Wangaratta airport



Source: Google earth

Figure 2: The aircraft touchdown

Source: Russell Eastaway

Figure 3: Barricades alongside runway 18 at taxiway intersection

Source: Russell Eastaway

Instructor Comment

The instructor's day started with maintenance release duty of about 1 hour. This was followed by the 4 hours block for the navigation flight, to be followed by a 2 hour circuit session, and some catch up paperwork.

He started to feel some time pressure with ongoing delays caused by his student. Although his student had been given the route the night before, he still was not ready at the allocated departure time, and there were some errors in his flight plan. The flight planned route was slightly different to the normal navigation exercise at this level, and this timeframe did not give the student a lot of time to prepare.

Also, his sleep had been disrupted for the last few nights, due to a sick family member.

He advised that during the approach and landing at Wangaratta, he had narrowed his focus onto the student. The student had been experiencing some difficulty with directional control during the flare and touchdown, and the instructor was working intently with the student on his approach and landing.

Operator comment

In the morning the student obtained the current weather and NOTAMs for the flight. The instructor reviewed and assessed the weather, but did not check the NOTAMs, and therefore missed the NOTAM regarding the closure of Wangaratta airport. The operator advised the instructor wanted to remain punctual and efficient, and this probably contributed to him overlooking this step.

The operator also suggested a positive action for future closures maybe to place a white cross at each threshold to further alert pilots that the runway is closed.

Safety message

Before commencing a flight, the pilot in command should review all available information appropriate to the intended operation, including current weather reports and forecasts, and the condition and suitability of the selected landing area/s. This occurrence also highlights the need to check for any operational markers.

General details

Occurrence details

Date and time:	12 April 2014 – 1210 EST	
Occurrence category:	Incident	
Primary occurrence type:	Runway event	
Location:	Wangaratta Airport, Victoria	
	Latitude: 36° 24.95' S	Longitude: 146° 18.42' E

Aircraft details

Manufacturer and model:	Piper Aircraft Corporation and PA-28-161	
Registration:	VH-FEZ	
Serial number:	28-8016055	
Type of operation:	Flying Training	
Persons on board:	Crew – 1	Passengers – 1
Injuries:	None	None
Damage:	None	

Loss of control involving a Cirrus SR22, N802DK

What happened

Damage to N802DK

Source: NSW Police Force

On 10 May 2014, an accredited Cirrus salesman planned to conduct a sales demonstration flight of a Cirrus SR22 aircraft, registered N802DK, in the local training area, from Bankstown Airport, New South Wales.

The aim of this flight was for the prospective purchaser, who was the holder of a private pilot licence, to experience the aircraft handling and systems. As the salesman was a flight instructor, he was the pilot in command (PIC) for the flight and was seated in the front right seat. The potential buyer of the aircraft was a passenger on the flight and was seated in the front left seat. There was also a passenger in the rear seat. The passenger in the front seat had previously had one flight in the aircraft (also as a passenger) and had subsequently expressed some concerns about the stall and spin characteristics of the aircraft.

As part of the normal start up procedures, the PIC removed the safety pin from the Cirrus Airframe Parachute System (CAPS) handle prior to placing the ignition key in the ignition switch. At about 1330 Eastern Standard Time (EST), the PIC reported that he taxied the aircraft to the run-up bay and performed the engine run-ups, and explained and checked each item on the electronic checklist; however the passenger in the front seat reported that he did not observe these checklists being actioned. The passenger in the front seat conducted the take-off, and established the aircraft in a climb heading to the training area in a north-westerly direction. The PIC talked about the aircraft systems, controls and instrumentation, and the Electronic Stability and Protection system.

Due to smoke from back-burning fires in the training area, the PIC elected to track towards Katoomba at about 6,000 ft above mean sea level (AMSL) to conduct a series of manoeuvres to demonstrate the electronic stability of the aircraft. The passenger in the front seat conducted a 30° angle of bank turn. The instructor then described that when 45° angle of bank was exceeded, the electronic stability system increased the pressure against the control stick to return the aircraft to 30° of bank; however that could be overridden by the pilot applying greater force. The PIC then suggested the passenger in the front seat perform a 60° turn to the left.

The passenger in the front seat asked the PIC whether he should increase the power setting prior to commencing the steep turn, however was advised that it was not necessary and the power remained at about 24 inches Hg manifold pressure. He reported that significant back pressure on the control stick was required and he was unable to maintain altitude throughout the steep turn with that power setting.

The PIC then stated that they would conduct a stall[1] with the wings level to demonstrate the aircraft's under-speed protection system. The passenger in the front seat reduced the power to idle, held the nose of the aircraft up to allow the airspeed to reduce, and the stall warning message appeared on the primary flight display. The PIC directed him to hold that attitude until the stall buffet was felt and then the nose of the aircraft dropped and the passenger in the front seat recovered the aircraft from the stall.

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[1] Aerodynamic 'stall' is the term used when a wing is no longer producing enough lift to support an aircraft's weight.

The PIC then took control of the aircraft and stated 'watch this'. He selected 50% flap, rolled the aircraft into a left turn at about 25° angle of bank, reduced the power to idle, and raised the nose of the aircraft. The passenger in the front seat queried the use of flap and the PIC confirmed it was intended. As the aircraft approached the stall, the PIC pointed to the vertical speed indicator. As he did this, the right wing dropped rapidly and the aircraft entered a spin to the right. The PIC reported that at this time he performed his normal recovery procedure from this manoeuvre: maintained a neutral aileron control position, applied forward pressure on the control stick to pitch the aircraft nose down, rudders neutral and applied power. He reported that he moved the throttle lever forwards to increase power however there was a distinct hesitation in the engine response.

The passenger in the front seat reported that on about the third rotation of the spin, the PIC said 'I'm sorry', and he realised that the PIC had lost control of the aircraft. The passenger in the front seat reported that he applied full left rudder in an attempt to counter the rotation.

As the rate of rotation to the right slowed, the passenger in the front seat felt the PIC apply right rudder, and the aircraft again accelerated rotating to the right. When about 2,000 ft above ground level, the PIC was unsure whether he then had enough height remaining to recover control of the aircraft, and elected to deploy the parachute. He reported that at this stage, he said 'I'm sorry'. The rocket fired and a loud bang was heard. The aircraft initially pitched up slightly and then as the parachute deployed, the aircraft pitched down rapidly into a nose-low attitude. The PIC closed the throttle, selected the fuel mixture to idle cut-off and activated the emergency beacon. He reported that he also selected the fuel to 'OFF'. About 6 seconds after the rocket fired, the right snub line of the parachute released, followed by the left snub line, which then established the aircraft in a wings level attitude.

The aircraft was overhead high voltage powerlines and the passenger in the front seat asked the PIC whether there was any way to manoeuvre the aircraft to avoid them and was advised that there was not. The aircraft narrowly avoided the powerlines, collided with branches of a tree, and came to rest on a fence in the garden of a residential dwelling (Figure 1). The passenger in the front seat reported that he observed that the ignition and master switches and fuel selector were still 'ON' and selected them to 'OFF'. He reported that he had to shake the PIC as he appeared dazed, and told the PIC and the passenger to hurry up and open the door and exit the aircraft. The PIC reported that after exiting the aircraft he confirmed that no injuries had been sustained and spoke to National Search and Rescue personnel to confirm that the emergency beacon had been activated.

Figure 1: Accident site of Cirrus SR22, N802DK

Source: NSW Police Force

Pilot comments

Passenger (front left seat)

The passenger in the front left seat reported that they were not given any safety briefing prior to the flight and there was no formal handing over/taking over procedure being followed during the flight. He had not been shown how to operate the CAPS and during the spin was uncertain as to how and whether to pull the handle. After the deployment of the CAPS, he was unsure as to the correct position to be seated in for landing, but recalled that the seats were designed to collapse to absorb shock so he opted to remain sitting upright with his feet firmly on the floor. When over the powerlines, he was unsure whether they could restart the engine to manoeuvre away from them.

Pilot in command (PIC) (front right seat)

The PIC provided the following comments:

- He was probably overconfident as he had done the demonstration 30-50 times in the previous 6 months.
- There was no specified routine and series of manoeuvres for a demonstration flight, unlike the specific syllabus for the accredited Cirrus 'transition' training flights.
- A formal handing over/taking over protocol was used during the flight.
- He thought that as the aircraft entered the spin, the passenger in the left seat had made an uncommanded rudder input.
- He normally demonstrates the manoeuvres in the training area and by tracking over the escarpment, he lost about 2,000 ft of safety height.
- He had performed the same manoeuvre earlier that day, without the subsequent loss of control.

Passenger (rear seat)

The passenger in the rear seat provided the following comments:

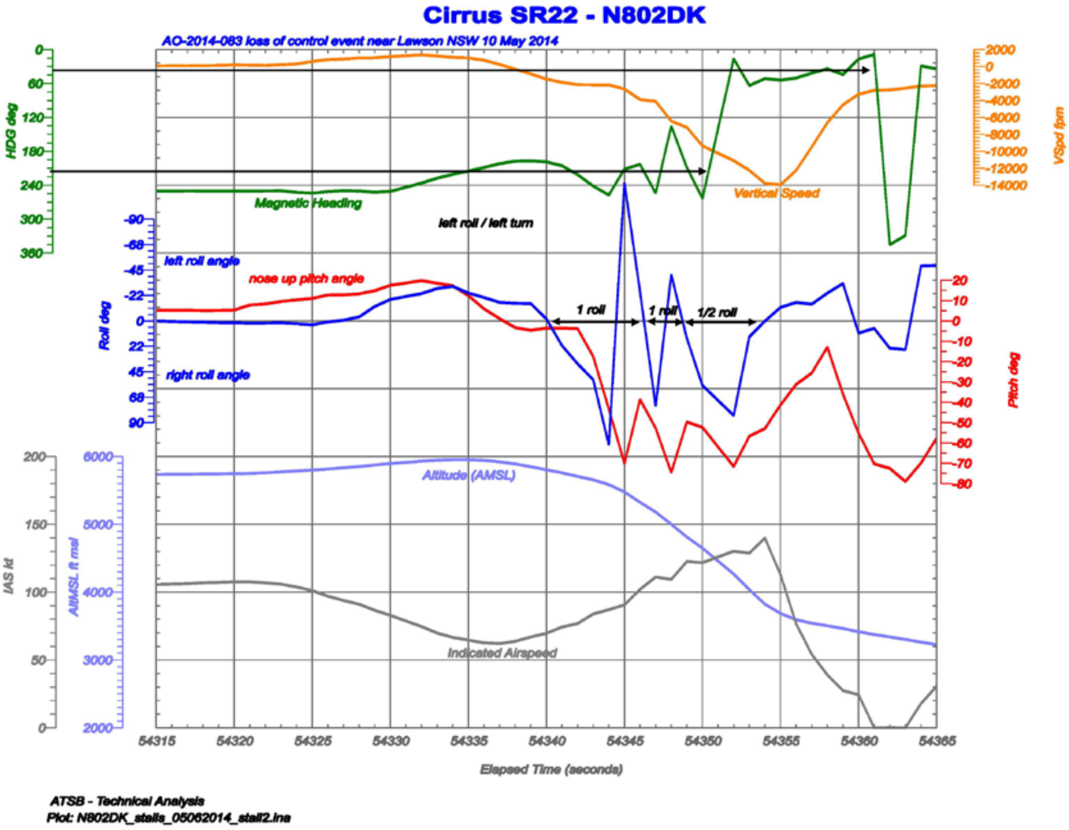
- The general tenor of the flight was very informal.
- There was no full safety brief including regarding exits, no handing over/taking over protocol, and no discussion regarding the use of the parachute.
- There was a lot of discussion during the flight regarding the stall and spin characteristics of the cuffed wing, with the PIC advising that the combination of the cuffed wing and electronic protections prevented the aircraft from stalling.
- There was a lack of communication about the stall demonstration; they were over rough terrain with insufficient height, and a passenger in the back seat.
- The only approved spin recovery in the aircraft was to deploy the CAPS.

Flight data

The aircraft flight data was provided to the ATSB and is shown in the following diagrams. The control input parameters were not recorded in the aircraft's data.

At the commencement of the manoeuvre, when at about 5,800 ft AMSL, the aircraft nose pitched up to about 20°, and simultaneously entered a left turn with about 25° angle of bank (roll) (Figure 2). The maximum roll value in the turn was about 30° with a corresponding pitch angle of about 17°. The indicated airspeed reduced to about 62 kt. The right wing then dropped rapidly and the aircraft rolled to the right, the nose pitched down to about 70° and the aircraft commenced a nose low spin to the right. The first complete roll to the right took about 6 seconds and the second roll had a noticeably higher roll rate and took about 2.5 seconds. The roll rate then reduced, with the next 180° of roll taking about 5 seconds. The CAPS was deployed and the parachute inflated when the aircraft was about 1,000 ft above ground level. The aircraft continued to roll when the parachute inflated, and the aircraft nose pitched down about 80°. The maximum vertical speed reached about 14,000 feet per minute prior to the CAPS deployment.

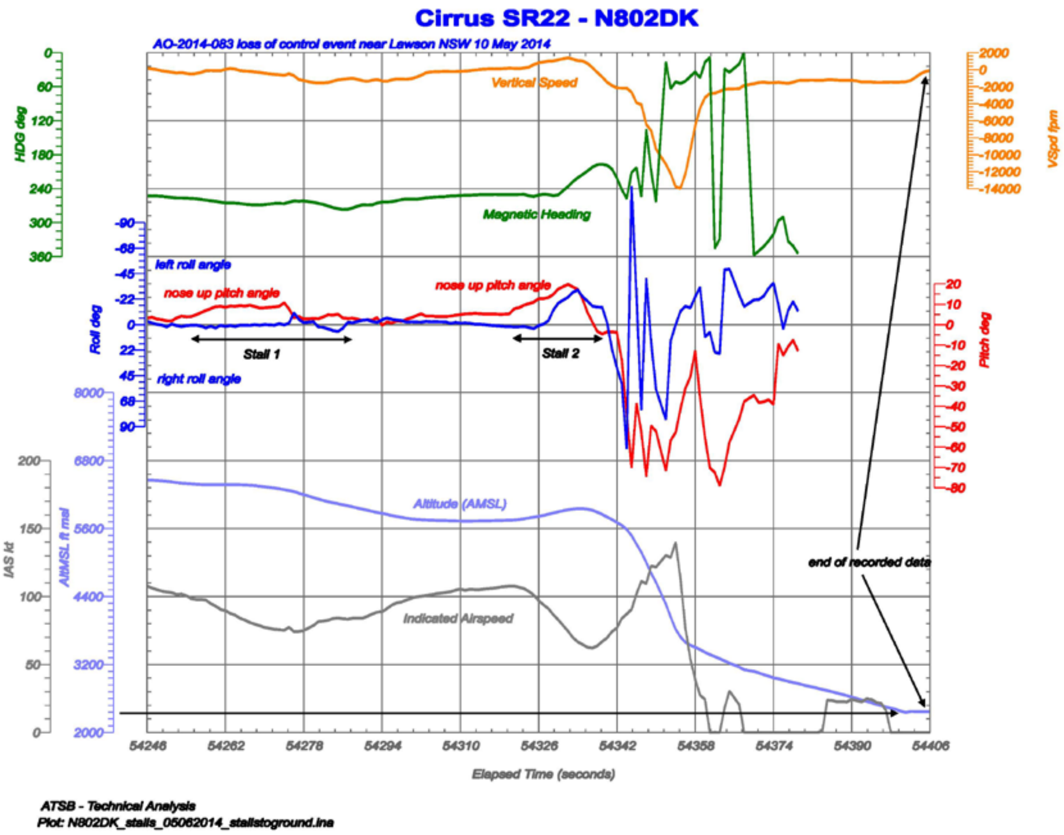
Figure 2: Roll and pitch data



Source: ATSB

Figure 3 shows the flight data from the commencement of the first stall until the aircraft collided with the ground. The nose up pitch angle in the first stall reached a maximum of about 9°, and in the second stall about 20° was reached. The first stall developed over a period of about 25 seconds before recovery and the second was about 16 seconds prior to the aircraft nose dropping below the horizon. In the first stall, the airspeed reduced from 100 kt to 75 kt in about 25 seconds, and in the second stall the airspeed reduced from about 100 kt to 62 kt in about 12 seconds.

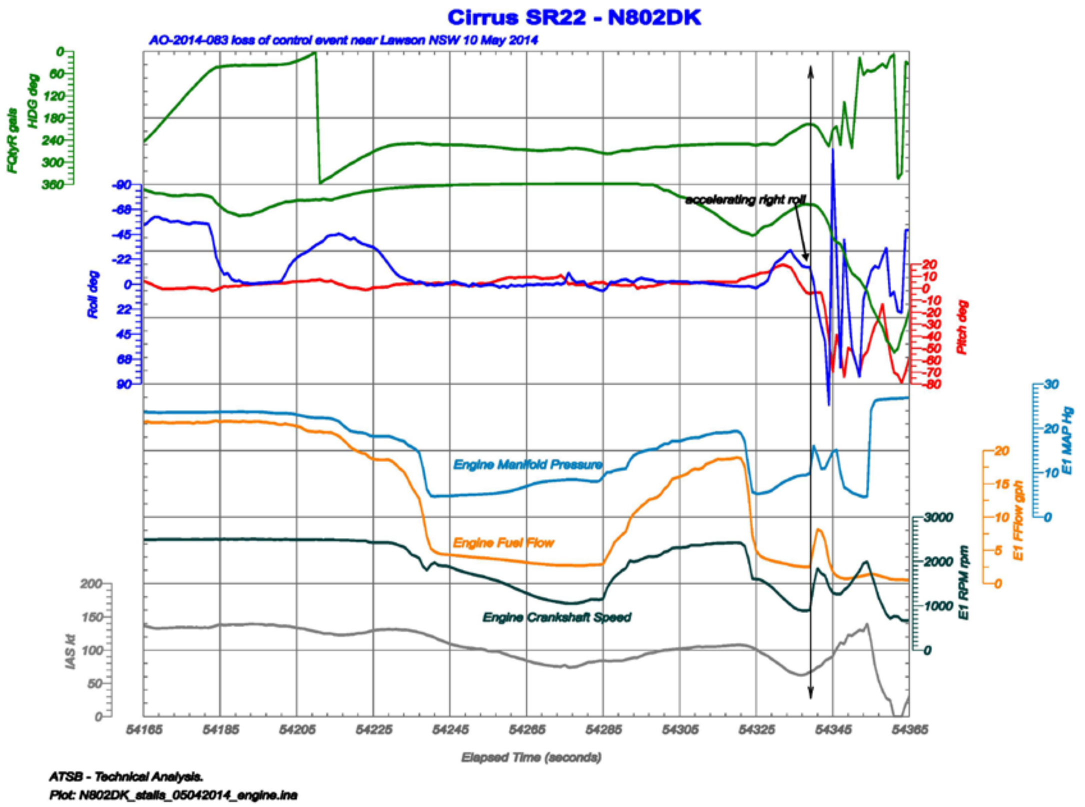
Figure 3: Flight data from N802DK



Source: ATSB

Figure 4 depicts the engine parameters during the steep turn, the wings-level stall and the subsequent stall, spin and CAPS deployment. The manifold pressure, fuel flow and crankshaft speed (rpm) were reduced prior to commencement of the manoeuvre. These then increased in a consistent manner at the incipient spin stage. The rpm increased momentarily prior to the engine shutdown while the manifold pressure was low. This may have been due to increasing airspeed, low nose attitude and high rate of descent.

Figure 4: Flight data depicting engine settings



Source: ATSB

Cirrus SR22 spin recovery

The SR22 Pilot Operating Handbook (POH) stated:

> ***WARNING***
>
> *In all cases, if the aircraft enters an unusual attitude from which recovery is not expected before ground impact, immediate deployment of the CAPS is required. The minimum demonstrated altitude loss for a CAPS deployment from a one-turn spin is 920 feet. Activation at higher altitudes provides enhanced safety margins for parachute recoveries. Do not waste time and altitude trying to recover from a spiral/spin before activating CAPS.*
>
> *The aircraft is not approved for spins, and has not been tested or certified for spin recovery characteristics. The only approved and demonstrated method of spin recovery is activation of the Cirrus Airframe Parachute System (CAPS). Because of this, if the aircraft 'departs controlled flight,' the CAPS must be deployed.*
>
> *While the stall characteristics of the aircraft make accidental entry into a spin extremely unlikely, it is possible. Spin entry can be avoided by using good airmanship: coordinated use of controls in turns, proper airspeed control following the recommendations of this Handbook, and never abusing the flight controls with accelerated inputs when close to the stall.*

> *If, at the stall, the controls are misapplied and abused accelerated inputs are made to the elevator, rudder and/or ailerons, an abrupt wing drop may be felt and a spiral or spin may be entered. In some cases it may be difficult to determine if the aircraft has entered a spiral or the beginning of a spin.*
>
> *If time and altitude permit, determine whether the aircraft is in a recoverable spiral/incipient spin or is unrecoverable and, therefore, has departed controlled flight.*

Cirrus engaged in an extensive flight test program to investigate the aircraft stall characteristics and spin behaviour. The proper spin recovery procedure was found to be brisk movement of the elevator control to the full down position. This was reported to be an unnatural control movement, when the nose of the aircraft may already appear to the pilot to be pointing down sharply. Cirrus determined that the probability of a typical general aviation pilot properly applying the spin recovery controls was low. The procedure in the event of loss of control of the aircraft as stated in the above extract of the POH is to activate the CAPS.

Cirrus comments

Cirrus advised that restarting the engine with the chute deployed would not provide the aircraft with forward speed to avoid obstacles; it would cause the aircraft to spin around under the canopy. The canopy can not be cut away by the pilot as it was during the aircraft testing and certification phase.

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.

As a result of this occurrence, the pilot in command has advised the ATSB that he is preparing a set of protocols for demonstration flights, including manoeuvres of a significantly lower level of risk than those included in the training scenarios and a more thorough pre-flight briefing.

Safety message

This incident provides a reminder to pilots to know your own limitations and those of the aircraft. This demonstrates the importance of thorough planning and preparation for every flight and also of re-assessing when forced to deviate from the plan, such as operating over higher terrain. Thorough passenger and student briefings conducted prior to the flight may assist in dealing with emergency situations. Animation from the recorded flight data of a 10-turn spin fatal Cirrus SR20 accident is available at www.youtube.com/watch?v=e7GwjMk6HuI.

General details

Occurrence details

Date and time:	10 May 2014 – 1435 EST	
Occurrence category:	Accident	
Primary occurrence type:	Loss of control	
Location:	near Katoomba, New South Wales	
	Latitude: 33° 43.80' S	Longitude: 150° 25.78' E

Aircraft details

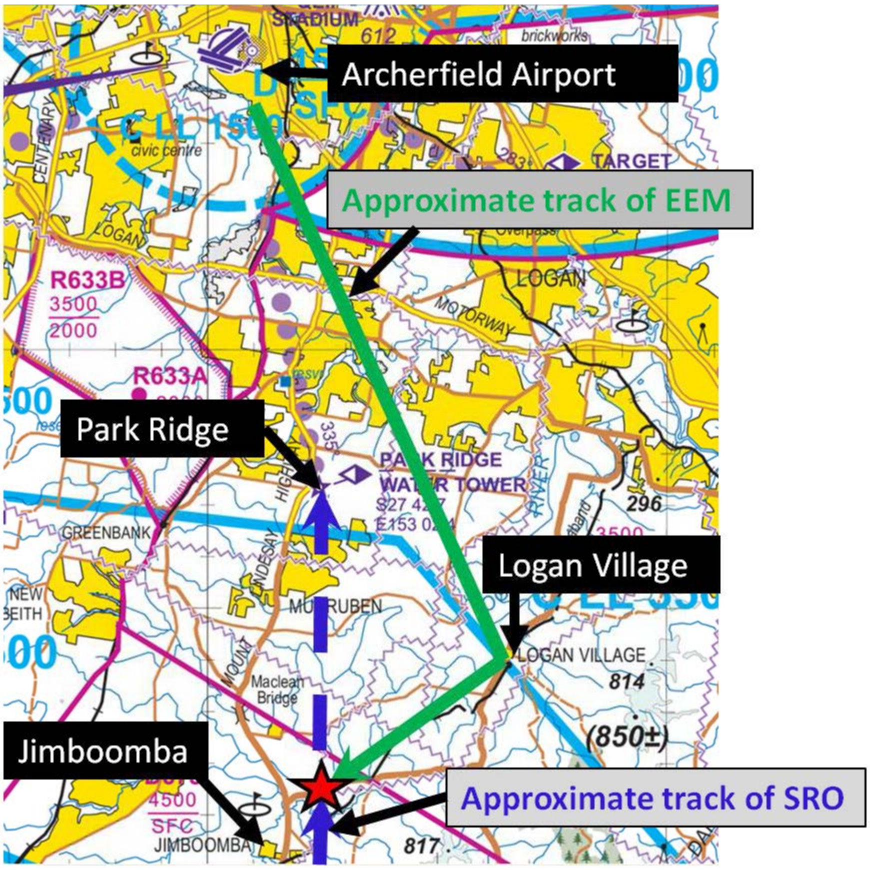
Manufacturer and model:	Cirrus Design Corporation SR22	
Registration:	N802DK	
Serial number:	4046	
Type of operation:	Aerial work	
Persons on board:	Crew – 1	Passengers – 2
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Substantial	

Near collision involving a Beech BE76, VH-SRO and a Cessna 172, VH-EEM

What happened

On 30 May 2014 at about 0900 Eastern Standard Time (EST), a Beech BE76 aircraft, registered VH-SRO (SRO), departed Archerfield Airport, Queensland, for a local flight to the training area south of the airport, with an instructor and a pilot in command under supervision (ICUS) on board. At about 0920, the student pilot of a Cessna 172 aircraft, registered VH-EEM (EEM), departed Archerfield for a solo local area flight. The student's planned route was to track 135° (south-east) outbound from Archerfield at 1,000 ft above mean sea level (AMSL), and when overhead the Logan Motorway, climb to 2,500 ft AMSL and track towards Logan Village. At Logan Village, the student pilot climbed the aircraft to 3,000 ft AMSL and practiced turns before tracking towards Jimboomba (Figure 1). The pilot of another aircraft in the vicinity broadcast on the area frequency and the student pilot of EEM sighted that aircraft and responded.

Figure 1: Aircraft tracks overlaid on Brisbane visual terminal chart

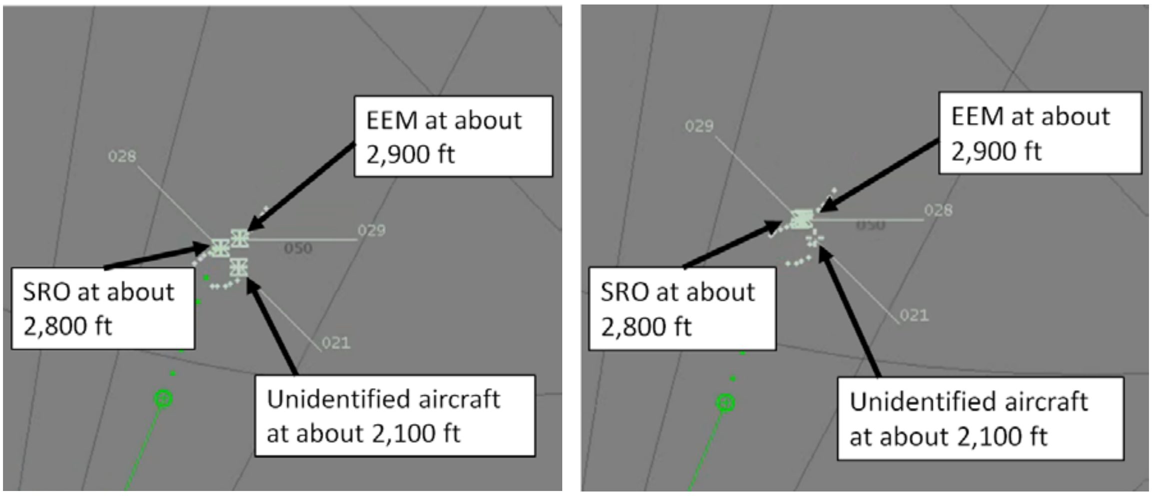


Source: Airservices Australia and pilot recollection

After completing training exercises at 3,000 ft AMSL south of Jimboomba, the pilots of SRO commenced tracking north towards Park Ridge to return to Archerfield. At about 0940 EST, while at 6 km south of Park Ridge and 3,000 ft AMSL, the instructor in SRO sighted EEM on a converging heading in his 1 o'clock position,[1] and immediately took control of the aircraft from the pilot under supervision. He conducted a descent and estimated that EEM passed about 50 ft above SRO and about 100m away horizontally. The student pilot of EEM observed SRO pass below and to the right.

Radar data provided to the ATSB by Airservices Australia indicated that EEM passed about 100 ft over SRO (Figure 2), with aircraft altitudes unverified.

Figure 2: Radar display of the incident



Source: Airservices Australia

Pilot comments

Instructor of VH-SRO

The instructor of SRO reported that the normal procedures were to track anticlockwise around the southern training area. When operating in the training area, although there was no requirement to do so for aircraft operating under visual flight rules (VFR), Brisbane Centre air traffic control (ATC) had occasionally alerted pilots, when aircraft appeared to come into close proximity on the radar screen. He was not advised of EEM by ATC in this incident.

Student pilot of VH-EEM

The student pilot of EEM reported that he was maintaining 3,000 ft AMSL to attempt to remain above any aircraft tracking towards, and on descent to Park Ridge, as aircraft were required to report at Park Ridge at 1,500 ft AMSL. As SRO was a low wing aircraft and EEM high-winged, neither pilot would have been able to sight the other aircraft when SRO was above EEM.

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 (VH-EEM and VH-SRO)

As a result of this occurrence and following discussions with the Civil Aviation Safety Authority (CASA) and Airservices Australia, the operator has implemented a new procedure for company pilots on entry to the southern (D673) and eastern (D666, D675) training areas. At the standard departure points from Archerfield Airport, pilots are to contact Brisbane Centre ATC on frequency

[1] The clock code is used to denote the direction of an aircraft or surface feature relative to the current heading of the observer's aircraft, expressed in terms of position on an analogue clock face. Twelve o'clock is ahead while an aircraft observed abeam to the left would be said to be at 9 o'clock.

125.7 MHz and request traffic in their destined training area. Company pilots will be reminded that this action is in addition to the need to maintain an effective lookout for other aircraft.

The procedures and limitations in the provision of information services in Class G airspace, are detailed in *AIP GEN 3.3 – 2.16 Surveillance Information Services (SIS) to VFR Flights in Class E and Class G Airspace,* http://www.airservicesaustralia.com/aip/aip.asp?pg=10.

Safety message

This incident highlights the importance of communication and the limitations of unalerted see-and-avoid principles. Issues associated with unalerted see-and-avoid have been detailed in the ATSB's research report Limitations of the See-and-Avoid Principle. The report highlights that unalerted see-and-avoid relies entirely on the pilot's ability to sight other aircraft. Broadcasting on the local area frequency is known as radio-alerted see-and-avoid, and assists by supporting a pilot's visual lookout for traffic. An alerted traffic search is more likely to be successful as knowing where to look greatly increases the chances of sighting traffic. The report is available at www.atsb.gov.au/publications/2009/see-and-avoid.aspx.

General details

Occurrence details

Date and time:	30 May 2014 – 0950 EST	
Occurrence category:	Serious incident	
Primary occurrence type:	Near collision	
Location:	27 km S Archerfield Airport, Queensland	
	Latitude: 27° 48.75' S	Longitude: 152° 58.77' E

Aircraft details: VH-SRO

Manufacturer and model:	Beech Aircraft Corporation	
Registration:	VH-SRO	
Serial number:	ME-58	
Type of operation:	Flying training – dual	
Persons on board:	Crew – 2	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

Aircraft details: VH-EEM

Manufacturer and model:	Cessna Aircraft Company	
Registration:	VH-EEM	
Serial number:	17280487	
Type of operation:	Flying training – solo	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

Helicopters

Collision with terrain involving a Robinson R22 helicopter, VH-WDB

What happened

Accident site

Source: Owner

On 23 May 2014, at about 1100 Eastern Standard Time (EST), the pilot of a Robinson R22 helicopter, registered VH-WDB, conducted a local flight on a property about 90 km north of Bourke, New South Wales. The pilot flew the helicopter to a cleared landing area adjacent to a stock yard. From about 600 ft above ground level (AGL), he commenced the descent to the landing site, aiming to approach quietly and slowly to minimise disturbance to stock grazing nearby. When at about 9-15 ft AGL, he commenced a left turn into a light breeze, then at his 11 o'clock[1] position, and entered the hover.

As the helicopter turned left, the pilot felt a violent shudder through the cyclic[2] control. The pilot reported that the helicopter continued to yaw[3] and he applied opposite pedal in an attempt to counteract the yaw, however the pedal was ineffective and the yaw accelerated. The pilot rolled the throttle off, moved the cyclic forward and lowered the collective[4]. As the helicopter descended rapidly, the pilot then raised the collective to cushion the landing. The right skid touched down first and the helicopter rolled to the right, coming to rest on the right side (Figure 1).

Figure 1: Damage to WDB

Source: Owner

The helicopter was substantially damaged and the pilot was uninjured.

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1 The clock code is used to denote the direction of an aircraft or surface feature relative to the current heading of the observer's aircraft, expressed in terms of position on an analogue clock face. Twelve o'clock is ahead while an aircraft observed abeam to the left would be said to be at 9 o'clock.

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.

3 Yaw is the term used to describe motion of an aircraft about its vertical or normal axis.

4 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.

Pilot comments

The pilot had bought the helicopter new in January 2014 and it had completed a total of 187.4 hours at the time of the accident. The rotor drive belts had been replaced twice, the first time after only 26 hours. He had been advised to leave the clutch engaged while the helicopter was parked at night to stretch the belts. He had to jump start the helicopter each morning due to the tightness of the belts.

Initially following the accident, the pilot reported that the helicopter had yawed rapidly to the right, which he had attempted to counteract with left pedal; however he later reported that the helicopter had yawed rapidly to the left, and he had attempted to apply right pedal but was unsuccessful in counteracting the yaw.

Engineering inspection

The engineering inspection conducted after the accident found the following:

- Damage to the helicopter was consistent with high vertical impact loads.
- Damage to the skid attach points was consistent with the aircraft rotating at touchdown.
- No aircraft unserviceabilities, including in the tail rotor control system were found other than those sustained in the accident.
- The drive belts were found intact and had moved forward one groove on the upper sheave consistent with a power-on main rotor strike.

General details

Occurrence details

Date and time:	23 May 2014 – 1120 EST	
Occurrence category:	Accident	
Primary occurrence type:	Collision with terrain	
Location:	90 km N Bourke, New South Wales	
	Latitude: 29° 14.32' S	Longitude: 146° 06.47' E

Helicopter details

Manufacturer and model:	Robinson Helicopter Company R22	
Registration:	VH-WDB	
Serial number:	4629	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Substantial	

Collision with terrain involving a Bell 412, VH-ESD

What happened

VH-ESD

Source: Operator

On 23 May 2014, at about 0810 Eastern Standard Time (EST), the crew of a Bell 412 helicopter, registered VH-ESD, were tasked by the Queensland Emergency Medical System Coordination Centre (QCC) to conduct a rescue in the Mount Spec area about 72 km WNW of their base in Townsville, Queensland. Due to the inaccessibility of the area by road and the reported condition of the patient, the crew planned to conduct a winching operation. The crew consisted of a pilot, an air crew officer (ACO), a rescue crew officer (RCO), a paramedic and a doctor.

At about 0855, the helicopter arrived at the location provided by the QCC and the crew observed smoke indicating where the injured person was located. The pilot conducted two orbits of the site and the crew inspected the area and assessed the risks associated with the task. The site was in a river valley with a series of cascading waterfalls. The pilot elected to face the helicopter down the slope, to provide a greater power margin to be able to exit the area, without having to climb away. In this position, there were obstacles from the waterfall and higher ground behind the helicopter, and a clear area ahead. The crew also discussed the tag line, which attached to the corner of the stretcher to prevent it spinning around during winching. It was normally operated by the RCO on the ground, who would walk backwards to create an angle between himself and the stretcher, however this was not possible at this site due to a vertical drop behind the RCO. The pilot would be required to manoeuvre the helicopter rearwards to create the tag line angle.

The pilot then established the helicopter in a hover about 100 ft above the ground, and reported that his reference point, used to maintain the helicopter's position in the hover, was a tree in about his 3 o'clock position and about 7 m from the helicopter. The ACO moved to the rear door, and took over the 'reference' of the helicopter. In this role, the ACO directed the pilot to manoeuvre the helicopter as required to perform the operation and remain clear of all obstacles.

As previously briefed, the doctor and RCO were winched down to the site together, and subsequently the paramedic was lowered. By this time the helicopter had been in the hover with the power in the take-off range for about 4 minutes, with a 5 minute limit at this power setting; consequently the pilot conducted an orbit before returning to winch the stretcher and rescue equipment down. No problems were encountered during this sequence of winches.

The pilot and ACO then departed the immediate vicinity in the helicopter and initial contact was established with the crew on the ground via UHF radio. After about 10 minutes, communication on the ground was again attempted, however due to a loud interference noise on the radio they were unable to communicate with the ground crew. They then returned and overflew the area to ascertain using hand signals, whether the ground crew were ready to be picked up. The RCO waved them away and the helicopter departed and conducted an orbit of the area. The ACO was then able to establish radio communication with the RCO who advised when they were ready. The sequence of recovery winches was confirmed between the ACO and RCO. On returning to the winching site, due to the interference noise on the radio affecting their ability to communicate with each other, the pilot and ACO deselected the radios.

The winch recovery of the doctor and stretcher commenced. During the initial recovery phase, the pilot stated that due to the 5 minute power limit, a circuit would be required before the final recovery of the RCO and paramedic. The ACO then directed the pilot to manoeuvre the helicopter backwards to set the tag line on the stretcher and winched up the doctor and the stretcher. During this winch, the helicopter had twice drifted to the left and the ACO directed the pilot to manoeuvre the helicopter right.

To manoeuvre the stretcher into the helicopter, the ACO directed the pilot to move forwards and to the right to provide a buffer at the tail of the helicopter, and then handed the visual reference over to the pilot, which was standard operating procedure for the organisation, while the ACO's attention was focused on securing the stretcher inside the cabin.

About 1 minute later, the ACO returned to the door and observed that the helicopter had drifted back and left and he immediately directed the pilot to manoeuvre up and to the right, however the tail rotor collided with the foliage of a tree. The RCO attempted to alert the pilot to the proximity of vegetation to the tail of the helicopter over the radio but the radios in the helicopter were deselected. The pilot advised that he was again about 4 minutes into the 5 minute hover power limit and had to go around prior to picking up the RCO and paramedic. The ACO advised that the helicopter had collided with some light foliage and the pilot assumed it was the main rotor blades that had struck the vegetation. The ACO pointed out to the pilot some vegetation similar to that which the helicopter had collided with. The pilot had not detected any strike, there were no abnormal indications or vibrations and the helicopter was operating normally.

The RCO and paramedic were then winched into the helicopter and the ACO returned to the front seat. The crew discussed whether it was necessary to divert to Townsville Airport, but elected to proceed to the hospital. The paramedic and doctor later stated that the tail had been close to the vegetation but the pilot reported that at that time, he had in his mind that it was the main rotor blades rather than the tail rotor blades that had struck the foliage.

After landing at the hospital, the pilot exited the helicopter and inspected the main rotor blades. The ACO then advised that it was the tail rotor not the main rotor that had struck the foliage and the pilot observed some ripples on the tail rotor blades and called the base engineer to inspect the helicopter (Figure 1).

Figure 1: Damage to ESD tail rotor

Source: Operator

The engineering inspection revealed that the tail rotor blades required replacement and the tail rotor gear boxes and hub assembly required inspection.

Pilot comments

The pilot reported that he thought that the main rotor blades had struck the foliage, not the tail rotor. He reported that had he known that it had struck the tail rotor, he would have either diverted to the airport or landed in a paddock to inspect the rotor blades prior to continuing the flight.

The company had a standard task risk analysis (TRA), which stated that prior to commencing the winching operation, the pilot was to brief the crew for a recovery if visual reference is lost, and he omitted the briefing. While he had the reference, and was therefore responsible for maintaining the helicopter position and obstacle clearance, he is unsure whether he momentarily shifted his focus inside to check the power, and was unaware that the helicopter had drifted backwards.

As a senior pilot, his main tasks are checking and training flights and administration, and he rarely conducts operational flights.

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-ESD

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

- Operational staff will be reminded of the importance of applying the controls listed in the winching task risk analysis (TRA), possibly via a Safety Bulletin.
- Senior staff are to provide advice to crew regarding actions to be taken following any event or incident, specifically the desirability of conducting a safe out-landing.
- The currency requirements for management and training and checking pilots are to be reviewed, in particular with respect to operational tasks.
- Technical staff will review the compatibility between the Bell 412s and the radios used by the RCOs.
- In-cockpit reminder lists of any treatments or controls mandated by Task Risk Analyses are to be provided.
- The next crew resource management (CRM) training is to focus on information sharing, feedback loops and cockpit gradients.

Safety message

This incident highlights to helicopter pilots the importance maintaining a good reference point when operating in confined areas and to establish the helicopter into the safest position possible particularly while the other crew members' attention is focused inside the cabin. It also provides a reminder to clarify understanding between crew members, as in this incident the ACO knew the tail rotor had struck foliage and the pilot had thought it was the main rotor and based his decisions on that belief.

General details

Occurrence details

Date and time:	23 May 2014 – 0920 EST	
Occurrence category:	Accident	
Primary occurrence type:	Collision with terrain	
Location:	69 km NW Townsville, Queensland	
	Latitude: 18° 45.62' S	Longitude: 146° 22.23' E

Helicopter details

Manufacturer and model:	Bell Helicopter Company 412	
Registration:	VH-ESD	
Serial number:	36026	
Type of operation:	Aerial work - EMS	
Persons on board:	Crew – 5	Passengers – 1
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Substantial	

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

Enquiries 1800 020 616
Notifications 1800 011 034
REPCON 1800 011 034
Web www.atsb.gov.au
Twitter @ATSBinfo
Email atsbinfo@atsb.gov.au

Investigation

ATSB Transport Safety Report
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