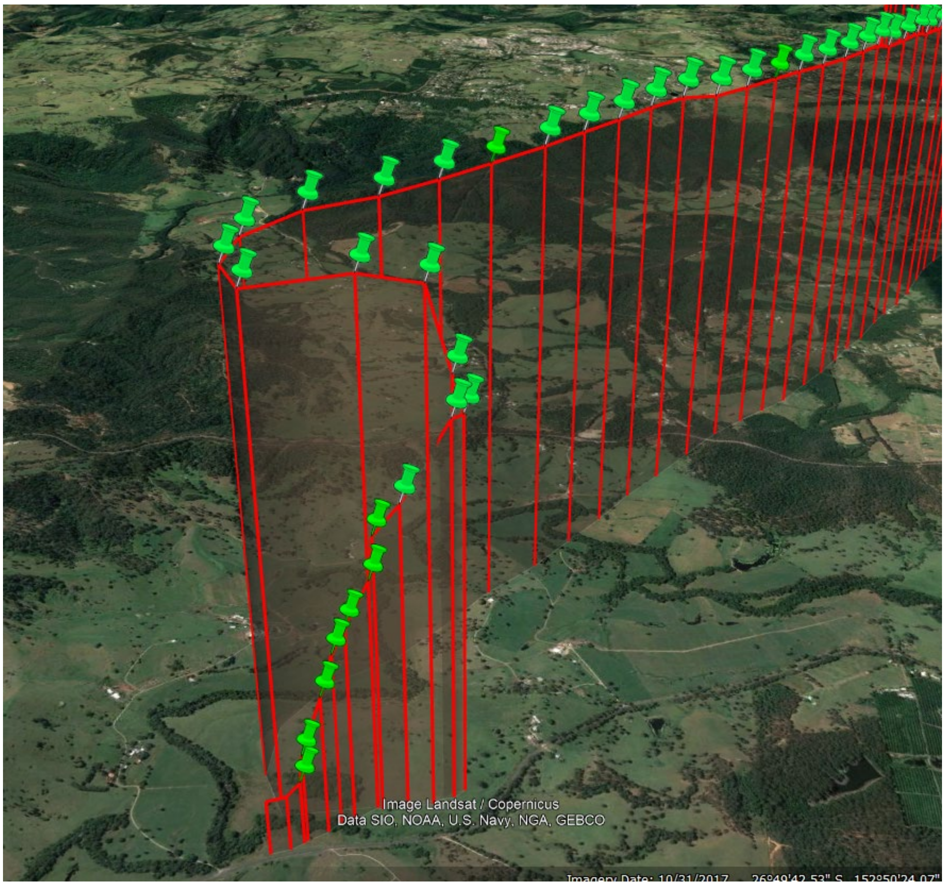
Australian Government

Australian Transport Safety Bureau

Collision with terrain involving Cessna A150M, VH-CYO

5 km west-south-west of Peachester, Queensland, on 23 June 2021



ATSB Transport Safety Report

Aviation Occurrence Investigation (Defined)

AO-2021-025

Final – 10 August 2022

Cover photo: **Google Earth, annotated by the ATSB**

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Addendum

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Executive summary

What happened

On 23 June 2021, a Cessna A150M Aerobat, registered VH-CYO, departed from the Sunshine Coast Airport, Queensland, with an instructor and student pilot on board. The purpose of the aerobatic training flight was to introduce and practice spin entry and recovery techniques.

The aircraft climbed to about 6,000 ft above mean sea level and arrived at the area intended to conduct aerobatics about 20 minutes after departure. Radar data showed that the aircraft then entered into a left spin that continued for about 55 seconds until the aircraft impacted terrain. The instructor and student were fatally injured, and the aircraft was destroyed.

What the ATSB found

Forward movement of the aircraft and the low angle of entry indicated that the aircraft was most likely in the process of recovering from the spin when it impacted with trees.

Examination of the aircraft did not identify any mechanical defect. However, the aircraft was significantly disrupted and therefore functionality of the flight controls was unable to be fully assessed. Pre- and post-accident medical information did not identify any underlying conditions in either pilot that may have contributed to the accident.

The aerobatics instructor was experienced in conducting spins, primarily in the Pitts Special aircraft type. However, it was likely that they had no experience in spinning a Cessna A150 Aerobat or any similar variant. The instructor's theoretical spin training provided to the aerobatic student pilot (and another student at the same time) did not include instruction on the recovery technique as prescribed in the Aerobat pilot's operating handbook (POH). Further, the ATSB established that it was likely the instructor intended to practice 2 spin recovery techniques. One of those techniques, broadly known as the Mueller/Beggs recovery method, has been shown to not recover a Cessna A150 Aerobat established in a spin to the left. The other method known as PARE, aligned closely with the aircraft's POH and, if utilised, it would recover the aircraft from a spin.

The ATSB was unable to ascertain which of the recovery technique(s) was being utilised at the various stages of the spin recovery preceding the accident. For this reason, the ATSB was unable conclude if the use of an inappropriate recovery technique contributed to the accident.

What has been done as a result

The ATSB has issued a Safety Advisory Notice SAN (AO-2021-025-SAN-001) for aerobatic pilots and aerobatic instructors who conduct spins utilising the Mueller/Beggs spin recovery method, to raise awareness of its limitations.

Safety message

Although the reason for the accident could not be fully established, the investigation identified that one of the spin recovery methods that was to be practiced on the day of the accident would most likely not recover the Cessna A150M Aerobat from a spin.

This investigation presents a timely reminder that pilots should review the pilot's operating handbook of the aircraft type that they intend to operate. Prior to intentionally spinning an aircraft, pilots should obtain instruction and/or advice in spins and recovery techniques from an instructor who is fully qualified and current in spinning that model. Further, aerobatic pilots and instructors should be aware and also teach the Meuller/Beggs method of spin recovery advantages, but most importantly its limitations in that it will not recover all aircraft types from a spin.

Contents

The occurrence

Aerobatics instructional flights

Two private pilots (students), who were members of the Sunshine Coast Aero Club, contracted an aerobatics instructor to provide aerobatic flight training in the aero club's Cessna A150M Aerobat (Aerobat), registered VH-CYO. That training included theoretical and practical training aspects.

As the instructor did not work at the aero club, the aero club's chief flying instructor (CFI) conducted a check flight with the instructor in the Aerobat to assess the instructor's ability. The CFI was not rated in aerobatics, and the check flight was limited to an assessment of the instructor's general handling and area knowledge. The CFI stated that the instructor performed the flight to a high standard and concluded that the instructor had the requisite skill and knowledge to conduct the flight training in the aero club's Aerobat.

The students hired the aero club's Aerobat for the practical flight training. The training was split into 2 days, commencing on the 16 June 2021. On that day 4 flights were undertaken, with 2 one-hour flights per student. The students undertook theoretical and practical instruction on:

- stall recovery techniques
- stall turns
- loops
- barrel rolls
- aileron rolls.

It was reported that, during the practical flight phase on that day, the instructor demonstrated each of the manoeuvres before handing control to the student.

Pre-flight briefing on the day of the accident

On the morning of 23 June 2021, the 2 students and the instructor continued the aerobatics training from Sunshine Coast Airport, Queensland, commencing with pre-flight theoretical instruction on spin training. The briefing contained information about:

- what is a spin[1]
- inverted and upright spins
- what is a spiral dive[2]
- difference between a spin and a spiral dive
- the Mueller/Beggs emergency spin recovery method
- the PARE method for spin recovery.

One of the students indicated that, during the pre-flight briefing, they were not instructed on what recovery method was recommended in the Aerobat *Pilot's Operating Handbook* (POH), or that it closely aligned with the PARE method. Further, they were instructed on the advantages of the Mueller/Beggs method, but not on its limitations; namely, if the Mueller/Beggs method was utilised on an Aerobat, the aircraft would not recover from a spin to the left (see *Aerodynamic spins*).

Both students were instructed to write down the 2 spin recovery methods on a piece of paper for reference in flight when the practical component of the spin recovery was to be undertaken. One of the students indicated that they believed they were going to utilise both methods of spin

[1] Spin: a sustained spiral descent of a fixed-wing aircraft, with the wing's angle of attack beyond the stall angle.

[2] Spiral dive: a steep descending turn with the aircraft in an excessively nose-down attitude and with the airspeed increasing rapidly.

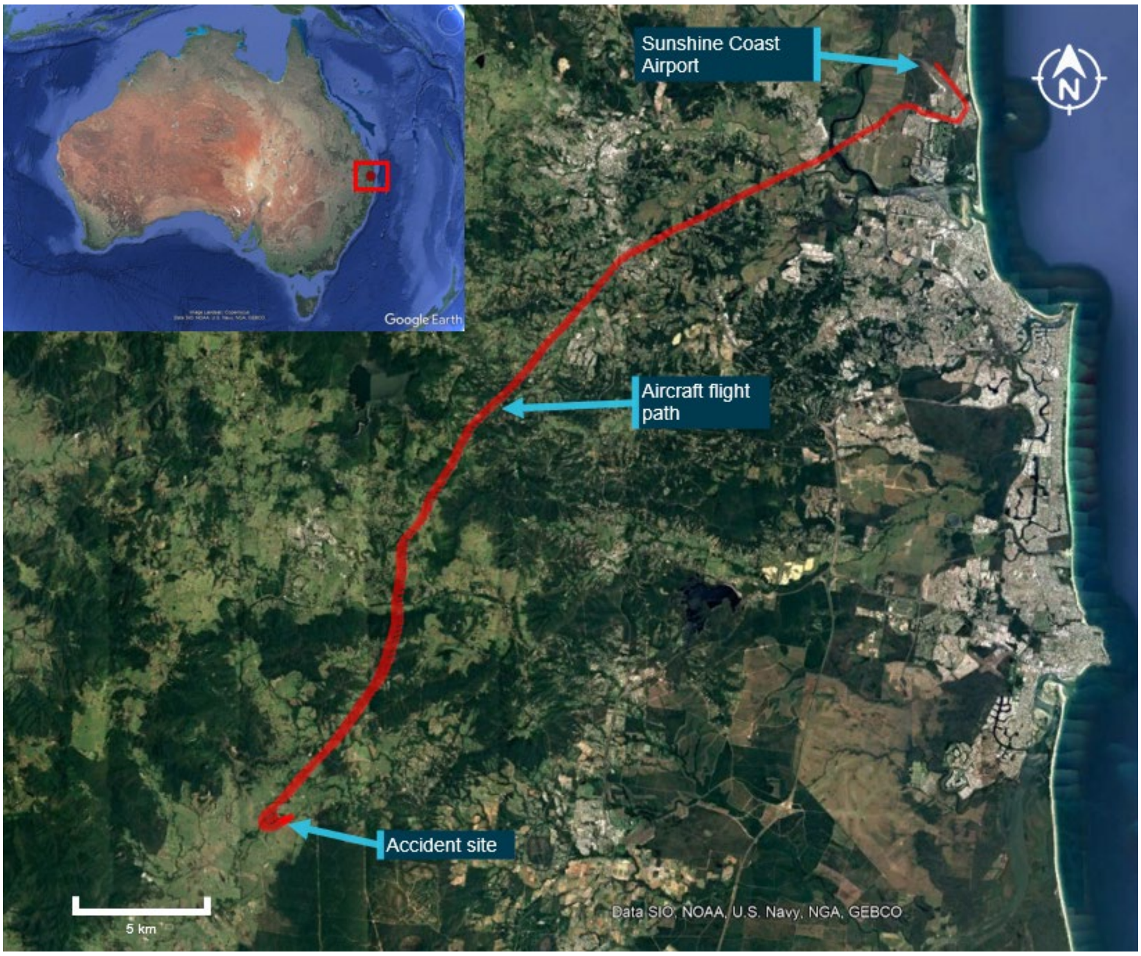
recovery during their flight instruction. The first method written down on both students' spin recovery notes was the Mueller/Beggs method.

Accident flight

At 1103 Eastern Standard Time,[3] VH-CYO took off from the Sunshine Coast Airport, with the instructor and one of the aerobatic student pilots on board. The flight was being conducted under visual flight rules (VFR), and visual meteorological conditions existed during the flight. The accident flight was the first of 4 one-hour flights intended for that day (2 per student).

The aircraft departed to the south-west and climbed to about 6,000 ft above mean sea level (AMSL). Radar data showed that the aircraft arrived at the area intended to conduct aerobatics about 20 minutes after departure (Figure 1).

Figure 1: VH-CYO flight track radar data showing take-off point and accident site



Source: Google Earth, annotated by the ATSB

Figure 2 shows recorded radar data for the last 3 minutes of the flight. It indicated that, within the last 90 seconds, the aircraft conducted a 180° left turn, decelerated while maintaining altitude, and then descended rapidly, with the point of decent beginning at 5,800 ft above ground level (AGL). That manoeuvring was indicative of the planned entry into a spin.

At about 1122, 55 seconds after the initiation of the spin, the aircraft impacted terrain. The aircraft was destroyed, and the 2 occupants were fatally injured.

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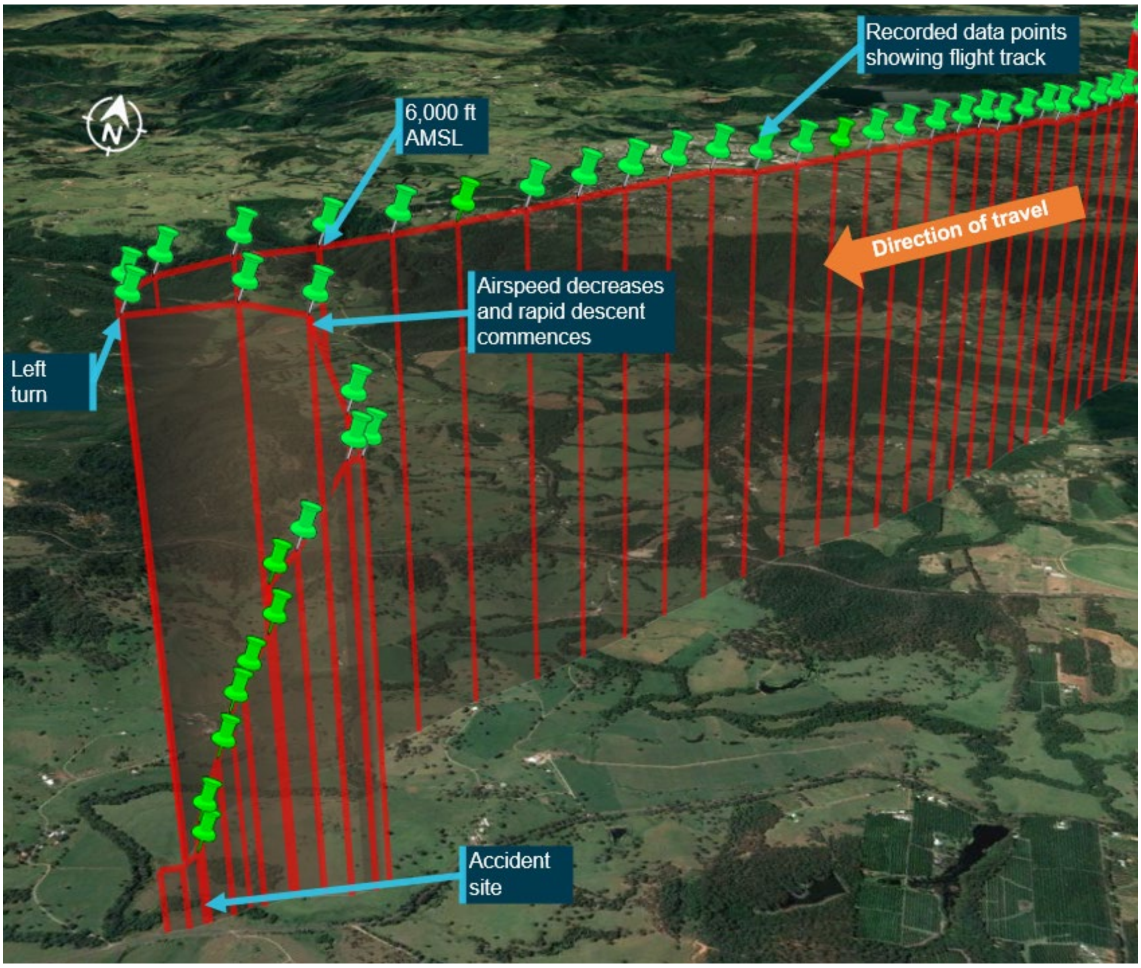
3 Eastern Standard Time (EST) was Coordinated Universal Time (UTC) + 10 hours.

Figure 2: VH-CYO last 3 minutes of recorded flight data viewed from the left and above



Radar positions (depicted by green pins) were recorded every 5 seconds. The last 2 points depicted without pins were predictive in nature and were not considered to be accurate.
Source: Google Earth, annotated by the ATSB

Post-accident events

Following the accident, the second student arrived back at the aero club in preparation for the afternoon's flights and made enquiries as to the whereabouts of VH-CYO. A short time later the chief pilot of the aero club discussed the aircraft's movements with the Sunshine Coast Airport control tower and was advised that the aircraft had not returned after its initial departure that morning.

The aircraft was reported missing by a member of the aero club at about 1515, about 3 hours after it was due to return for refuel. A subsequent search found the wreckage in bushland near Peachester, Queensland, several hours later.

Context

Pilot information

Instructor

Experience and qualifications

The instructor held a valid commercial pilot licence (aeroplane) that was issued on 10 August 2017. The licence included the following ratings and endorsements:

- single engine aeroplane class rating
- manual propeller pitch control, design feature endorsement
- aeroplane formation, spinning and aerobatics (low level) flight activity endorsement
- flight instructor rating with grade 2, spinning, formation (aeroplane) and aerobatics training endorsements
- aeroplane formation, spinning and aerobatics flight activity endorsements.

The instructor had their own aviation company that predominantly conducted aerobatic joy flights and instructional flights in the company's 2 Pitts Special aircraft. The ATSB had access to the pilot's logbook information up to 16 February 2020, at which point the instructor had accumulated 1,112.3 flight hours. The information in those logbooks indicated that the instructor had about 100 hours of flight experience in a Cessna 152 (a similar, non-aerobatic variant of the Aerobat), but none of that recorded experience was aerobatic in nature.

In the week prior to the accident, the instructor provided information to the Sunshine Coast Aero Club that they had about 100 hours experience in the Cessna 152. However, there was no mention of experience in the Cessna A150 Aerobat. The provided information was consistent with the information in the instructor's logbook.

The ATSB was informed that, in recent times, the instructor had been utilising cloud-based pilot logbook software to record flight experience. The ATSB was unable to gain access to the cloud-based system.

The instructor's initial and ongoing aerobatics training was conducted in the Pitts Special aircraft. Apart from the instruction flights in VH-CYO during the week prior to the accident, the ATSB was unable to identify any previous aerobatic experience in the Cessna A150 Aerobat or any other similar Cessna variants.

The person who conducted the aerobatics training to give the instructor a rating for aerobatics, and a rating to instruct in aerobatics, stated that they informed the instructor of the limitations in the Mueller/Beggs method during their initial aerobatics training. All of the practical flying training aspects were conducted in a Pitts Special.

Medical information and recent history

The instructor held a current class 1 medical certificate with no restrictions, and the accompanying medical records did not indicate any underlying medical issues at the time of the accident.

The instructor was reported to be fit and well on the day of the accident. There were no issues identified in the post-accident medical and toxicological results (including carbon monoxide) that may have affected the instructor's operation of the aircraft.

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Aerobatic student

Experience and qualifications

The aerobatic student pilot held a valid private pilot licence (aeroplane) that was issued on 13 June 2010. They also held a single-engine aeroplane class rating, and manual propeller pitch control and retractable undercarriage design feature endorsements. The student had a total of 248.5 flight hours experience.

The student had conducted an introductory aerobatic flight in an American Champion Aircraft Corp 8KCAB with an instructor in December 2014. That flight did not include spins.

Medical information and recent history

The aerobatic student pilot held a current class 2 medical certificate with no restrictions, and the accompanying medical records did not indicate any underlying medical issues at the time of the accident. The student was reported to be well rested and in good spirits on the morning of the accident. There were no issues identified in the post-accident medical and toxicological results (including carbon monoxide) that may have affected the student's operation of the aircraft.

Operator information

The Sunshine Coast Aero Club was located at the Sunshine Coast Airport. At the time of the accident, the aero club had about 100 members and 3 aircraft: 2 Recreational Aviation Australia (RAAUS) registered Sling 2 aircraft and a Cessna A150 Aerobat (Aerobat), registered VH-CYO.

The Aerobat was recently purchased with the intent to conduct aerobatic instructional flights for its members. At the time of the accident, the aero club did not have a Civil Aviation Safety Regulation (CASR) Part 141 certificate to conduct flight training in a VH registered aircraft, nor was it required for an instructor to conduct spin or aerobatics flight training. There were no aerobatics-trained instructors at the aero club.

The aero club sought the assistance of a contracted aerobatics instructor to conduct the aerobatic flight training, utilising the instructor's own flight training approval. The first aerobatic flight training conducted by the aero club utilising VH-CYO was the week prior to the accident with the flight instructor who was on board the accident flight.

Aircraft information

General information

The Cessna 150 is a high-wing, 2-seat, single piston engine aeroplane designed for flight training. The Aerobat was a slightly modified model that was designed to conduct basic aerobatic training. The type of manoeuvres approved in the Aerobat *Pilot's Operating Handbook* (POH) included spins.

VH-CYO

VH-CYO (Figure 3) was manufactured in 1976 and first registered in Australia in 1995. It had been owned and operated by the Sunshine Coast Aero Club since March 2021. However, it had not been utilised for aerobatics until the week prior to the accident.

Figure 3: VH-CYO Cessna A150M Aerobat

Source: Simon Coates

Maintenance information

The aircraft had a current certificate of airworthiness, certificate of registration, and maintenance release with no outstanding maintenance or defects listed.

Subsequent to the accident, it was reported to the ATSB that the right-side radio push-to-talk switch had a defect which prevented radio calls from that position. Therefore, all calls had to be made from the headset and microphone plugged into the left-side jack point. It was also reported that the defect did not affect the intercom between pilots.

Rudder stop modification

The Cessna 150 and 152 series aircraft had a mandatory rudder stop modification identified as *Single Engine Bulletin (SEB) 01-1*. The Service bulletin was also mandated by Federal Aviation Administration Airworthiness Directive (AD) 2009-10-09 and therefore automatically mandated in Australia. The purpose as stated in the bulletin was as follows:

> To provide an enhanced rudder stop, bumper, doubler and attachment hardware designed to assist in preventing the possibility of the rudder overriding the stop bolt during full left and/or right operation of the rudder.

VH-CYO had the rudder stop modification incorporated at the time of the accident.

Weight and balance

The aircraft's published maximum take-off weight (MTOW) according to the Pilot Operating Handbook was 727.3 kg (1,600 lb). The aircraft's weight for the accident flight was estimated to be about 14.3 kg over the MTOW on departure and about 7.1 kg overweight at the time of the accident.

Taking into consideration the aircraft's calculated weights at take-off, and at the time of the accident, a centre of gravity (CG) calculation could not be carried out, as the aircraft's weight was outside that of the published CG calculation limits (Figure 4). As the aircraft was over the MTOW, the data was extrapolated outside of the chart limits to get an estimate of the CG location at the time of the accident. The extrapolated value placed the CG aft of mid-range, but well forward of the aft limit.

Figure 4: Estimated weight and balance

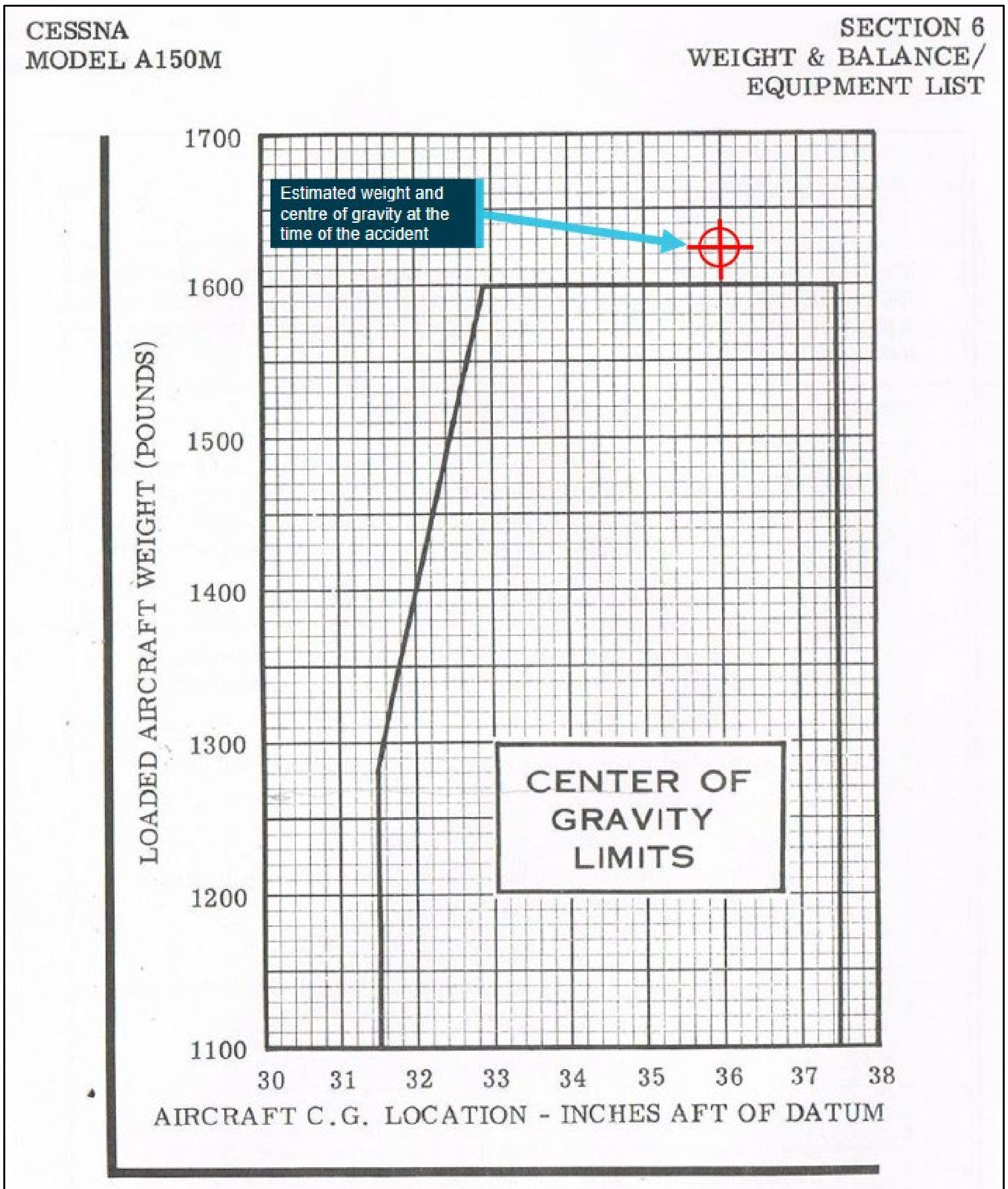


Figure 6-10. Center of Gravity Limits

Source: Cessna, annotated by the ATSB

Recorded information

The aircraft flight path was derived from primary[4] and secondary[5] surveillance radar data recorded by Airservices Australia. The data included the aircraft's position with a time stamp and altitude above mean sea level (AMSL) at 5-second intervals.

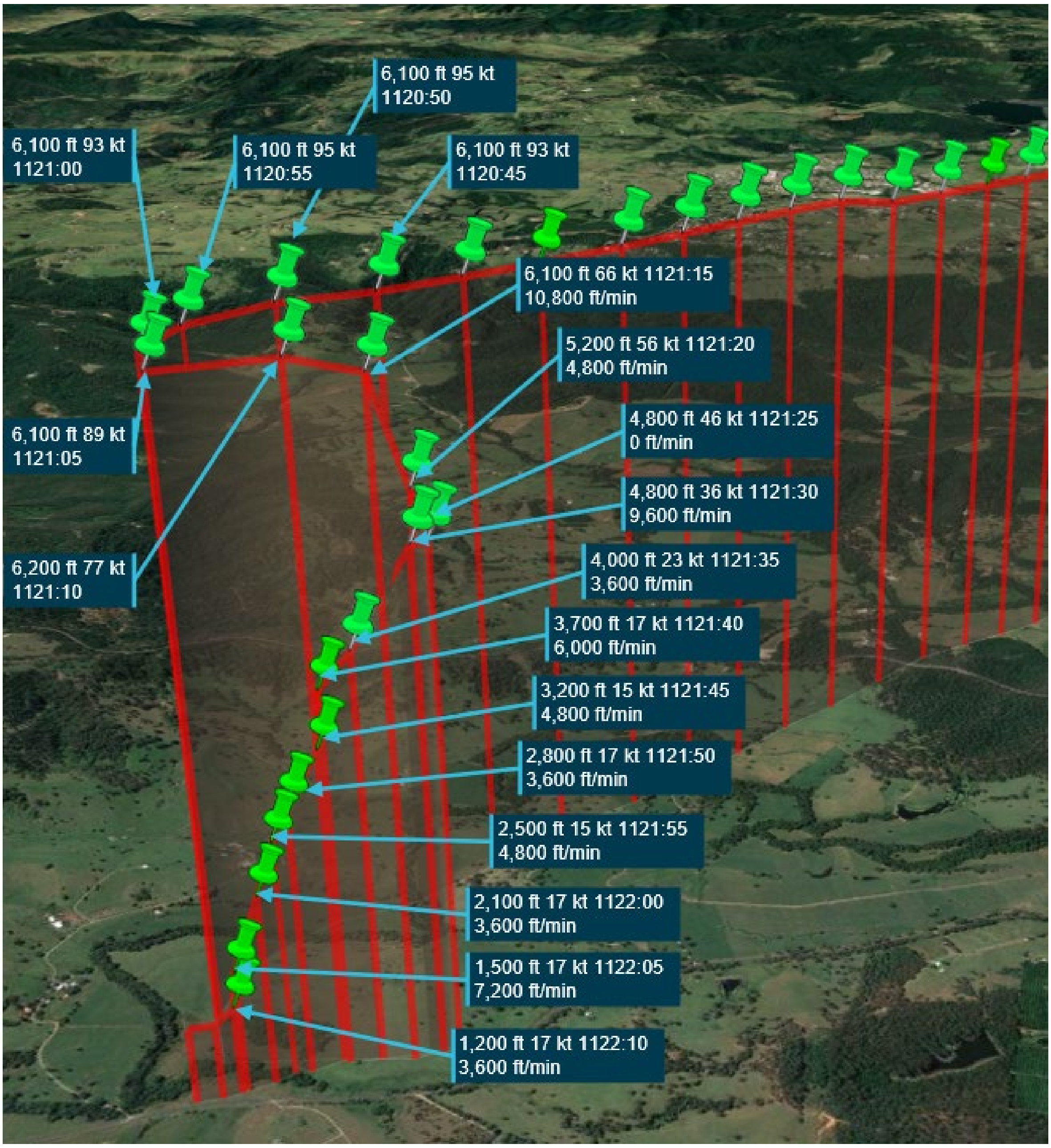
4 Primary radar returns are produced by radar transmissions that are passively reflected from an aircraft and received by the radar antenna. The received signal is relatively weak and provides only position information, not the aircraft's altitude.

5 Secondary radar returns are dependent on a transponder in the aircraft replying to an interrogation from a ground station. An aircraft with its transponder operating is more easily and reliably detected by radar and, depending on the mode selected by the pilot, the aircraft's pressure altitude is also displayed to the air traffic controller.

Figure 5 shows the last 90 seconds of flight with the spin entry beginning about 55 seconds before impact with terrain. The decent rate varied between data points, with an average descent rate of about 5,000 ft/min. The radar returns stopped at about 1,200 ft above mean sea level (AMSL), which was 800 ft above ground level (AGL) at the accident site. That was most likely due to the aircraft descending below radar coverage.

The last 2 recorded data points without pins were considered to be predictive and not an accurate representation of the aircraft position.

Figure 5: Radar data with timestamp, airspeed, altitude and vertical decent rate labelled

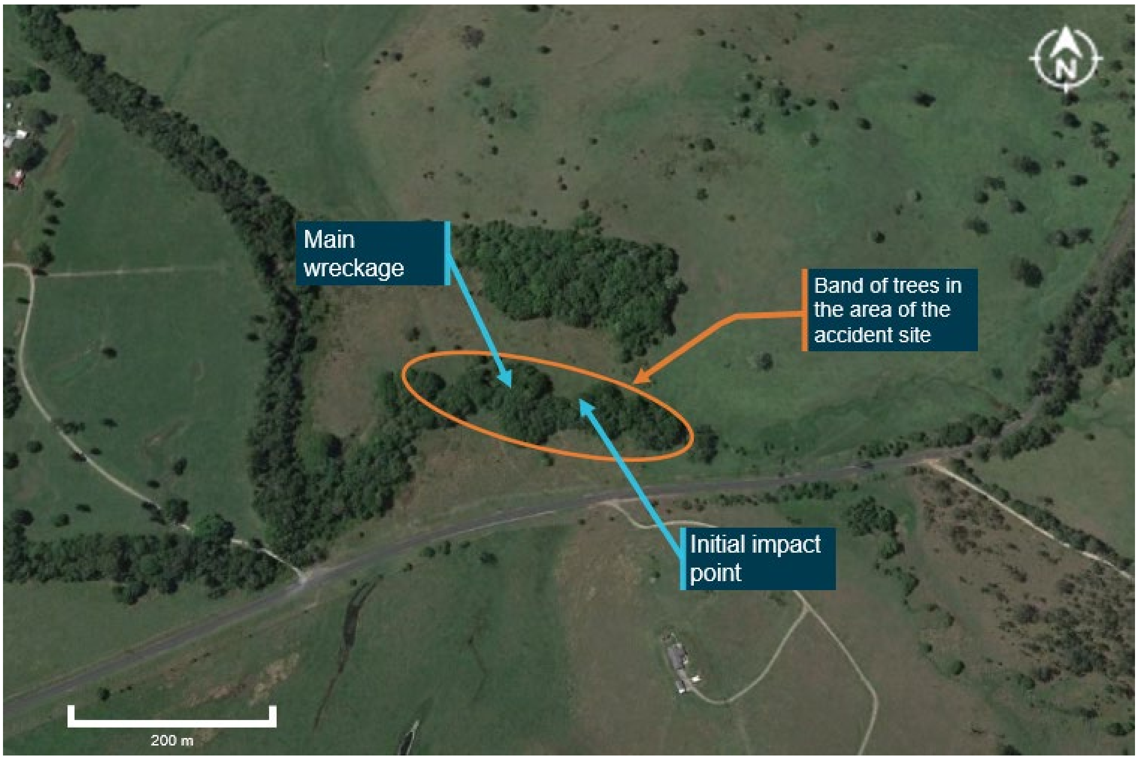


Source: Google Earth, annotated by the ATSB

Site and wreckage examination

The accident site was located in a dense stand of trees that stood about 15–20 m high and straddled a creek line in a band about 50 m wide, with open areas of farmland on either side (Figure 6).

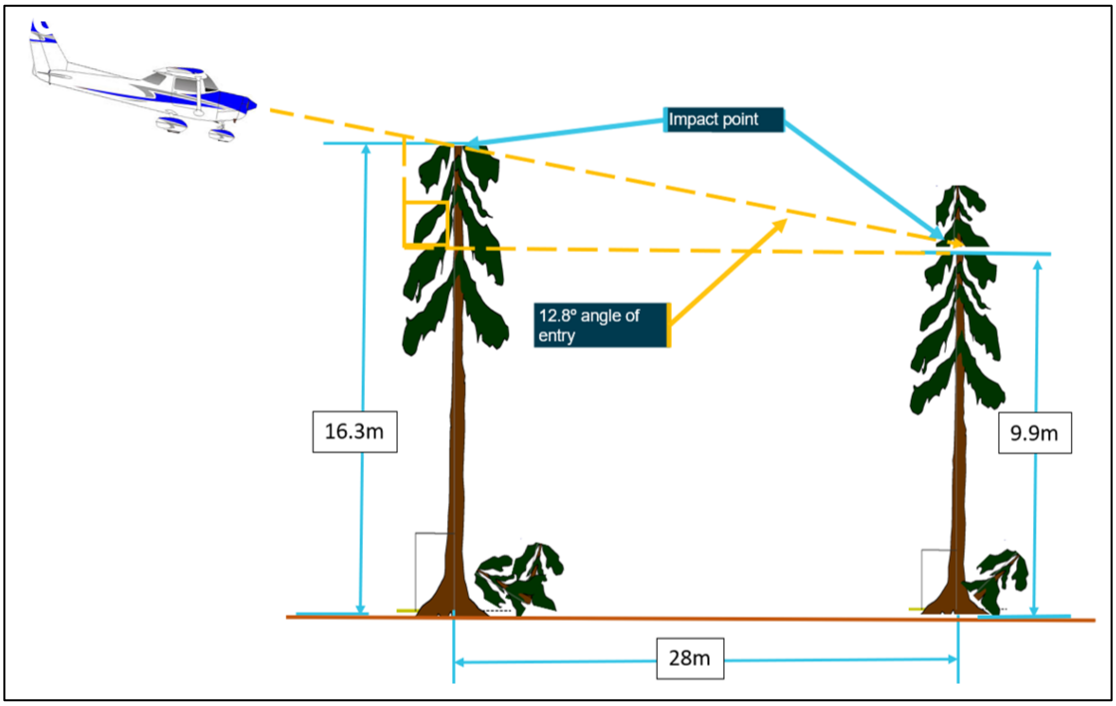
Figure 6: Area of accident site



Source: Google Earth, annotated by the ATSB

The wreckage trail extended about 50 m from the initial tree impact point, until the final piece of wreckage, oriented in an east-west direction. There were several notable tree impact points, including trees that had been broken in half or completely felled by the impact forces. Calculations of the tree impact damage heights indicated the final flight path angle was a descent of 12.8° (Figure 7).

Figure 7: Final flight path angle of entry



Source: ATSB

The main wreckage came to rest at the base of a tree that was struck at a height of about 10 m. The aircraft structure was significantly disrupted as a result of impacting several trees (Figure 8).

Figure 8: Aircraft main wreckage at the base of a large tree that was struck

Source: ATSB

The ATSB conducted an examination of the aircraft wreckage. The examination identified that:

- the disruption to the aircraft and foliage, coupled with the length of the wreckage trail, indicated that the aircraft had significant forward speed at impact
- the flaps were in the retracted position
- the aircraft had no evident pre-impact defects with the flight controls or aircraft structure
- the aircraft was intact prior to impact with terrain
- the engine had no obvious defects upon external examination, was free to rotate and had compression on all 4 cylinders
- the throttle setting was captured at an idle position (full out and bent to one side) during the accident sequence
- the propeller rotational damage signatures were minimal, indicating a low power setting
- both seats were in the full aft position.

Survivability aspects

General information

During the accident sequence, the cockpit area was completely disrupted due to significant impacts with trees, leading to the occupants' liveable space being compromised. For this reason, it was considered unlikely that the accident was a survivable event.

Flight notes and tracking overdue arrivals

The CASR Part 91 Manual of Standards (MOS) stated that for some types of visual flight rules (VFR) flights a pilot was required to submit a flight plan, nominate a SARTIME for arrival, or leave a flight note with a responsible person. These included air transport flights, a flight over water, a flight in a designated remote area, or a flight at night proceeding beyond 120 NM from the departure aerodrome. In other cases, a pilot could elect to submit a flight plan, nominate a SARTIME or leave a flight note.

If a flight note was left with a responsible person, then that person had to be over 18 years old, have access to at least 2 operative telephones, and satisfy the pilot that they know how to contact the Joint Rescue Coordination Centre (JRCC) and will do so immediately in the event that the pilot’s flight was overdue.

In summary, a flight note was not formally required for flights similar to that conducted in VH-CYO on the day of the accident. However, flight notes or another method of identifying if an aircraft is overdue is highly recommended.

The ATSB was informed that the Sunshine Coast Aero Club had a method of tracking estimated arrival times. That method involved instructors informing the aero club administration of estimated arrival times and aircraft movements. The ATSB noted that the instructor of VH-CYO did not inform the aero club administration about the estimated time of the aircraft’s return. It was considered likely that the instructor, being a contractor who had not worked with the aero club before, was not informed or aware that it was the aero club procedure to do so.

The aircraft accident occurred at 1122. It was scheduled to return to refuel at about 1200, and it was reported missing at about 1515 by the aero club chief pilot when the second student raised concerns about the aircraft not returning from its flight.

The post-mortem reports for the pilots indicated that the occupants’ chances of survival would not have improved if the location of the wreckage was identified sooner.

Emergency and personal locator beacons

The aircraft was not fitted with a fixed emergency locator transmitter (ELT), nor was it required to be under the current regulations.

ATSB research into the effectiveness of ELT’s in aviation accidents (AR-2012-128) stated that:

> Data from the ATSB database show that ELTs function as intended in about 40 to 60 per cent of accidents in which their activation was expected. Records of the Australian Maritime Safety Authority’s SAR incidents shows that search and rescue personnel were alerted to aviation emergencies in a variety ways including radio calls and phone calls, and that ELT activation accounted for the first notification in only about 15 per cent of incidents. However, these ELT activations have been directly responsible for saving an average of four lives per year.

A personal locator beacon (PLB) was identified on the accident site in an area that was away from and not likely to be located by the occupants of the aircraft (if they had survived the impact). The beacon was in date and passed a self-function test to indicate that it was serviceable.

The ATSB research report also mentioned PLBs with the following suggestion:

> …carrying a personal locator beacon (PLB) in place of or as well as a fixed ELT will most likely only be beneficial to safety if it is carried on the person, rather than being fixed or stowed elsewhere in the aircraft.

Aerodynamic spins

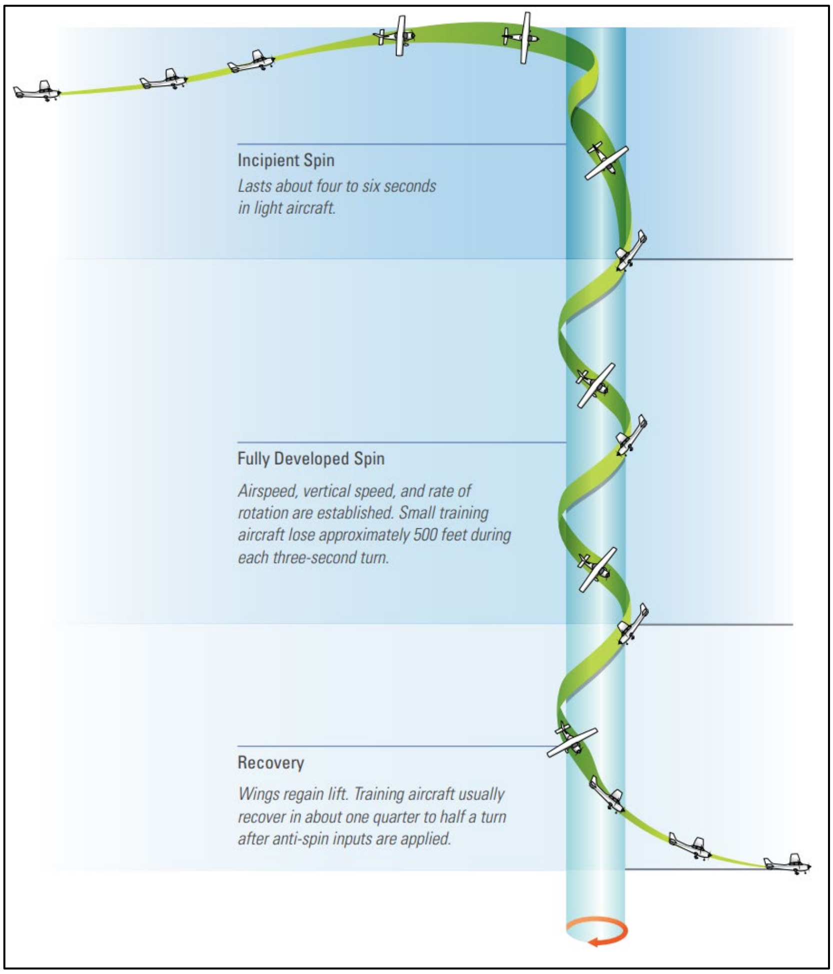
General description

An aerodynamic spin is a sustained spiral descent in which an aircraft's wings are in a stalled condition, with one wing producing more lift than the other. This difference in lift sustains the rotation and keeps the aircraft in the spin. The nose angle can also vary considerably. In a fully-developed, upright, left spin, an aircraft will simultaneously roll to the left while yawing to the left, making a vertical corkscrew path through the air. A spinning aircraft will descend more slowly than one in a vertical or spiral dive and it will also have a lower airspeed, which may oscillate.

Intentional spins are normally entered from a stall in straight and level flight, with the reduction in power, the application of full back elevator and full rudder in the intended direction of rotation at the moment of stall.

When entering a spin, an aircraft's motion through the air is irregular at first. This is known as the incipient phase of the spin. Though the nature of the incipient spin is heavily dependent on the aircraft type and the manner of entry, recovery may be more rapid and require less control input in this stage compared with recovery from a developed spin. After a number of rotations and depending on the aircraft type, loading, and control inputs, an aircraft in an incipient spin may then settle into a regular rotating descent, known as a developed spin. A spin may steepen (nose-down) or flatten (nose more horizontal) as it continues, potentially requiring different recovery techniques. Figure 9 shows the various stages from spin entry until recovery.

Figure 9: Various stages of a spin and recovery



Source: New Zealand Civil Aviation Authority, Spin avoidance and recovery

Recommended practices in preparation for spin

The CASA *Flight Instructor Manual: Aeroplane* stipulated:

> The aeroplane must be clear of inhabited areas and normally in an area designated for the practice of such exercises. In addition it should be at a height sufficient to ensure recovery by 3,000FT above ground level. The pre-spinning check will vary from aeroplane to aeroplane but will normally be similar to that used as a pre-stalling check in that particular aeroplane. In most aeroplanes flaps and undercarriage must be retracted during both the spin and spiral. … In all cases a 360° turn to ensure that all is clear around and below should be carried out immediately prior to commencing each exercise.

The information stipulated in the flight instructor's manual was commonly referred to by the acronym HASELL, which is:

- **H**eight – sufficient to recover by 3,000 ft AGL
- **A**irframe – wheels up / flaps up / CG ok / trim set
- **S**ecurity – seat belt tight / no loose items in aircraft or pockets
- **E**ngine – temperature and pressure / carburettor heat / mixture / fuel quantity and selection
- **L**ocation – aerobatic area / no built-up area or public gathering within 600 m / forced landing fields available
- **L**ookout – 360° turn or wingover.

Spin recovery techniques

Aircraft manufacturer spin recovery information

There was information provided by the aircraft manufacturer on spin recovery in 2 sections of the Cessna A150M Aerobat POH. This information was the same in each section, and the spin recovery technique stated that:

> Should an inadvertent spin occur, the following procedure should be used:
>
> 1) Retard throttle to idle position.
> 2) Place ailerons in neutral position.
> 3) Apply and <u>hold</u> full rudder opposite to the direction of rotation.
> 4) Just <u>after</u> the rudder reaches the stop, move the control wheel <u>briskly</u> forward far enough to break the stall. Full down elevator may be required at aft centre of gravity loadings to assure optimum recovery.
> 5) <u>Hold</u> these control inputs until rotation stops.
> 6) As the rotation stops, neutralise rudder and make a smooth recovery from the resulting dive.

It also stated that:

> Variations in basic airplane rigging or in weight and balance due to installed equipment or cockpit occupancy can cause differences in behaviour, particularly in extended spins. These differences are normal and will result in variations in the spin characteristics and in recovery lengths for spins of more than 3 turns. However, the above recovery procedure should always be used and will result in the most expeditious spin recovery.

Cessna also provided further information in a document tilted *Spin Characteristics of Cessna Models 150, A150, 152, A152, 172, R172 and 177*. Apart from reiterating the recovery procedure provided in the POH, it also stated information including:

> Basic Guidelines for Intentional Spins
>
> 1) Know your aircraft thoroughly.
> 2) Prior to doing spins in any model aircraft, obtain thorough instruction in spins from an instructor fully qualified and current in spinning <u>that model.</u>

PARE spin recovery method

The PARE spin recovery method is generic and typical of most light single engine aircraft types. PARE is an acronym that stands for:

- **P**ower, idle
- **A**ilerons, neutral (and flaps up)
- **R**udder, full opposite to the spin direction and held in that position
- **E**levator, forward

Hold these inputs until rotation stops, then:

- Rudder, neutral
- Elevator, easy pull to straight and level or climbing attitude.

A comparison between the Cessna A150 Aerobat recovery method and the PARE method indicated there was little difference between the 2 methods, with the exception that the Cessna method emphasised the use of the term 'briskly' in regards to the forward movement of the elevators, and that full forward elevator may be required.

Mueller/Beggs (emergency) spin recovery technique

The Mueller/Beggs recovery technique, sometimes referred to as the emergency spin recovery technique, was documented in an aerobatic article written by an aerobatic pilot, Eric Mueller, in the 1980s. The article stated that it was a technique designed to recover a Pitts Special aerobatic aircraft from an upright or inverted spin, even if the pilot was disorientated. The technique is as follows:

1. Power off
2. Remove your hands from the stick
3. Apply full opposite rudder
4. Neutralise the rudder and recover to level flight.

Another aerobatic pilot, Gene Beggs, popularised the recovery technique in a series of articles. Beggs' reference manual titled *Spins in the Pitts Special* stated:

> With this method you can quickly and easily recover from any spin in the Pitts Special. It is easy to remember and execute even if you are frightened or confused; furthermore, it is not necessary to know whether the spin is upright or inverted, the recovery is the same in either case.

In the Beggs course notes for advance spin recovery, the frequently asked questions section stated:

> The question I hear most is "Will the emergency spin recovery work on all aircraft?" No, not exactly! Although I have found it works beautifully in the vast majority of cases, there are rare exceptions. You may occasionally encounter a spin mode in some aircraft in which you must physically apply nose-down elevator. This is extremely rare, and I assure you it will never happen in a Pitts Special.

A newsletter titled *Spinoffs* written by Beggs in 1985 indicated that the author was informed by another pilot that a Cessna A150 Aerobat would not recover using the emergency recovery method (Meuller/Beggs method). Beggs decided to conduct some spin testing in a standard Cessna 150. The following is a summary of that testing:

- The aircraft would recover using the emergency recovery technique (hands off) in fully developed spins to the right.
- The aircraft would not recover using the emergency recovery technique in fully-developed spins to the left, no matter how many turns the aircraft was allowed to do.

- If the elevator was pushed forward briskly during the emergency recovery technique to the left, the aircraft would always recover promptly in one additional turn with pitch attitude almost perfectly vertically down.
- In spins both to the right and left, the use of opposite aileron (out spin aileron) would produce a recovery from the spin. This was opposite to the results obtained in all other aircraft types (that had been previously spun by Beggs).
- In the Cessna 150, the use of in-spin aileron always increased the rate of rotation and steepened the pitch attitude. This was also opposite to the results obtained in all other aircraft types.

Beggs stated having conducted thousands of emergency spin recoveries in numerous aircraft types. The Cessna 150 was one of the very few aircraft that required the application of full forward elevator to recover.

Regulatory requirements and guidance

The CASR Part 61 MOS, Volume 2, Section 6, Unit FAE-8 – Spinning, described the skills and knowledge required to execute and recover from an upright spin.

Unit FAE-8, element 4, titled *underpinning knowledge*, stated that the following items were required to be imparted to students:

> …
>
> (o) standard spin entry and recovery techniques for the aircraft being flown;
>
> (p) number of turns normally required for spin recovery in the aeroplane type;
>
> …
>
> (r) Mueller-Beggs spin recovery action and limitations on its application
>
> (s) ‘g’ and any other limitations applicable to spinning for the aeroplane type.

The Civil Aviation Aeronautical Publication (CAAP) 155-1(0) *Aerobatics* was issued in 2007. In relation to spin recovery, it stated:

> Modern aerobatic aircraft designs normally have predictable spin characteristics and respond to the standard spin recovery technique. However, older aircraft and non-certificated or amateur built aircraft may have special characteristics which require particular recovery procedures. Therefore, pilots need to be familiar with, and practised in, the spin recovery procedure specified for the particular aircraft type.

It also stated:

> Spin recovery procedures will vary between aircraft types and situations. The aircraft flight manual should be the final authority for spin recovery procedure…

The CAAP also discussed the Mueller/Beggs spin recovery method. The ATSB requested CASA’s interpretation on the Mueller/Beggs spin recovery limitations referenced in the MOS. It stated:

> Civil Aviation Advisory Publication (CAAP) 155-1(0) – Aerobatics, published January 2007 provides guidance to pilots on aerobatics operations. Section 7 - Risk management and TEM includes subsection 7.24 Mueller-Beggs Spin Recovery, which describes the Mueller-Beggs recovery technique and associated limitations. There is also reference to the techniques in the underpinning knowledge sections of the Units of competency in Appendix A of the CAAP from which the MOS references were drawn.
>
> As stated in 7.24.1, the main limitation, as is that it is known, is the technique is not effective in a number of aircraft types. 7.24.4 advises pilots to determine the extent to which the technique has been tested and found to be reliable in a particular aircraft type. It also states pilots wishing to test the procedure should also be familiar with the normal spin recovery procedure specified for the type.

> While 7.24.5 states the technique is not recommended, it may prove to be useful in the event a pilot becomes disoriented.
>
> Based on the above information CASA's opinion of the limitations of the Mueller-Beggs technique are:
>
> 1. Application of the technique may not be effective for the aircraft in which the training is conducted,
> 2. Use of the technique will likely delay the recovery from the spin and consequently increase the height lost, perhaps to a point recovery cannot be achieved,
> 3. The technique might be in conflict with the aircraft manufacturer's recommended technique.
>
> Reference to the technique is included in the CAAP to make pilots aware of its existence as an alternative recovery technique. In the event they become disoriented from high rates of rotation, which can be encountered in an upright or inverted spin, the technique might effect a recovery if other recovery techniques applied are unsuccessful.

Associated with a range of regulatory changes in December 2021, the CAAP was removed from the CASA website in January 2022.[6]

In April 2020, CASA issued Advisory Circular AC 61-16 v1.0 (*Spin avoidance and stall recovery training*). In addition to a variety of other guidance, it stated:

> Before selecting an aircraft for stalling or spinning training, consult with the manufacturer and other users to establish what manoeuvres are safe to conduct, including steep turns, stalls, stalls with a wing drop and spinning.

It also stated that, prior to spinning any aircraft, pilots should:

- Comply with aircraft flight manual weight and balance and manoeuvre limitations, placards and, if provided, procedures and advice for each intended manoeuvre…
- Obtain thorough instruction in spins from an instructor fully qualified and current in spinning that model…
- Enter each spin at a high altitude. Plan recoveries to be completed well above the minimum legal altitude…
- Conduct all spin entries and recoveries in accordance with the procedures recommended by the manufacturer...

In the guidance for instructors, it stated:

- Ensure the aircraft is operated in accordance with the aircraft flight manual limitations and entry and recovery procedures for manoeuvres including stalling and spinning…
- Recognise and avoid the potential for negative training with a clear understanding of what the desired training outcome is for the lesson. The latent effects of negative training can stay with a pilot throughout their career…

The effects of centre of gravity on spins

The CASA *Flight Instructor Manual: Aeroplane* included a section for spins and how it is affected by the CG. It stated:

> The effect of the position of the Centre of Gravity (CG) must be pointed out to the student if movement of this position within the limits laid down has a great effect on the spinning characteristics of the aeroplane. Normally a forward CG results in a steeper spin with a high rate of descent. A forward CG makes recovery much easier and may even prevent a spin altogether, resulting in a spiral dive. An aft CG tends to flatten the attitude resulting in a lower rate of descent. The recovery action to be taken when an aeroplane is spinning in a flat attitude is the same as the normal recovery technique with respect to the actual control movements. However, in the flat spin case it is essential to ensure that

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[6] CASA advised that the CAAP was intended to be replaced by AC 61-18 Aerobatics.

full control movement is applied in the recovery action and that this is maintained if necessary, for a much longer period than normal. In some aeroplanes it takes many turns to recover from a flat spin.

Related occurrences

Cessna A150 Aerobat (VH-CYO), Cairns, Australia, December 1995

The ATSB received a report from a previous pilot of VH-CYO about an incident that occurred in the aircraft involving a flat spin. The incident occurred near Cairns Airport in December 1995. A summary of that event was as follows:

- On the day of the incident, the aircraft (VH-CYO) was being operated as an aerobatic aircraft with a student and instructor on board. The purpose of the day's instructional flights was stalls, spins and spin recoveries.
- On the day of the training sequence, air traffic control (ATC) clearance was obtained to operate between 5,000 ft and 3,000 ft AMSL.
- The spin training exercise commenced at 5,000 ft and consisted of showing recovery, student follow through, and finally student completing the entry and recovery.
- As a final exercise, the student was instructed to commence the spin at about 5,000 ft, to allow the 'spin' to fully develop and recover from the spin when instructed.
- The instruction to recover was given at about 4,300 ft and the student was observed to apply the correct Cessna A150 POH recovery technique. However, the aircraft failed to recover from the spin. The instructor took control of the aircraft and applied the POH spin recovery method, but the aircraft failed to recover from the spin.
- As the aircraft descended towards the cleared level of 3,000 ft, the instructor believed the aircraft would not respond to the POH recovery method and may had entered a flat spin. The instructor attempted to force the nose down by commencing a backwards and forwards full deflection of the elevator motion. That action did not assist, so the instructor coordinated full throttle acceleration to elevator deflection with the thought that it might assist in getting a nose-down attitude.
- The instructor regained some control of the aircraft as it passed 1,000 ft, with the aircraft exiting the spin and entering a spiral dive. At approximately 700 ft, recovery from the resulting dive was completed, ATC was advised that the aircraft had flown below the minimum specified altitude, and a clearance was obtained to return to Cairns Airport.

A subsequent engineering inspection, which included a check of the aircraft rigging, did not identify any defects.

The instructor of the 1995 flight advised the ATSB that, after some consideration, they believed that the issue was most likely one of a rear centre of gravity in the loading of the aircraft. The instructor stated that they were 182 cm and about 85 kg, with the student being at least 188 cm and about 90–95 kg. Both seat positions were adjusted to the rear stop and the fuel load was from memory sufficient for about 3.0 hours total.

The instructor of the 1995 flight stated that they had spoken to 2 other pilots, who had detailed that, while conducting spinning together in another C150, they had experienced difficulty in exiting a planned spin, and their experience seemed to have been very similar to what the instructor encountered.

Cessna 152 accident, Concord, United States, 29 January 2018

A Cessna 152 aircraft, registered N93316, lost control and impacted terrain, fatally injuring the pilot. A subsequent inspection of the aircraft identified that one of the rudder cables had failed and the other had frayed to a point where about 50% of the strands had fractured.[7]

[7] National Transportation Safety Board investigation WPR18FA075

Safety analysis

Introduction

Radar data indicated that, while being used to conduct spin training, the Cessna A150 Aerobat (VH-CYO) entered a spin at 5,800 ft above ground level and the spin was not fully recovered before the aircraft impacted terrain. Site and wreckage examination indicated that the aircraft had significant forward velocity, a low angle of entry, and the throttle was captured in the idle position. Those items of evidence indicated that the aircraft was most likely in the initial stages of recovery from the spin when the aircraft impacted terrain.

In previous training with the student on board, the instructor had demonstrated each manoeuvre before handing control to the student. The accident occurred during the first manoeuvre of the training session, and the ATSB was unable to ascertain which of the 2 pilots (instructor or student) was controlling the aircraft at various stages of the spin and for the initiation of the recovery.

This analysis discusses several possible reasons for the aircraft not being fully recovered from a spin before impacting terrain. These include:

- mechanical failure
- flight control obstruction
- aft centre of gravity and flat spin
- pilot incapacitation
- interference with the controls
- incorrect recovery technique.

Potential scenarios to explain absence of recovery from spin

Mechanical failure

A failure of the aircraft structure, the flight control system, or a rudder locking past the rudder stops have contributed to aircraft accidents in the past. However, examination of the aircraft structure and flight controls of the aircraft did not reveal any pre-impact defects. The aircraft also had a modification incorporated to prevent the rudder-stop locking issue that had contributed to some previous Cessna 150 accidents.

Further, there was evidence that the aircraft was in the early stages of recovery from the spin, which indicated that whatever had delayed the recovery had been overcome prior to impacting terrain.

Overall, it was considered unlikely that some type of mechanical failure of the flight controls contributed to the accident. However, due to the disruption and displacement of the wreckage, the ATSB was unable to completely rule out the possibility of a mechanical issue.

Flight control obstruction

Aircraft accidents have previously occurred where foreign object obstruction has led to flight controls becoming locked, preventing the pilots from controlling their aircraft. If an object had locked the controls of VH-CYO, the initial stages of the recovery evident before impact with terrain would indicate that the controls became unlocked, or more controllable, during the final stages of the descent.

The examination of the aircraft did not reveal any issues in relation to flight control locking due to foreign object fouling. However, due to the disruption and displacement of the wreckage, the ATSB was unable to rule out the possibility of a flight control obstruction, but it was considered to be unlikely.

Aft centre of gravity and flat spin

The further aft the aircraft's centre of gravity is, the more difficult it may be to lower the nose in order to recover from a spin. In this case, the aircraft was slightly over the maximum allowable take-off weight (MTOW) for the entire flight. Regarding the aircraft loading and centre of gravity (CG), and after interpolating the data (as the aircraft was outside its weight limit), it was considered to be within the desired CG range, trending towards aft of nominal.

It is possible that the spin entry or recovery actions created a flat spin, where the nose was comparatively high compared to a normal spin (with the nose slightly down). This can be exacerbated by an aft CG and can make the aircraft slower to respond to recovery techniques. Previous incidents in the same aircraft type have shown that flat spins can be very difficult to recover, even when the appropriate recovery technique is applied for an extended period.

In summary, it is possible that the aircraft entered a flat spin that was unable to be fully recovered, and that the aft CG may have exacerbated the difficulty in recovering from the spin. However, there was insufficient evidence to conclude that this occurred.

Pilot incapacitation

Both of the pilots were reported to be well at the time of the accident, and the pre and post-accident medical information did not identify any conditions or issues with either pilot that may have contributed to the accident. Also, as previously noted, the aircraft was most likely in the initial stages of recovery from the spin when the aircraft impacted terrain. Accordingly, the ATSB considered it unlikely that pilot incapacitation contributed to the accident.

Interference with the controls

The Cessna A150 Aerobat is a dual control aircraft. If an inexperienced pilot were to 'freeze' at the controls or make other inappropriate flight control inputs, it may be difficult for the instructor to regain control of the aircraft.

As previously noted, it was not possible to ascertain which of the 2 pilots (instructor or student) was controlling the aircraft at various stages of the spin and for the initiation of the recovery. In addition, during the previous week, the student conducted steep turns, stall recovery, loops, and barrel and aileron rolls. The student had also done a small amount of aerobatics several years before the accident and had a reasonable amount of flight experience. Overall, none of the available evidence indicated that the student was susceptible to freezing at the controls or making other inappropriate flight control inputs.

Incorrect recovery technique

The instructor owned, was trained on, and had significant aerobatic experience in the Pitts Special aerobatic aircraft. However, the ATSB could not identify any aerobatic experience for the instructor in the Cessna A150 Aerobat or similar variants, apart from the previous week's instructional activities with the same students. That training did not include spin entry and recovery techniques.

The aircraft manufacturer's guidance document on spin characteristics stipulated that, if the instructor was unfamiliar with the aircraft type's spin characteristics, then they should obtain thorough instruction in spins from an instructor qualified and current in spinning that particular model aircraft. The Civil Aviation Safety Regulation (CASR) Part 61 Manual of Standards (MOS) stated that underpinning knowledge for spin training included the standard spin entry and recovery techniques for the aircraft being flown. Other CASA guidance highlighted the importance of being familiar with the spin recovery method specific to the aircraft type. However, the ATSB could not identify if the instructor had sought additional information about the Aerobat's spin characteristics. It is possible that, due to the instructor's general familiarity and experience on a similar, non-aerobatic variant (the Cessna 152), they did not consider that recovery techniques successfully utilised on other aircraft types would not work equally as effectively on the Cessna A150 Aerobat.

The theoretical spin recovery training conducted by the instructor on the morning of the accident included 2 recovery methods; namely the PARE and Mueller/Beggs methods. The PARE method was closely aligned with (but not exactly the same as) the method described in the Cessna A150 Aerobat *Pilot's Operating Handbook* (POH) and the Cessna guidance document. The Mueller/Beggs method has proven to be a very effective method of spin recovery in most aircraft types, though there are a few aircraft types that will not recover using this method. The Cessna A150 Aerobat and similar variants are aircraft types that most likely will not recover from a spin to the left, as was the case in this accident.

The Part 61 MOS stated that the instructor should teach the students the method of recovery in the aircraft type that they will be operating in. It also stated that the limitations of the Mueller/Beggs method should also be discussed. However, according to the second student who received the theoretical instruction, the instructor did not highlight to the student's what recovery method was recommended in the POH, or that the Aerobat would not recover utilising the Mueller/Beggs technique.

Further, the instructor informed the students to write down both methods of recovery (Mueller/Beggs and PARE) on a piece of paper for reference during the flight. The second student was of the firm belief that they would be conducting both methods of spin recovery in the Aerobat, with the first method written down being the Mueller/Beggs method.

The ATSB considered it likely that the instructor was not aware or did not recall that the Aerobat would not recover utilising the Mueller/Beggs method in a spin to the left. Further, the evidence indicates that the instructor intended to utilise both methods of recovery in 2 separate spin sequences on the accident flight.

If the Mueller/Beggs method was being used for the first exercise, it would provide a viable explanation of the accident sequence. However, based on the available evidence, the ATSB was unable to establish if the Mueller/Beggs method was being utilised at the time of the accident, or if it contributed to the delayed recovery time.

Survival aspects

Management of overdue aircraft

Due to the nature of the impact, the accident was not survivable. However, the investigation noted that there were potential areas for improvement that could be relevant in other situations.

The Sunshine Coast Aero Club had a common practice for flight instructors to log an estimated arrival/return time with the aero club's administrator prior to departing for a flight. However, that procedure was not utilised on the day of the accident. The ATSB considered it likely that the contracted flight instructor was not informed of the procedure and therefore did not inform the administrator of their estimated time for return. As a consequence, the aero club did not discover that the aircraft was overdue for some time, and subsequently reported the aircraft missing about 3 hours after it was due to return.

Although there is no regulatory requirement to do so for many types of flights under the visual flight rules, a standardised method to identify if an aircraft is missing would decrease the amount of time for the Joint Rescue Coordination Centre to be notified and for a subsequent search for the aircraft to commence.

Emergency locator transmitter and portable locator beacons

The aircraft was not fitted with a fixed emergency locator transmitter (ELT). Although a fixed ELT is not a regulatory requirement, they are an effective safety feature that have been shown to significantly reduce the amount of time between an aircraft accident and identifying the location of the aircraft by search and rescue.

A portable locator beacon (PLB) was identified in an area away from the aircraft occupants that would not likely have been located without an extensive search. Carrying a PLB would be much more beneficial to safety if it is carried on the person, rather than being fixed or stowed elsewhere in the aircraft.

Findings

ATSB investigation report findings focus on safety factors (that is, events and conditions that increase risk). Safety factors include ‘contributing factors’ and ‘other factors that increased risk’ (that is, factors that did not meet the definition of a contributing factor for this occurrence but were still considered important to include in the report for the purpose of increasing awareness and enhancing safety). In addition, ‘other findings’ may be included to provide important information about topics other than safety factors.

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

From the evidence available, the following findings are made with respect to the collision with terrain accident involving Cessna A150 Aerobat registered VH-CYO on 23 June 2021.

Contributing factors

- While the student and instructor were conducting aerobatic spin training starting at 5,800 ft above ground level, for reasons that could not be established, the aircraft did not fully recover from a spin before impact with terrain.

Other factors that increased risk

- It is likely that the aerobatics instructor had no flight experience conducting spinning and/or spin instruction in the Cessna A150 Aerobat or similar variants. It was also considered probable that they did not seek advice from an experienced aerobatic instructor on the A150 type about the aircraft’s spin characteristics.
- The spin training theory provided by the instructor to the 2 aerobatics students was generic in nature, and did not highlight the limitations of the Mueller/Beggs spin recovery technique or provide guidance on the method recommended in the Cessna A150 *Pilot’s Operation Handbook*, as stipulated in the Civil Aviation Safety Authority aerobatic instruction procedures and guidance material.
- It was likely that the aerobatics instructor intended to practice the Mueller/Beggs method of spin recovery during the accident flight in the Cessna A150 and was likely unaware that the aircraft type was one of the few types that would not recover from a spin to the left utilising that technique.
- On the day of the accident the aircraft operator was not utilising a flight following procedure to identify if an aircraft was overdue, nor were they required to under the current regulations. Therefore, the overdue aircraft was not identified and reported as missing for 3 hours after it was due to return.

Other findings

- The aircraft structure and flight controls were examined, and no pre-impact defects were identified.
- It could not be determined which pilot was controlling the aircraft during the various stages of the accident flight and spin recovery.
- The aircraft was not fitted with a fixed emergency locator transmitter, nor was one required by the regulations. Fixed emergency locator transmitters have been shown to be an effective safety feature to reduce the amount of time taken to identify an aircraft’s location, even if the occupants are incapacitated.

Safety action

Safety advisory notice

Safety advisory notice to aerobatic pilots and instructors

SAN number:	AO-2021-025-SAN-001

The ATSB strongly encourages all aerobatic pilots and aerobatics flight instructors to be aware:

- the Mueller/Beggs method of spin recovery does not recover all aircraft types from a spin
- the Mueller/Beggs spin recovery method limitations should be emphasised during spin theory training
- the Mueller/Beggs method of spin recovery will not recover a Cessna A150 Aerobat or similar variants from a spin in some circumstances
- they should review the pilot's operating handbook of the aircraft type that they intend to operate for the recommended spin recovery technique
- prior to doing spins in any model aircraft, they should obtain instruction and/or advice in spins from an instructor who is fully qualified and current in spinning that model.

General details

Occurrence details

Date and time:	23 June 2021 at 11:22 Australian Eastern Standard Time	
Occurrence class:	Accident	
Occurrence categories:	Collision with terrain	
Location:	Peachester, QLD	
	Latitude: 26°51'17.42 S	Longitude: 152°50'6.70 E

Aircraft details

Manufacturer and model:	Cessna A150M Aerobat	
Registration:	VH-CYO	
Operator:	Sunshine Coast Aero Club	
Serial number:	A1500655	
Type of operation:	Flying Training	
Activity:	Instructional flying	
Departure:	Sunshine Coast Airport	
Destination:	Sunshine Coast Airport	
Persons on board:	Crew – 2	Passengers – 0
Fatalities:	Crew – 2	Passengers – 0
Aircraft damage:	Destroyed	

Glossary

AC	Advisory circular
AGL	Above ground level
AMSL	Above mean sea level
ATC	Air traffic control
CAAP	Civil aviation advisory publication
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulations
CFI	Chief flying instructor
CG	Centre of gravity
ELT	Emergency locator transmitter
IAS	Indicated airspeed
MOS	Manual of standards
MTOW	Maximum take-off weight
PARE	Spin recovery method that is generic and typical of most light single engine aircraft types
PLB	Personal locator transmitter
POH	Pilot operating handbook
VFR	Visual flight rules

Sources and submissions

Sources of information

The sources of information during the investigation included the:

- Sunshine Coast Aero Club
- student pilot who underwent theoretical and practical training with the instructor
- the instructor’s aerobatics instructor
- Civil Aviation Safety Authority
- Queensland Police Service
- aerobatic subject matter experts
- Airservices Australia.

References

ATSB Research Investigation AR-2012-128, *The effectiveness of emergency locator transmitters in aviation accidents*.

New Zealand Civil Aviation Authority (2014) *Spin avoidance and recovery*.

Experimental Aircraft Association Inc. (1985) ‘Spinoffs-Gene Beggs’*, International Aerobatic Club Sport Aerobatics Magazine*.

Beggs G (2001) *Aerobatics with Beggs: Spins in the Pitts Special (A guide and reference manual for aerobatic instructors and students).*

Submissions

Under section 26 of the *Transport Safety Investigation Act 2003*, the ATSB may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. That section allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to the following directly involved parties:

- the Sunshine Coast Aero Club
- the student pilot
- the instructor’s aerobatic instructor
- the Civil Aviation Safety Authority (CASA)
- the aircraft manufacturer.

A submission was received from CASA. The submission was reviewed and, where considered appropriate, the text of the report was amended accordingly.

Australian Transport Safety Bureau

About the ATSB

The ATSB is an independent Commonwealth Government statutory agency. It is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers.

The ATSB's purpose is to improve the safety of, and public confidence in, aviation, rail and marine transport through:

- 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, as well as participating in overseas investigations involving Australian-registered aircraft and ships. It prioritises investigations that have the potential to deliver the greatest public benefit through improvements to transport safety.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, international agreements.

Purpose of safety investigations

The objective of a safety investigation is to enhance transport safety. This is done through:

- identifying safety issues and facilitating safety action to address those issues
- providing information about occurrences and their associated safety factors to facilitate learning within the transport industry.

It is not a function of the ATSB to apportion blame or provide a means for determining 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. The ATSB does not investigate for the purpose of taking administrative, regulatory or criminal action.

Terminology

An explanation of terminology used in ATSB investigation reports is available on the ATSB website. This includes terms such as occurrence, contributing factor, other factor that increased risk, and safety issue.