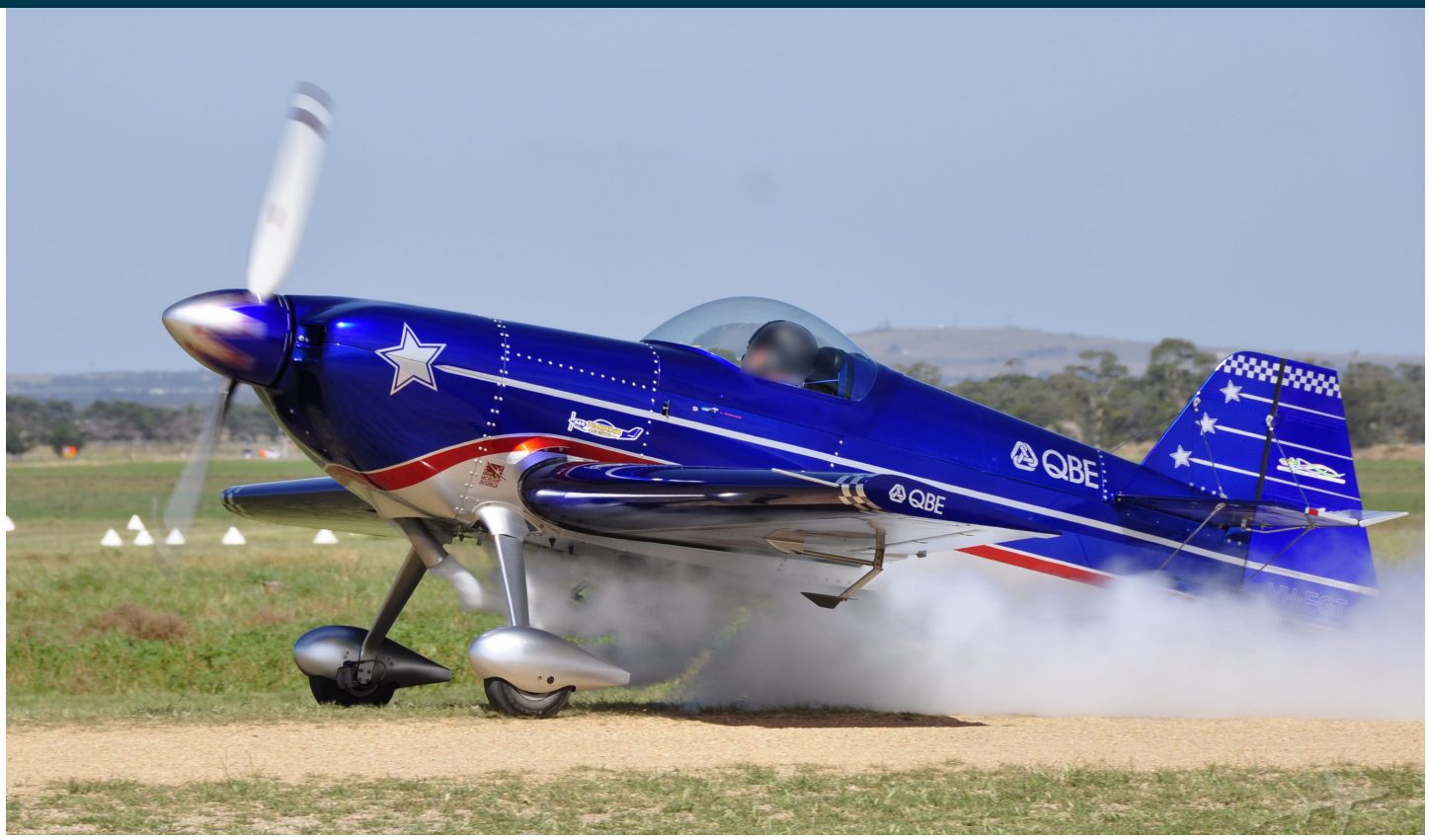
Australian Government
Australian Transport Safety Bureau

Collision with terrain involving One Design DR-107, VH-EGT

Goolwa Airport, South Australia | 10 October 2014



Investigation

ATSB Transport Safety Report
Aviation Occurrence Investigation
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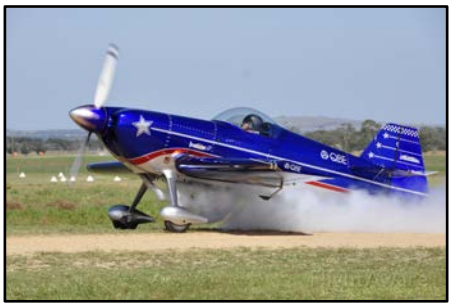
Addendum

Page	Change	Date

Safety summary

What happened

VH-EGT



Source: FlightAware

On the afternoon of 10 October 2014, the pilot of an amateur-built One Design DR-107 aircraft, registered VH-EGT, was performing low-level aerobatic manoeuvres. The manoeuvres were being performed to the east of Goolwa Airport, South Australia.

Witnesses described the aircraft performing a series of similar manoeuvres. Each involved a vertical climb and tumbling manoeuvre followed by a vertical dive and a low-altitude recovery.

Witnesses reported that, during recovery from the last vertical dive, the aircraft collided with terrain. The aircraft was destroyed by the impact and the pilot was fatally injured.

What the ATSB found

The ATSB found no evidence of pilot incapacitation or a mechanical fault with the aircraft that could have contributed to the accident. There was insufficient evidence to determine why the recovery was not accomplished above the pilot's minimum-authorised aerobatics height.

The Civil Aviation Safety Authority (CASA) recommends that pilots performing low-level aerobatics undertake regular peer reviews due to the high level of skill and fine safety margins involved. The ATSB found no evidence of the pilot undertaking a peer review of their aerobatic performance in the 15 months prior to the accident.

Finally, the ATSB identified a safety issue that CASA does not require builders of amateur-built experimental aircraft to produce a flight manual, or equivalent, for their aircraft following flight testing. Without a flight manual, the builder, subsequent owners and other pilots do not have reference to the operational and performance data necessary to safely operate the aircraft.

What's been done as a result

In response to the identified safety issue, the ATSB has issued a safety recommendation to CASA to take action to require builders of amateur-built experimental aircraft to produce a flight manual, or equivalent, for their aircraft following flight testing.

Safety message

This accident highlights the risks inherent in performing low-level aerobatics. Applying the recommendations in CASA civil aviation advisory publication CAAP 155-1(0) *Aerobatics* will reduce these risks. Specifically, pilots are encouraged to always maintain minimum approved heights above the ground when performing aerobatics and to engage in regular peer reviews.

Owners of amateur-built experimental aircraft are also encouraged to ensure a comprehensive and accurate flight manual, or equivalent, is available for reference by themselves, subsequent owners and other pilots who may fly the aircraft.

Contents

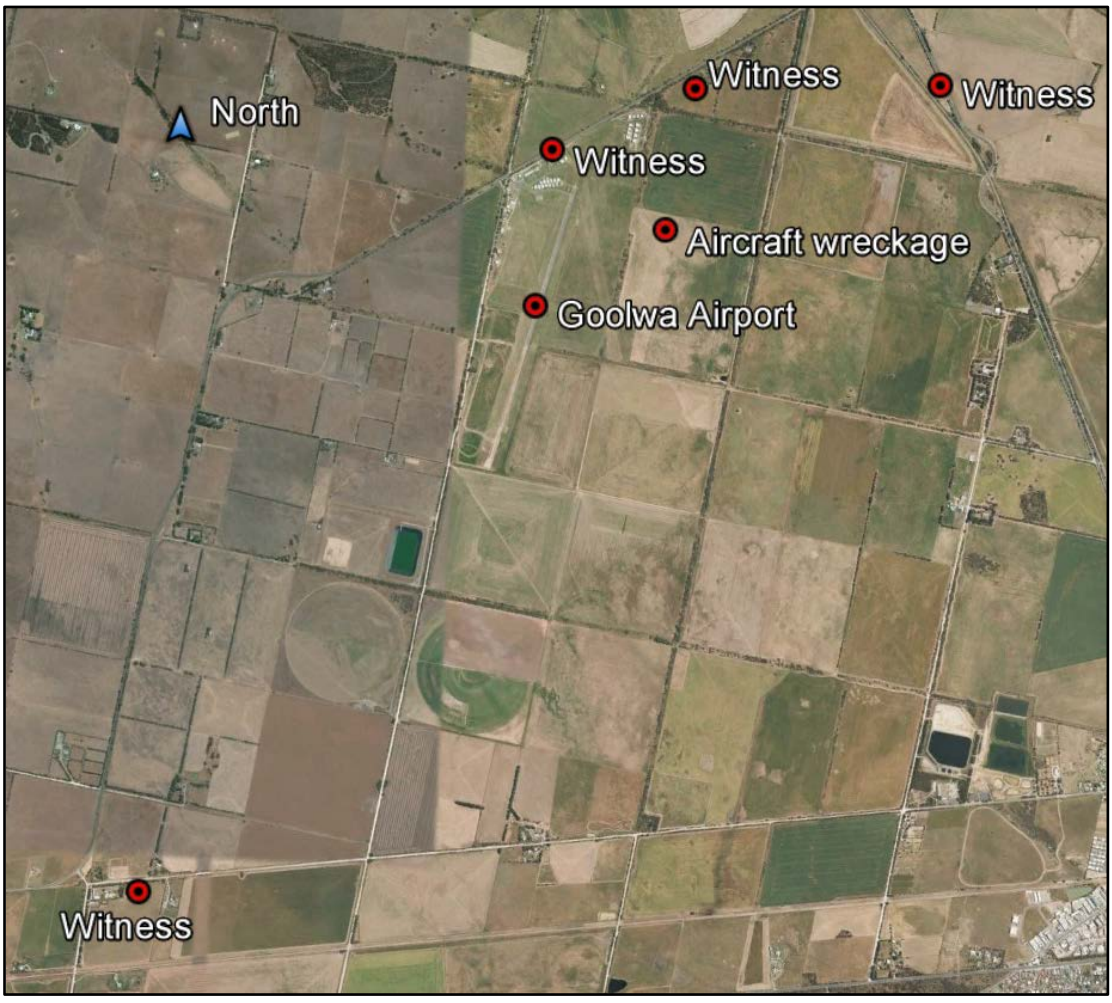
The occurrence

On the afternoon of 10 October 2014, the pilot of an amateur-built One Design DR-107 (DR-107) aircraft, registered VH-EGT (EGT), was performing low-level aerobatic manoeuvres to the east of Goolwa Airport, South Australia. The aerobatics were observed by a number of witnesses and described as consisting of a series of repeated manoeuvres. Specifically, the aircraft was seen to conduct a number of vertical climbs and tumbling manoeuvres, followed by a vertical dive and a low altitude recovery.

Witnesses observed that as the aircraft started to recover from a vertical dive it collided with terrain. The two witnesses furthest from the aircraft reported that the aircraft was rolling or spiralling while in the final vertical dive. By contrast, the two closest witnesses reported the aircraft was not rolling or spiralling during the final vertical dive.

The collision occurred at about 1430 Central Daylight-saving Time[1] in a paddock to the east of Goolwa Airport (Figure 1). Emergency services received a telephone call from a witness to the accident at 1431. Police, fire and ambulance personnel arrived at the accident site by 1443. The aircraft was destroyed by the impact and the pilot was fatally injured.

Figure 1: Goolwa Airport showing the location of the aircraft wreckage and witness locations. The runway is oriented basically north/south



Source: Google earth, modified by the ATSB

[1] Central Daylight-saving Time (CDT) was Coordinated Universal Time (UTC) + 10.5 hours.

Context

Pilot information

The pilot held a Private Pilot (Aeroplane) Licence, issued in March 1983, with the appropriate aircraft endorsements to operate a DR-107-type aircraft. The pilot also held a valid and unrestricted Class 2 Aviation Medical Certificate, issued by the Civil Aviation Safety Authority (CASA).

The pilot's last recorded biennial aeroplane flight review was on 4 September 2013. Entries in the pilot's logbook recorded a total flying experience of 993 hours to 20 September 2013. There were no further entries in the pilot's logbook after this date. The pilot had logged a total of 201.8 hours in EGT to 20 September 2013. From that date, entries in EGT's maintenance release indicated the pilot flew the aircraft for a further 16.8 hours. It could not be determined if the pilot flew any aircraft other than EGT after 20 September 2013.

In November 1990 the pilot was assessed as competent, by a CASA Approved Testing Officer, to recover from spins in a Cessna 152-type aircraft and to perform basic aerobatic manoeuvres. The manoeuvres included loops, aileron rolls, slow rolls, barrel rolls and stall turns.

In order for CASA to grant a low-level aerobatics approval, pilots were required to demonstrate proficiency at progressively lower levels. The pilot was granted progressively lower low-level aerobatics approvals as follows:

- in August 2009, the pilot was found competent to recover from inverted spins and to perform low-level aerobatics down to 500 ft above ground level[2]
- in August 2011, the pilot was found competent to perform low-level aerobatics down to 330 ft and to perform non-aerobatic manoeuvres down to 100 ft.

In August 2013 CASA renewed the pilot's low-level aerobatics approval for a further 2 years. The pilot's continued competence to perform low-level aerobatics was not re-assessed prior to this renewal.

The pilot exceeded the recommended minimum recent experience for low-level aerobatics contained in Civil Aviation Advisory Publication (CAAP) 155-1(0) *Aerobatics*.

Aircraft Information

General

The aircraft was a single-seat, low-wing, fixed-gear, amateur-built[3] aircraft designed for competition aerobatics (Figure 2). Entries in the aircraft's logbook indicated that the pilot commenced construction of the aircraft as an amateur builder in October 2003. The aircraft was completed in March 2008. A CASA authorised person issued a special certificate of airworthiness in the experimental category on 13 March 2008.

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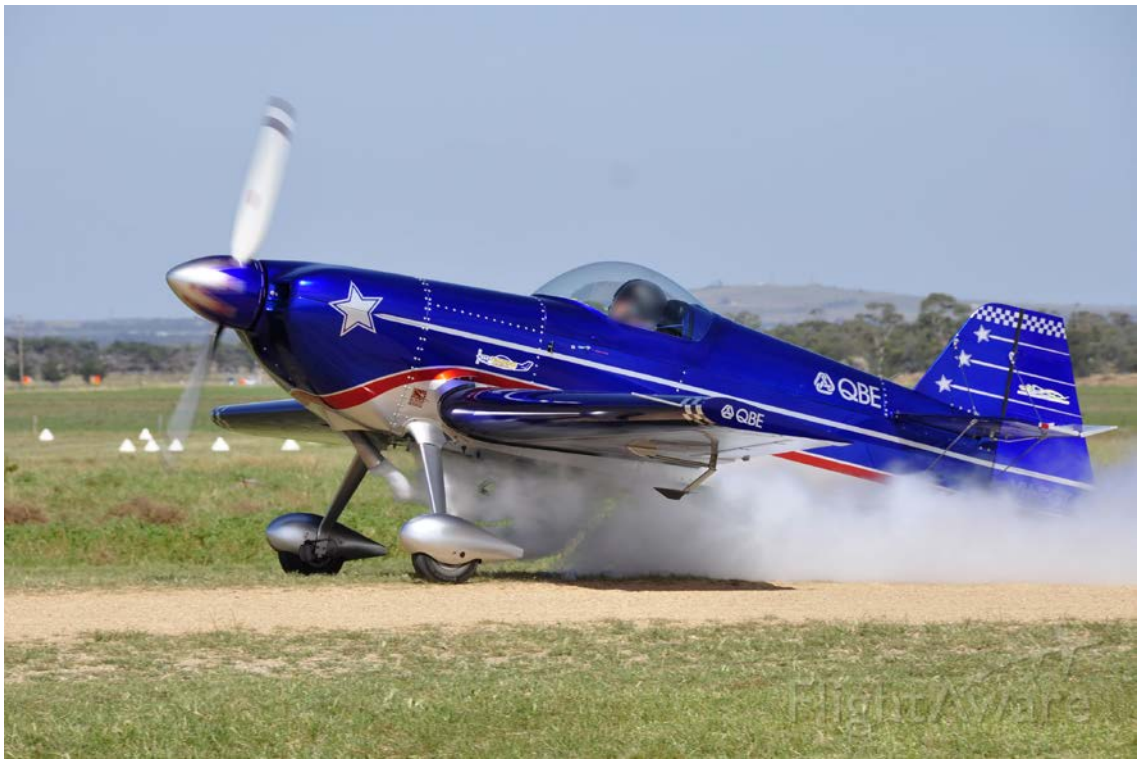
2 Unless indicated otherwise, aerobatic heights are above ground level.

3 An amateur-built aircraft is an aircraft, the major portion of which has been fabricated and assembled by a person or persons who undertook the construction project solely for their own education or recreation.

Figure 2: VH-EGT



Source: FlightAware

The last entry in the aircraft's maintenance records was the removal, by the pilot,[4] of the propeller and engine in September 2013. The pilot removed the engine and propeller from the aircraft for overhaul following a propeller overspeed. There was no record of the engine and propeller overhaul or subsequent installation in the aircraft. There was also no record of the last annual inspection performed on the aircraft.

On 14 January 2014, the pilot issued a maintenance release that was valid for 12 months. This allowed the aircraft to be operated privately under the day visual flight rules.[5] The aircraft flew for 16.8 hours between 14 January 2014 and the accident. No defects or unserviceable equipment endorsements were recorded on the maintenance release.

Aircraft weight and balance

The pilot, as builder of the aircraft, determined the aircraft's empty weight and balance limits and produced a weighing summary document in March 2008. The empty weight was recorded to be 475 kg. The ATSB found no record of a maximum take-off weight (MTOW) in the aircraft's records or the CASA aircraft file. No flight manual or placards relating to the aircraft's weight and balance were found.

The kit supplier of the plans and building materials for the aircraft specified an empty weight of 322 kg and a MTOW of 517 kg. The aircraft's weighing summary contained an aerobatic weight of 610 kg, which is 93 kg above the kit supplier's listed MTOW. CASA allowed builders of amateur-built experimental aircraft to nominate their own MTOW. However, builders are required to demonstrate that their aircraft are safe to fly at their nominated MTOW during flight testing.

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[4] Amateur builders are permitted to maintain their aircraft and to issue maintenance releases subject to the conditions in CASA *Instrument number CASA 33/13*.

[5] Visual flight rules (VFR) are a set of regulations that allow a pilot to only operate an aircraft in weather conditions generally clear enough to allow the pilot to see where the aircraft is going.

Logbook entries indicated that the aircraft was test flown at approximately 610 kg on 1 and 2 June 2008.

The aircraft designer determined that the aircraft was capable of withstanding a flight load factor of plus or minus 10 g[6] at a weight of 454 kg. Operations at weights above this required a corresponding decrease in the maximum flight load factor. This included a corresponding reduction in the aircraft's maximum manoeuvring speed (V_A).[7] The ATSB determined that the manoeuvring speed on the aircraft's airspeed indicator was marked appropriately for a 610 kg aerobatic weight. The V_A marking on the airspeed indicator, in the absence of a flight manual, indicated the application of a reduced flight load factor limit.

The ATSB surveyed DR-107 owners on the Australian civil aircraft register to place the aircraft's MTOW in context with other aircraft of the same type. Reported empty weights varied from 408 kg to 493 kg. MTOWs varied from 550 kg to 669 kg. One responder stated that their aircraft did not have a MTOW.

Flight Manuals

The ATSB found no evidence that a flight manual or equivalent placarding was produced for the aircraft. A flight manual documents emergency procedures, systems information, operational and performance data necessary to safely operate an aircraft. For certified aircraft,[8] a flight manual is produced by the aircraft manufacturer for use by any pilot who flies the aircraft. For an amateur-built experimental aircraft, the builder of the aircraft is considered the manufacturer.

As each amateur-built aircraft is unique, CASA requires the builder to test their aircraft following construction. The purpose of flight testing is to determine that the aircraft is safe to fly and to determine the aircraft's flight limits and performance characteristics. CASA recommends, but does not require, builders of amateur-built experimental aircraft to produce a flight manual for their aircraft following flight testing.

The ATSB's survey of DR-107 owners indicated that half of the responders did not have a flight manual. The owners without a flight manual were not the builders of their aircraft, having purchased their aircraft from the builder or a subsequent owner.

Meteorological information

The Bureau of Meteorology did not provide observations or forecasts for Goolwa Airport. The area forecast[9] covering Goolwa Airport indicated that a trough would pass over the airport from the south-west at around the time of the accident. Low altitude winds were forecast to change from the north-west to the south-west as the trough passed.

Weather observations from nearby Victor Harbour and Hindmarsh Island indicated that the trough passed Goolwa at least 2 hours before the accident.

Witnesses at Goolwa Airport reported that the weather was fine and sunny with good visibility at the time of the accident. Witnesses also reported a 'strong wind' coming from the south-west. Due to low terrain to the south-west of Goolwa Airport, the presence of mechanical turbulence was considered unlikely.

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6 G Load is the nominal value for acceleration. In flight, g load values represent the combined effects of flight manoeuvring loads and turbulence. This can be a positive or negative value.

7 Manoeuvring speed (V_A) is the speed above which full deflection of the flight control(s) will exceed aircraft structural limitations.

8 A certified aircraft has a Certificate of Airworthiness issued by CASA stating that the aircraft type meets all requirements on grounds of safety.

9 Australia is subdivided into a number of aviation forecast areas.

Wreckage and impact information

On-site examination

The accident site was in a flat, recently-harvested paddock adjacent to Goolwa Airport. The aircraft collided with terrain approximately 400 m east of the northern end of runway 01/19.[10] The wreckage trail was approximately 45 m long on a bearing of 115°. The length of the wreckage trail, combined with the initial ground impact mark and damage to the aircraft, indicated an impact at relatively high vertical and horizontal speed. Ground impact marks and aircraft damage further indicated that the aircraft collided with terrain in a wings-level, slightly nose-down pitch attitude (Figure 3).

Figure 3: Initial ground scar

Source: ATSB

Fuel-soaked soil was identified under the wreckage, indicating that the aircraft's fuel tank contained fuel prior to its disruption during the impact sequence. No evidence was found of any fault with the aircraft that could have contributed to the accident.

Propeller ground impact marks, blade dispersion and damage was consistent with the engine operating under power at the time of the accident. Witness reports of engine noise were consistent with the engine operating normally up to the collision with terrain. There was no evidence of an in-flight fire or break-up.

The aircraft was not fitted with a fixed emergency locator transmitter, nor was it required to be by regulation.

[10] Runways are named by a number representing the magnetic heading of the runway.

Medical and pathological information

The forensic pathologist who conducted the post-mortem examination concluded that the pilot succumbed to injuries sustained during the impact sequence. No abnormalities were identified that could have led to pilot incapacitation.

Toxicology results did not identify any substances that could have impaired the pilot's performance.

Operational information

Aerobatic manoeuvres

Witnesses reported that the pilot was performing low-level aerobatic manoeuvres on the day of the accident, including vertical dives. Vertical dives meet the definition of an aerobatic manoeuvre contained in CAAP 155-1(0). There was insufficient evidence to determine the height at which the pilot was recovering from the vertical dives.

The ATSB was unable to determine the reason why the pilot was performing low-level aerobatics. However, the pilot had previously performed air show aerobatic routines and may have been practicing for an upcoming performance.

An experienced aerobatic pilot pointed to the possibility that the aircraft was in a spin,[11] which may have become an inverted spin during the final descent. While there was insufficient evidence to confirm that proposition, such a development would have required additional time, and therefore height, to recover the aircraft to level flight.

The ATSB obtained video evidence of the pilot performing aerobatic manoeuvres at Goolwa Airport significantly below 330 ft 1 week prior to the accident. This was below the height that the pilot was permitted to engage in aerobatic flight.

Peer Reviews

Due to the 'high level of skill and fine safety margins' in low-level aerobatics, CAAP 155-1(0) part 7.28.1 strongly suggested pilots undertake regular peer reviews of their aerobatic performance. In this respect, Part 7.28.2 of the CAAP stated:

> The peer review process is intended to provide an independent assessment by a similarly qualified person or persons on the way the pilot conducts the activity and to identify any incorrect techniques or practices that the pilot may have developed over time. It is not intended to be a flight test for the renewal of the permission, but an opportunity for constructive discussion with other practitioners with a view to enhancing the safety of a pilot's performance.

CAAP 155-1(0) recommended a maximum of 15 months between reviews. The ATSB was unable to find any evidence of the pilot undertaking a peer review of their aerobatic performance in the 15 months before the accident.

[11] A spin is a sustained spiral descent with the wings stalled; in most cases a stable autorotation.

Tests and research

Research by the ATSB identified that the accident rate of experimental amateur-built aircraft was significantly higher than for similar factory-built aircraft. Specifically, ATSB research investigation AR-2007-043(2) *Amateur-built aircraft Part 2: Analysis of accidents involving VH-registered non-factory-built aeroplanes 1988-2010* (available at www.atsb.gov.au) identified that:

> The fatal/serious injury accident rate across the period of the study was significantly higher for amateur-built aircraft (average 1.27 per 10,000 hours) than it was for similar factory-built aircraft (average 0.22). The fatal and serious injury accident rate was more than 5.5 times higher for amateur-built aircraft compared to factory-built during private operations.
> Similar to the total accident rate, the fatal/serious injury accident has reduced from 1988-1999 to 1999-2010, but the reduction has been significantly greater for amateur-built aircraft. In the second half of the period of study from 1999-2010, the fatal/serious injury accident rate was more than 3.5 times higher for amateur-built aircraft.

Those results were consistent with the findings of the United States National Transportation Safety Board (NTSB) safety study NTSB/SS-12/01 *The Safety of Experimental Amateur-Built Aircraft* (available at www.ntsb.gov). The abstract of that study noted that:

> Experimental amateur-built (E-AB) aircraft represent nearly 10 percent of the U.S. general aviation fleet, but these aircraft accounted for approximately 15 percent of the total—and 21 percent of the fatal—U.S. general aviation accidents in 2011…

The NTSB study also stated that:

> Areas identified for safety improvement include expanding the documentation requirements for initial aircraft airworthiness certification, verifying the completion of Phase I flight testing, improving pilots' access to transition training and supporting efforts to facilitate that training, encouraging the use of recorded data during flight testing, ensuring that buyers of used E-AB aircraft receive necessary performance documentation, and improving aircraft identification in registry records.

As a result of their safety study, the NTSB made a number of recommendations to the United States Federal Aviation Administration (FAA) that were aimed at improving the safety of amateur-built aircraft. These included recommendations that the FAA:

> Revise 14 Code of Federal Regulations 21.193, Federal Aviation Administration Order 8130.2G, and related guidance or regulations, as necessary, to require applicants for an airworthiness certificate for experimental, operating amateur-built aircraft to submit for Federal Aviation Administration acceptance a flight test plan that will (1) ensure the aircraft has been adequately tested and has been determined to be safe to fly within the aircraft's flight envelope and (2) produce flight test data to develop an accurate and complete aircraft flight manual and to establish emergency procedures and make a copy of this flight test plan part of the aircraft's certification file. (A-12-29)
>
> …
>
> Revise Federal Aviation Administration Order 8130.2G, and related guidance or regulations, as necessary, to require the review and acceptance of the completed test plan documents and aircraft flight manual (or its equivalent) that documents the aircraft's performance data and operating envelope, and that establishes emergency procedures, prior to the issuance of Phase II operating limitations. (A-12-32)

The FAA responded to these NTSB recommendations on 24 September 2012 and advised that they were 'creating a cross-organizational Amateur-Built Safety Team to review the current guidance and policy for amateur-built certification and operation.' At the time of writing, no further safety action had been reported to the NTSB.

Related occurrences

A review of the ATSB occurrence database identified three potentially similar accidents that occurred during aerobatic manoeuvres. Of these, two involved amateur-built aircraft. One of the occurrences was preceded by a loss of engine power during take-off. There was insufficient information available on the circumstances of the other two occurrences to determine if they were substantially similar to this accident.

Safety analysis

Introduction

While performing aerobatic manoeuvres the pilot did not fully recover the aircraft from a vertical dive before colliding with terrain. The ATSB did not find any evidence of pilot incapacitation or a fault with the aircraft that could have contributed to the accident. The weather conditions were also considered unlikely to have influenced the development of the accident. Additionally, the pilot was qualified to perform low-level aerobatics down to 330 ft and the aircraft type was appropriate for the aerobatic manoeuvres being performed that day.

This analysis will consider the possible reasons why aerobatic flight was continued below 330 ft. In addition, the safety benefit of aerobatic peer reviews and provision of aircraft flight manuals for amateur-built experimental aircraft will be discussed.

The occurrence

The accident site ground impact marks and aircraft damage indicated that the aircraft was in a slightly nose-low, wings-level attitude at impact. Additionally, the ATSB determined that the aircraft collided with terrain with a high vertical and horizontal speed. This evidence is consistent with witness reports indicating that the aircraft appeared to be pulling out of a dive when it collided with terrain.

There was insufficient evidence to determine why the recovery was not accomplished above the pilot's minimum aerobatics height of 330 ft. It is possible that the pilot either intentionally or inadvertently delayed the recovery of the aircraft during the vertical dive.

Misjudgement of the height that recovery was initiated

The ATSB was unable to determine the intended lowest height of the aerobatics on the day of the accident. However, evidence was provided to the ATSB that the pilot performed aerobatic manoeuvres significantly below 330 ft 1 week prior to the accident.

It is possible that the pilot was completing the aerobatic manoeuvres below 330 ft on the day of the accident. If this occurred, a misjudgement of the recovery initiation height may have resulted in insufficient remaining height above terrain for the pilot to recover the aircraft from the vertical dive before impacting terrain.

Inadvertent late initiation of the recovery

Raising the aircraft's pitch attitude from vertical nose-down to close to horizontal while maintaining the wings level required active inputs by the pilot and flight control authority. Consequently, pilot incapacitation or a fault with the aircraft's flight controls were considered unlikely. Momentary incapacitation of the pilot or an intermittent aircraft fault that distracted the pilot and delayed initiation of the recovery; however, could not be ruled out.

Witness descriptions of the aircraft rolling or spiralling were consistent with the aircraft being in a spin during the final descent. However, the two closest witnesses described the aircraft descending vertically without spinning. Additionally, observations of the attempted recovery and accident site ground impact marks indicated that the aircraft was not in a spin when it collided with terrain. If the aircraft had inadvertently entered an inverted spin at some stage during the vertical dive, additional height would have been required to recover the aircraft to level flight. In that case, the possibility that there was insufficient height available to fully recover the aircraft could not be ruled out.

Aerobatics peer review

The ATSB found no evidence of the pilot undertaking a peer review of their aerobatic performance in the 15 months prior to the accident. A peer review, as suggested by Civil Aviation Advisory Publication 155-1(0) *Aerobatics* has the potential to help a pilot maintain safety margins in low-level aerobatic routines, and may have assisted the pilot avoid inadvertently breaching their minimum approved aerobatics height. However, there was insufficient evidence to determine if the non-completion of the peer review influenced the development of the accident.

Aircraft flight manual

The Civil Aviation Safety Authority did not require amateur-built experimental aircraft to have a flight manual or equivalent placards. The ATSB found no evidence that a flight manual or equivalent placarding was produced for the aircraft following flight testing. The lack of a flight manual was unlikely to have influenced this accident due to the pilot's familiarity with the aircraft. This familiarity was a result of their experience building, test flying and operating the aircraft.

However, as evidenced by the recommendations made to the United States Federal Aviation Administration by the National Transportation Safety Board, not having a flight manual increases the risk associated with amateur-built experimental aircraft operations. Without a flight manual the builder, other pilots and especially subsequent owners do not have reference to operational and performance data necessary to safely operate the aircraft. Given that accidents involving amateur-built aircraft occur at a significantly higher rate than comparable factory-built aircraft, a requirement to document important operational information would be a valuable safety enhancement.

Findings

From the evidence available, the following findings are made with respect to the collision with terrain involving One Design DR-107 aircraft, registered VH-EGT, which occurred near Goolwa Airport, South Australia on 10 October 2014. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

Safety issues, or system problems, are highlighted in bold to emphasise their importance. A safety issue is an event or condition that increases safety risk and (a) can reasonably be regarded as having the potential to adversely affect the safety of future operations, and (b) is a characteristic of an organisation or a system, rather than a characteristic of a specific individual, or characteristic of an operating environment at a specific point in time.

Contributing factors

- The aircraft collided with terrain while the pilot was attempting to recover from an aerobatic manoeuvre at low level.

Other factors that increased risk

- Although suggested by Civil Aviation Advisory Publication 155-1(0) *Aerobatics,* the pilot probably did not undertake a peer review of their aerobatic performance in the preceding 15 months to the accident.
- **The Civil Aviation Safety Authority did not require builders of amateur-built experimental aircraft to produce a flight manual, or equivalent, for their aircraft following flight testing. Without a flight manual the builder, other pilots and subsequent owners do not have reference to operational and performance data necessary to safely operate the aircraft. [Safety issue]**

Safety issues and actions

The safety issue identified during this investigation is listed in the Findings and Safety issues and actions sections of this report. The ATSB expects that all safety issues identified by the investigation should be addressed by the relevant organisation(s). In addressing those issues, the ATSB prefers to encourage relevant organisation(s) to proactively initiate safety action, rather than to issue formal safety recommendations or safety advisory notices.

All of the directly involved parties were provided with a draft report and invited to provide submissions. As part of that process, each organisation was asked to communicate what safety actions, if any, they had carried out or were planning to carry out in relation to each safety issue relevant to their organisation.

The initial public version of these safety issues and actions are repeated separately on the ATSB website to facilitate monitoring by interested parties. Where relevant the safety issues and actions will be updated on the ATSB website as information comes to hand.

Flight manual requirements for amateur-built experimental aircraft

Number:	AO-2014-163-SI-01
Issue owner:	Civil Aviation Safety Authority
Operation affected:	Aviation: General Aviation
Who it affects:	Operators of amateur-built experimental aircraft

Safety issue description:

The Civil Aviation Safety Authority did not require builders of amateur-built experimental aircraft to produce a flight manual, or equivalent, for their aircraft following flight testing. Without a flight manual the builder, other pilots and subsequent owners do not have reference to operational and performance data necessary to safely operate the aircraft.

Response to safety issue and/or Proactive safety action taken by the Civil Aviation Safety Authority

In response to this safety issue, the Civil Aviation Safety Authority (CASA) advised that:

> CASA would like to note that an experimental aircraft must be placarded accordingly to ensure occupants are aware that they fly at their own risk, and that CASA does not set airworthiness standards for experimental aircraft (see Civil Aviation Regulation 1988 (CAR) subregulations 262AP(8) and (9)).
>
> The experimental certificate regulations provide for this level of safety with as much flexibility as possible. The experimental certificate, including conditions specified on or attached to the certificate, is the primary means of maintaining these minimum standards. In the case of experimental amateur built aircraft, the necessary flight restrictions and information about the aircraft, such as weight and balance, are established as part of the flight test program and included on the experimental certificate, or other appropriate method such as placards or an Aircraft Flight Manual (AFM).
>
> The regulations clearly provide that the experimental certificate system is only intended to establish minimum safety standards for other airspace users and people on the ground (see Civil Aviation Safety Regulation 1998 (CASR) subregulation 11.055(1C)). An AFM is not required under the regulations for experimental amateur built aircraft however CASA recommends an AFM be developed (see Advisory Circular (AC) 21.4, section 17).
>
> CASA does not fully understand the rationale behind the ATSB recommendation about mandating, rather than recommending the production of AFM for these experimentally operated aircraft given the non-existence of an AFM for this aircraft had no effect on the incident (as acknowledged in the report on page 10).

CAR 138 states that if a flight manual has been issued then the pilot must comply with it. CASA acknowledges that mandating an AFM for experimental amateur built aircraft may improve safety for subsequent owners and other pilots than the original owner/builder/pilot. However, the experimental certificate system functions as intended by the current regulations (ie. to ensure the safety of other airspace users and people on the ground).

CASA currently recommends an AFM be produced for experimental amateur built aircraft, but changing this to a mandatory requirement would incur a significant cost to the owners/operators. CASA does not believe this incident in isolation provides sufficient justification this change to the legislation given the other safety protections that are already established.

It is noted that the Sports Aircraft Association of Australia (SAAA) Maintenance Procedures Course at Topic 4 (attached) on pages 14–16 recommends how to prepare a Pilots Operating Handbook (POH) for an amateur built using the General Aviation Manufacturer's Association (GAMA) standards specification 1, this is available from the GAMA website: http://www.gama.aero/industry-standards.

CASA does not believe there needs to be a regulatory requirement for a POH, it is an SAAA recommended practice to develop one during flight testing and this should form the basis of educational information that could be sent through to all registered owners of these types of aircraft.

ATSB comment/action in response

The ATSB acknowledges that CASA and the SAAA recommend that an AFM/POH is produced as part of the flight test program required for experimental amateur-built aircraft. However, the ATSB remains of the view that, while the absence of a flight manual, or equivalent, did not influence this accident, such a document should be mandatory for the following reasons:

- Without a flight manual the builder, other pilots and especially subsequent owners do not have sufficient reference to operational and performance data necessary to safely operate the aircraft.
- Accidents involving amateur-built aircraft occur at a significantly higher rate than comparable factory-built aircraft. A requirement to document important operational information would provide a valuable safety enhancement at minimal cost.

ATSB safety recommendation to the Civil Aviation Safety Authority

Action number: AO-2014-163-SR-008

Action status: Released

The Australian Transport Safety Bureau recommends that the Civil Aviation Safety Authority takes safety action to address the lack of a requirement for builders of amateur-built experimental aircraft to produce a flight manual, or equivalent, for their aircraft following flight testing.

General details

Occurrence details

Date and time:	10 October 2014 – 1430 CDT	
Occurrence category:	Accident	
Primary occurrence type:	Collision with terrain	
Location:	Near Goolwa Airport, South Australia	
	Latitude: 35° 28.53' S	Longitude: 138° 45.03' E

Pilot details

Licence details:	Private Pilot (Aeroplane) Licence, issued March 1983
Endorsements:	Manual Propeller Pitch Control, Retractable Undercarriage, Tail wheel Undercarriage
Ratings:	Single Engine Aeroplane
Medical certificate:	Class 2, valid to December 2015
Aeronautical experience:	Approximately 1,010 hours
Last flight review:	4 September 2013

Aircraft details

Manufacturer and model:	Amateur-built - One Design DR-107	
Year of manufacture:	2008	
Registration:	VH-EGT	
Serial number:	001	
Total Time In Service	165.9 hours	
Type of operation:	Private Experimental	
Persons on board:	Crew – 1	Passengers – 0
Injuries:	Crew – 1 Fatal	Passengers – 0
Damage:	Destroyed	

Sources and submissions

Sources of information

The sources of information during the investigation included:

- an experienced aerobatic pilot
- the Bureau of Meteorology
- the Civil Aviation Safety Authority (CASA)
- the South Australian Police and Forensic Science SA
- the One Design DR-107 designer
- a number of other One Design DR-107 aircraft owners.

Submissions

Under Part 4, Division 2 (Investigation Reports), Section 26 of the *Transport Safety Investigation Act 2003* (the Act), the ATSB may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. Section 26 (1) (a) of the Act 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 experienced aerobatic pilot, the Sport Aircraft Association of Australia and CASA.

Submissions were received from the experienced aerobatic pilot, the Sport Aircraft Association Australia and CASA. The submissions were reviewed and where considered appropriate, the text of the report was amended accordingly.

Australian Transport Safety Bureau

The ATSB is an independent Commonwealth Government statutory agency. The ATSB is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to operations involving the travelling public.

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

Purpose of safety investigations

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to initiate proactive safety action that addresses safety issues. Nevertheless, the ATSB may use its power to make a formal safety recommendation either during or at the end of an investigation, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation.

When safety recommendations are issued, they focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on a preferred method of corrective action. As with equivalent overseas organisations, the ATSB has no power to enforce the implementation of its recommendations. It is a matter for the body to which an ATSB recommendation is directed to assess the costs and benefits of any particular means of addressing a safety issue.

When the ATSB issues a safety recommendation to a person, organisation or agency, they must provide a written response within 90 days. That response must indicate whether they accept the recommendation, any reasons for not accepting part or all of the recommendation, and details of any proposed safety action to give effect to the recommendation.

The ATSB can also issue safety advisory notices suggesting that an organisation or an industry sector consider a safety issue and take action where it believes it appropriate. There is no requirement for a formal response to an advisory notice, although the ATSB will publish any response it receives.

Australian Transport Safety Bureau

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Investigation

ATSB Transport Safety Report
Aviation Occurrence Investigation

Collision with terrain involving One Design DR-107, VH-EGT Goolwa Airport, South Australia, 10 October 2014

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