

Australian Government Australian Transport Safety Bureau

Departure from controlled flight and collision with terrain involving Ayres Corporation S2R Thrush VH-JAY

17 km SE of Hyden, Western Australia | 18 October 2013



Investigation

ATSB Transport Safety Report

Aviation Occurrence Investigation AO-2013-183 Final – 16 July 2014 Source: Cover photo by Jim Raeder.

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

Publishing information

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

© Commonwealth of Australia 2014

Ownership of intellectual property rights in this publication

Unless otherwise noted, copyright (and any other intellectual property rights, if any) in this publication is owned by the Commonwealth of Australia.

Creative Commons licence

With the exception of the Coat of Arms, ATSB logo, and photos and graphics in which a third party holds copyright, this publication is licensed under a Creative Commons Attribution 3.0 Australia licence.

Creative Commons Attribution 3.0 Australia Licence is a standard form license agreement that allows you to copy, distribute, transmit and adapt this publication provided that you attribute the work.

The ATSB's preference is that you attribute this publication (and any material sourced from it) using the following wording: *Source:* Australian Transport Safety Bureau

Copyright in material obtained from other agencies, private individuals or organisations, belongs to those agencies, individuals or organisations. Where you want to use their material you will need to contact them directly.

Addendum

Page	Change	Date

Safety summary

What happened

On 18 October 2013, the pilot of an Ayres Corporation S2R Thrush, registered VH-JAY, was conducting aerial agricultural spraying activities on a property near Hyden, Western Australia. At about 1330, following the completion of a number of spray runs and a break for lunch, the pilot departed to complete further spraying. Following the failure of the aircraft to return, a search was initiated. The aircraft wreckage was found a short time later about 1,700 m from the departure airstrip. The aircraft was destroyed and the pilot was fatally injured.

Aircraft wreckage

Source: ATSB

What the ATSB found

The ATSB found that the aircraft departed controlled flight from which the pilot was unable to recover, leading to the collision with terrain. On the basis of the available evidence, it was not possible to determine the reasons for the loss of control.

The ATSB identified two aspects of the aircraft's operation which had the potential to adversely affect safety. These were the use of an unapproved fuel mix and operation of the aircraft above its published maximum take-off weight.

Safety message

Operators and pilots are reminded of the dangers of operating aircraft engines on an unapproved fuel mix as this increases the likelihood of engine damage which could affect the safety of operations. Pilots and operators are also reminded of the need to adhere to an aircraft's maximum take-off weight to ensure the on-going safety of the aircraft and operations.

Contents

The occurrence	1
Context	3
Operations	3
Aircraft information	3
General	3
Maintenance	3
Engine and propeller	3
Fuel	4
Weight and balance	4
Meteorological information	6
Medical and pathological information	6
Wreckage and impact information	6
Overview	6
Survivability	7
Engine and propeller	/
Aircraft instruments	/
Recorded data	/
Previous occurrences	1
Safety analysis	9
The occurrence	9
Aircraft maximum weight limit	9
Fuel	9
Findings	11
Contributing factors	11
Other factors that increased risk	11
Safety issues and actions	12
General details	
Occurrence details	13
Aircraft details	13
Sources and submissions	
Sources of information	14
Submissions	14
Australian Transport Safety Bureau	
Purpose of safety investigations	15
Developing safety action	15

The occurrence

On 18 October 2013 the pilot of an Ayres Corporation S2R Thrush, registered VH-JAY (JAY), was conducting crop spraying operations on a property 17 km south-east of Hyden, Western Australia (Figure 1).

The pilot had completed 14 spray runs that morning before stopping for lunch. The aircraft was refuelled and reloaded with chemical mix prior to the recommencement of operations at about 1330 Western Standard Time.¹

At about 1410 ground crew and the pilot of another aircraft that had been conducting spray operations on the same property became concerned that the pilot had not returned and initiated an aerial search. The aircraft wreckage was found a short time later in an area of light scrub about 1,700 m from the refilling station (Figure 1 and Figure 2). The pilot was fatally injured and the aircraft was destroyed.

Figure 1: Overview of operational area including departure airstrip and spray area

Source: Google Earth. Image modified by ATSB.

Western Standard Time (WST) was Coordinated Universal Time (UTC) + 8 hours.

Figure 2: Aircraft wreckage

Source: ATSB

Context

Pilot information

The pilot was appropriately qualified for the flight; holding a Commercial Pilot (Aeroplane) Licence issued in 1993 and a Grade 1 Agricultural Rating (Aeroplane) issued in 1999. The pilot's most recent logbook recorded a total aeronautical experience in excess of 11,200 hours, with the majority of these hours accumulated conducting survey and agricultural flying activities. The pilot's previous logbooks were not available to the investigation.

The pilot was endorsed on the Ayres Thrush TPE331 variant (see the section titled *Engine and propeller*) in 2004. The most recent logbook, which commenced in 2009, did not record any hours in this aircraft type during this time. The operator reported that the pilot had advised of having accrued about 750 hours of flying experience on the Thrush. The pilot's most recent proficiency check was an agricultural flight proficiency check conducted on 4 December 2012.

Operations

The pilot was employed on a casual basis for an aerial agricultural operator based in Hyden. The operator owned VH-JAY (JAY) and another agricultural aircraft being used for spraying activities on the day of the accident. Along with the aircraft, the operator also had vehicles and trailers for supplying, mixing and loading the chemical, and refuelling the aircraft. The application flights were assisted by loaders who mixed and loaded the required chemical into the aircraft. The loaders remained at a refilling station next to a temporary airstrip on the property.

Aircraft information

General

The aircraft was manufactured in the United States in 1976 as a Rockwell International S2R² and was first registered in Australia as an Ayres Corporation S2R in 1984. The aircraft was certified in the restricted category³, permitting agricultural work, and was fitted with spraying equipment. The hopper was fitted with a system that allowed the hopper contents to be jettisoned in the event of an emergency. The operator purchased the aircraft about 3 years prior to the accident and had used it for agricultural operations since.

Maintenance

Prior to the flights on 18 October 2013, the airframe had accumulated a total of 7516.1 flying hours. The last 100-hourly inspection was carried out on 10 September 2013, at a total of 7446.3 flying hours. The maintenance release was current and listed no outstanding defects. In addition, the second pilot conducting operations on the day reported that the pilot of JAY had advised him that the aircraft was 'performing well' with no issues.

Engine and propeller

JAY was originally fitted with a Pratt and Whitney radial piston engine. In 1996 the aircraft was fitted with a Garrett turbine engine, model number TPE331-5-252M, serial number P33021 in accordance with supplemental type certificate (STC) SA00172SE. The engine drove a four-bladed Hartzell, constant-speed, reversing propeller, model HCB4TN-5NL_LT10890N. The propeller had a negative torque sensing (NTS) system which limited the amount of torque the engine could

² Rockwell International manufactured the S2R between 1965 until the sale of the production rights to Ayres Corporation in 1977. In 2003 Ayres' assets were purchased by Thrush Aircraft, the current producer of the aircraft.

³ In Australia, a restricted category aircraft was certified for designated special purpose operations as set out in Civil Aviation Safety Regulation 21.025(2). These included agricultural operations, such as spraying, livestock control, and fire fighting.

extract from the windmilling⁴ propeller by cycling the blades toward feather. The NTS provided automatic propeller drag reduction. The conversion to a turbine engine necessitated modification of the aircraft structure but the original hopper was retained.

Prior to the commencement of flying on the day of the accident, the engine logbook recorded that the engine had accumulated 3457.9 hours since overhaul and 9576.6 hours total time in service. The maintenance items recorded in the engine logbook were all routine.

Fuel

The operator reported that the fuel being used in JAY was a 70/30 blend of diesel and aviation turbine fuel, and included a fuel additive. The manufacturer of the fuel additive advised that the purpose of the additive was to offset the potential adverse effects of using diesel fuel in turbine engines. A fuel sample was taken from the operator's refuelling equipment and sent to a National Association of Testing Authorities-approved laboratory which reported that the chemical composition was consistent with a predominantly diesel blend.

The engine manufacturer advised the ATSB that the TPE331-5-252M engine was not approved to use diesel, nor were they aware of a supplemental type certificate allowing it. They also advised that, in general, running on diesel fuel instead of aviation turbine fuel will lead to:

- Increased carbon build-up on the fuel atomizer and combustor due to the higher distillation end point...
- Increased fuel system deposit or gum formation as fuel thermal stability and gum formation are not controlled in diesel fuel...
- Decreased altitude relight envelope due to lower volatility...
- Poor cold weather starting due to higher fuel viscosity
- Poor cold weather operation due to higher fuel freeze point...
- If the diesel was ultra low sulfur diesel it would typically have poor lubricity (unless lubricity additives were added) which could degrade fuel pump life...
- If the diesel was high sulfur, it could degrade turbine coatings
- Diesel fuel can contain bio-diesel...currently not approved in jet fuel...
- Diesel fuel can contain any number of additives which are not approved for aircraft gas turbine engines, and the effect on the engine is unknown...

In addition, the engine manufacturer stated that none of their engines were approved to use the fuel additive reported to be in the fuel blend.

On 26 May 2014, CASA issued Airworthiness Bulletin 28-015⁵ relating to the use of diesel fuel. This bulletin stated that the use of diesel fuel in turbine engines was only acceptable if the fuel was approved by the manufacturer and the fuel conformed to a specification detailed in their approved data.

Weight and balance

The aircraft's flight manual listed the aircraft's maximum take-off weight (MTOW) as 6,000 lbs (2,722 kg). The aircraft's reported load was 600 L of fuel and 1,200 L of chemical mix. Based on the reported fuel and chemical load, plus the weight of the aircraft and pilot, the ATSB estimated that the weight of the aircraft was about 3,855 kg (8,500 lbs) at take-off.

⁴ Term used to describe a rotating propeller being driven by the airflow rather than by engine power, and results in increased drag at normal propeller blade angles.

⁵ Available from <u>www.casa.gov.au/airworth/awb/index.htm</u>

Additionally, the aircraft's centre of gravity was calculated to be beyond the published aft limit. Operations with a rearward centre of gravity can adversely affect the aircraft handling.

Previously-identified safety issue

The ATSB previously identified (see the section titled *Previous occurrences*) that some Ayres S2R variants were being loaded beyond the published MTOW by applying an exemption issued by the Civil Aviation Safety Authority (CASA). This exemption was revoked in February 2012 and another exemption was issued which permitted operation at take-off weights up to the maximum listed in the aircraft flight manual, type certificate, or type certificate data sheet, or to any maximum gross weight established by a flight test that was supervised by CASA and shown on an in-aircraft placard. Prior to February 2012, CASA exemption EX38/11⁶ permitted operators of agricultural or restricted category aircraft to operate above the MTOW contained in 'a flight manual or a placard or another document'. This exemption was predicated on the complying aircraft having an appropriate jettison system installed (as most agricultural spraying aircraft do). A review of the agricultural sector conducted in 2014 by CASA, which included operations using the S2R aircraft, identified the prevalence of overweight operations across this sector.

Aircraft type history and operation in the US

The Ayres S2R was a variant of the Snow S2A aircraft type, which was certified in the United States (US) in 1959. Since then, the design has evolved into a range of different aircraft types and variants, now commonly and collectively known as Thrush aircraft.⁷ The S2R is one of 17 variants certified under a single type certificate that was originally approved in 1965.

In the US, as in many countries, the rules that apply to an aircraft's design and, to some extent, its operation depend on the rules in force at the time of original certification. An aircraft's 'certification basis' is the set of rules applicable to that aircraft. The S2R certification basis was US Civil Air Regulation (CAR) 8, effective 11 October 1950, for restricted category aircraft.

CAR 8 did not require manufacturers to set the MTOW for a restricted category aircraft used for agricultural purposes in the US. Rather, operators needed to formally develop operating weights for each aircraft using procedures set out in US Civil Aeronautics Manual (CAM) 8, which included design analysis and flight test methods. As a result, there was no fixed MTOW for certain aircraft types certified under CAR 8 in the US, including the S2R.

Some aircraft manufacturers provided a recommended MTOW and an operator could then use that MTOW directly or as a basis for determining an alternate operating weight under CAM 8. The manufacturer of the S2R set a recommended MTOW of 6,000 lb (2,721 kg).

Post July 1981, CAM 8 could not be used for certificating new restricted category agricultural aircraft in the US. However, aircraft originally certified under CAR 8 could continue to operate under the older rules.

The type certificate data sheet (TCDS) covering the S2R for restricted category operations listed the maximum weight as 6,000 lbs and was applicable to the serial number of JAY. In note 6 within the TCDS, it was stated that the S2R with a radial engine has demonstrated satisfactory operation in the restricted category under certain conditions, including at a weight of 6,900 lbs and 7,800 lbs depending on the radial engine type fitted.

However, CASA advised the ATSB that the increased weight was only applicable to the radial engine variant of the S2R and could not be applied in Australia to a turbine variant such as JAY. The turbine variant was required to be operated in accordance with the STC, in this case the MTOW for JAY was 6,000 lbs. CASA also advised that any increase in maximum weight in Australia should occur through an application for a supplemental type certificate approval.

⁶ Several other related exemptions were in force at various times prior to 2011.

⁷ Manufacturers of the type include Rockwell International, Ayres Corporation, and Thrush Aircraft.

Meteorological information

An anemometer at the airstrip indicated an 8 kt (15 km/h) wind from the north-west and a temperature of 29.5° C immediately before JAY departed on the occurrence flight. The second pilot reported that conditions were 'bumpy' in his own area of spraying, but that the pilot of JAY would have probably been in less turbulent conditions due to the differences in the terrain they were operating over.

Medical and pathological information

The pilot held a Class 1 Aviation Medical Certificate with the only restriction being that reading correction was to be available whilst using the privileges of the licence. A review of the CASA medical records showed the pilot was being treated for high blood pressure.

The forensic pathologist who conducted the post-mortem examination of the pilot concluded that the pilot succumbed to multiple impact-related injuries. The examination also identified well-established coronary artery heart disease; however, the forensic pathologist did not comment on whether or not this contributed to the accident.

Toxicology results did not identify any substances that may have impaired the pilot's performance. Witnesses reported that he appeared well-rested and in a good mood on the day of the accident.

Wreckage and impact information

Overview

Examination of the accident site indicated that the aircraft impacted terrain while inverted, in a right wing low attitude (Figure 3). The right wing of the aircraft contacted a shrub branch just prior to the initial ground impact.

Figure 3: Accident site, facing the direction of travel

Source: ATSB

The aircraft came to rest about 16 m east of the initial contact point. All of the major aircraft components were accounted for at the site with no evidence of fire or pre-impact damage observed and flight control continuity was verified. There was no evidence of birdstrike or wirestrike.

The initial impact point contained a number of aircraft components, including two propeller blades, as well as fibreglass and aluminium sections of the nose, engine cowling and hopper. Police who responded to the accident reported that this initial impact point contained fuel and chemical when they arrived at the site.

Survivability

The inverted impact compromised the survivable space for the pilot in the upper section of the cockpit area. The four-point harness was found attached at the buckle and hard points on the airframe, however the belt was cut after the accident to allow the pilot to be released. Additionally a flight helmet was found on-site. Based on witness accounts that the pilot normally wore it and damage to the helmet restraints, it appears that the helmet came off during the accident sequence.

Engine and propeller

On-site engine examination identified that there was no visible compressor damage, with the only external damage being consistent with ground impact. The propeller blades exhibited damage that was consistent with contacting the ground while under a significant level of power with only one blade remaining attached to the hub. While two of the three detached blades stayed in the impact point, the third was located about 30 m to the south-west of the initial impact point.

Aircraft instruments

Examination of the aircraft instruments recovered from JAY showed contact marks on two instruments, the torque pressure gauge and the engine RPM gauge. The mark on the torque pressure gauge was indicative of high power operation whereas the contact marks on the engine RPM gauge were consistent with low power. As that combination of readings was not possible while the aircraft was operating, the contact marks were not considered to be representative of the instrument readings at the time of the initial collision with terrain.

Recorded data

About 20 seconds of data from the accident flight was recovered from a memory card used by an agricultural global positioning system (GPS) receiver installed on the aircraft, with the data ending as JAY got airborne. The interruption of electrical power during the accident sequence was the most likely reason for the rest of the flight not being recorded. Based on data downloaded from similar receivers, the interval between the information being recorded and stored to the memory card can be up to 90 seconds.

The recorded speed and height of the accident flight were consistent with the day's previous flights up to the cessation of the recording. Based on the other recorded data, the ATSB estimated that the accident occurred about a minute after take-off. At the time the previous flights passed near the accident location, the aircraft's groundspeed was recorded at between 91 and 97 kt.

Previous occurrences

A review of the ATSB database found one accident involving an S2R variant. On 23 October 2013, the ATSB released a final investigation report⁸ into a fatal accident involving an Ayres Corporation S2R-G10 Thrush, which occurred about 36 km north-west of Moree, New South Wales on 11 April 2012. The ATSB found that, while on a ferry flight, the aircraft departed

⁸ The investigation report is available on the ATSB website at <u>www.atsb.gov.au.</u>

controlled flight and the pilot was unable to recover before impact with the ground. On the basis of the evidence available to the ATSB, it was not possible to determine with any certainty the reasons for the loss of control. There was no evidence of mechanical fault with the aircraft although impact and fire damage prevented a full assessment. Other factors such as pilot incapacitation or inappropriate aircraft handling could not be ruled out.

A search of accident and incident data held by the US National Transportation Safety Board and Federal Aviation Administration found no similar occurrences, including those linked to overweight operation, of an S2R aircraft.

Safety analysis

The occurrence

Examination of the aircraft and accident site identified that the aircraft collided with terrain in an inverted attitude with the right wing low. In the context of that apparent departure from controlled flight shortly after take-off, the ATSB considered several possibilities why that may have occurred.

No evidence of any mechanical defect or failure within the aircraft or engine that may have contributed to the accident was identified. A review of the likely environmental conditions indicated that it was unlikely that the weather had an adverse effect on the operation of the aircraft. In addition, there was no evidence of a birdstrike or wirestrike.

The pilot was being treated for high blood pressure and was reported by witnesses to appear well rested and healthy on the day of the accident. While the post-mortem showed that the pilot had succumbed to multiple injuries, it also identified that he had well established coronary artery heart disease. The forensic pathologist did not comment on whether or not this contributed to the accident.

The pilot was experienced in low level flight, including survey operations and agricultural operations. There were no prior indications of problems with regard to his handling of agricultural aircraft and there were no indications of problems with the aircraft that might have sufficiently distracted an experienced agricultural pilot to result in loss of control. However, the ATSB considered the possibility that the increased weight and balance outside of published limits may have adversely affected the aircraft handling.

Aircraft maximum weight limit

At the time of the accident, the aircraft was above its published MTOW by about 1,133 kg. One effect of increasing the aircraft's weight is to increase the aerodynamic stall speed. The aircraft's flight manual stated that, at the MTOW of 2,722 kg, the power-on stall speed with no flap in straight and level flight was 61 kt (113 km/h). At 3,855 kg the stall speed for the same configuration increased to about 73 kt (135 km/h). Additionally, increasing the weight above the MTOW also increases the stress on the airframe with the potential for long term structural damage or failure, and adverse aircraft handling.

Analysis of operations that day identified that the aircraft had probably flown at least one of the 14 previous flights at or near 3,855 kg. Additionally, based on recorded data from these flights, the aircraft would probably have had sufficient speed margin that a stall was unlikely to occur despite operating over the MTOW. As there was no recorded data for the accident flight, it was not possible to determine if the departure from controlled flight was the result of a stall.

In response to the revocation of the Civil Aviation Safety Authority (CASA) exemption allowing operations above MTOW, a supplemental type certificate was being developed to cover an increase in MTOW for the Thrush aircraft, which would take it to a new maximum up to 10,500 lbs. However, CASA advised that this STC may only cover certain aircraft serial numbers and therefore may not have applied to JAY. Irrespective, this certificate was not in place at the time of the accident, meaning that the MTOW limit for JAY was 2,722 kg. Despite the fact that there have been no accidents as a result of overweight operations, operators and pilots are reminded that in the absence of the supplemental type certificate, the approved MTOW of the aircraft was to be used.

Fuel

The engine manufacturer had significant concerns regarding the use of diesel in their engines and identified a number of adverse effects of both short and long term usage. In addition, although the

additive's purpose was to offset some of the adverse effects of diesel, its use was also not approved by the engine manufacturer. As such, the use of the unapproved fuel and additive increased the risk of engine damage and loss of power which could affect the safety of operations.

The report from the pilot that the aircraft had been performing well, despite operating at high weights was not consistent with degraded engine performance. Additionally, the assessment that the engine was producing significant power at impact indicated that the engine was unlikely to have been adversely affected by the use of unapproved fuel.

Findings

From the evidence available, the following findings are made with respect to the departure from controlled flight and collision with terrain of Ayres Corporation S2R Thrust registered VH-JAY that occurred 17 km south-east of Hyden, Western Australia on 18 October 2013. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

Contributing factors

• Shortly after take-off, and for reasons that could not be determined, a loss of control occurred from which the pilot was unable to recover, leading to collision with terrain.

Other factors that increased risk

- The fuel mix being used by the operator was not approved for use by the engine manufacturer and increased the risk of engine damage and loss of power.
- The aircraft was flown outside of the centre of gravity limits, and at a weight that exceeded the maximum allowable, increasing the risk of adversely affecting the aircraft controllability and structural integrity.

Safety issues and actions

Safety issues identified during an investigation are listed in the Findings and Safety Actions sections of this report. However, whereas an investigation may not identify any particular safety issues, relevant organisation(s) may proactively initiate safety action in order to further reduce their safety risk.

All of the relevant organisations identified during this investigation were given a draft report and invited to provide submissions. Although no safety issues were identified during this investigation, the following proactive safety action was advised by the Civil Aviation Safety Authority (CASA).

Proactive safety action taken by the Civil Aviation Safety Authority

Action number: AO-2013-183-NSA-006

CASA advised that on 16 May 2014 they wrote to all operators of Thrush aircraft, informing them of exemption CASA EX01/12 – Maximum Take-off Weight – Restricted Category aircraft and aeroplanes engaged in aerial application operations. This letter reminds operators that there is no provision in the exemption to exceed whichever is the highest applicable MTOW specified in:

1. the aircraft flight manual or approved flight manual supplement;

- 2. an approved placard in the aircraft approved by CASA; or
- 3. the Type Certificate or Type Certificate Data Sheet for the aircraft.

The letter further advises about weight related airworthiness requirements and time-in-service recording and that the continuing airworthiness instructions for aircraft often include airworthiness limitations that apply to specified components of the aircraft. For safety reasons CASA has mandated compliance with airworthiness limitations via a direction in Civil Aviation Order 100.5. If such requirements apply to an aircraft, then the operator must ensure that the time in service for the aircraft and its components is properly calculated to ensure that airworthiness limitations are not exceeded.

General details

Occurrence details

Date and time:	18 October 2013 – 1330 WST		
Occurrence category:	Accident		
Primary occurrence type:	Departure from controlled flight		
Location:	17 km south-east Hyden, Western Australia		
	Latitude: 32° 32.24' S	Longitude: 119° 00.59' E	

Aircraft details

Manufacturer and model:	Ayres Corporation S2R Thrush		
Registration:	VH-JAY		
Serial number:	2264R		
Type of operation:	Aerial Work		
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 the:

- witness interviews
- aircraft manufacturer
- global positioning system (GPS) manufacturer
- Civil Aviation Safety Authority (CASA)
- Pilot's medical records
- Bureau of Meteorology
- Western Australia Police.

Submissions

Under Part 4, Division 2 (Investigation Reports), Section 26 of the *Transport Safety Investigation Act 2003* (the Act), the Australian Transport Safety Bureau (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 operator, the aircraft manufacturer, the engine manufacturer, CASA, the Aerial Agricultural Association of Australia and the United States National Transportation Safety Board.

Submissions were received from the engine manufacturer and CASA. The submissions were reviewed and where considered appropriate, the text of the report was amended accordingly.

Australian Transport Safety Bureau

The Australian Transport Safety Bureau (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 fare-paying passenger operations.

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

Purpose of safety investigations

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

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

'estigation

ATSB Transport Safety Report Aviation Occurrence Investigation

Departure from controlled flight and collision with terrain involving Ayres Corporation S2R Thrush, VH-JAY 17 km SE of Hyden, Western Australia, 18 October 2013

AO-2013-183 Final – 16 July 2014