Australian Government

Australian Transport Safety Bureau

Loss of control and collision with terrain involving FU24 Stallion, VH-EUO

40 km north-east of Bathurst, New South Wales, on 16 June 2017

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Addendum

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Safety summary

What happened

On 16 June 2017, a Pacific Aerospace Limited FU24 Stallion, registered VH-EUO, was conducting aerial agricultural operations from an airstrip 40 km north-east of Bathurst New South Wales. The purpose of the operations was to apply fertiliser and seed to private grazing land.

At about 1405 Eastern Standard Time,[1] the aircraft took off from the airstrip for the second flight of the second job of the day. When the aircraft did not return as expected, the loader raised the alarm and a search for the aircraft commenced at approximately 1600. Early the next morning, the wreckage of the aircraft was found in dense scrubland to the east of the application area. The pilot received fatal injuries as a result of the collision with terrain.

What the ATSB found

The ATSB found that shortly after the end of the third application run, the aircraft was flown into an area of rising terrain that was outside the normal operating area for that job site. While subsequently repositioning the aircraft for the fourth application run, it was likely that the aircraft aerodynamically stalled leading to a collision with terrain. Based on the available evidence, it was not possible to determine the reason for the loss of control.

Additionally, there was no evidence of any in-flight failure of the airframe structure or flight control systems. The engine appeared to have been producing significant power at impact.

Safety message

Operators and pilots are reminded of the dangers of aerial application near rising terrain and the importance of pre-flight planning of application runs to account for nearby terrain. Although it could not be established that not dumping the hopper contributed to this accident, in an emergency, reducing the aircraft's weight by dumping the hopper load will optimise an aircraft's flight performance.

The Aerial Application Association of Australia (AAAA) have published strategies in their pilot's manual. With regard to the dumping of the load, the manual states '*The only safe rule is 'if in doubt, dump*'.'

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1 Eastern Standard Time (EST): Coordinated Universal Time (UTC) + 10 hours.

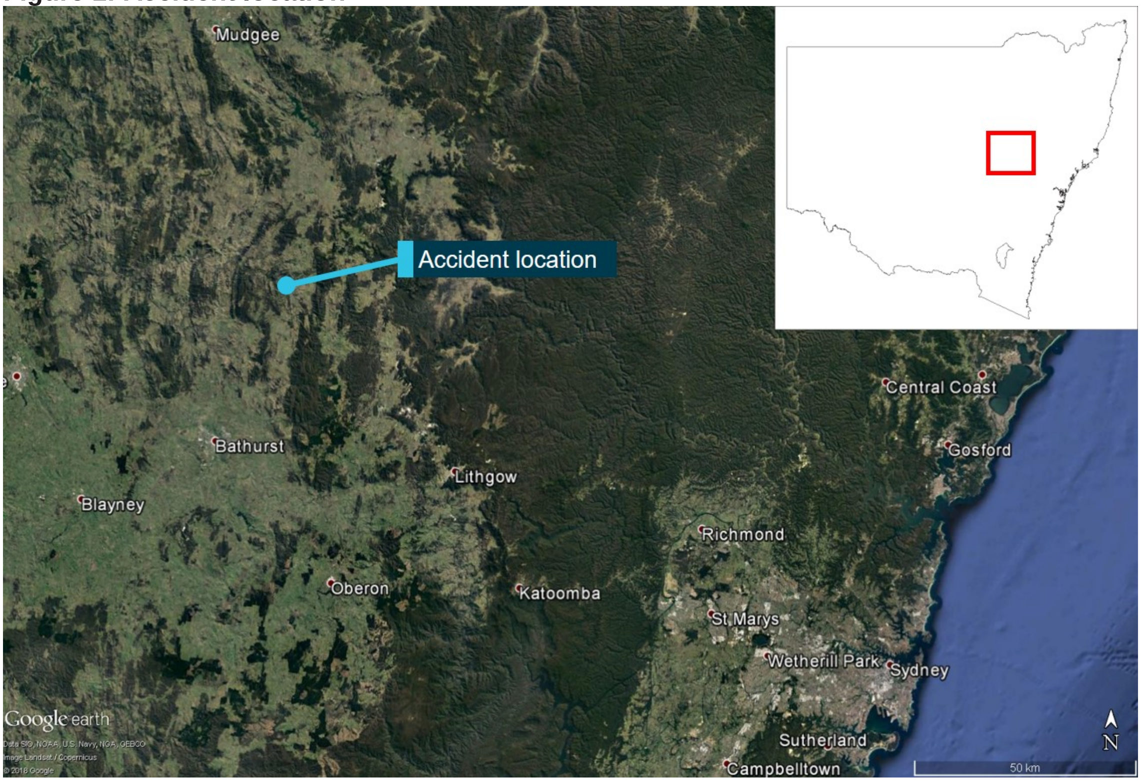
Contents

The occurrence

What happened

On 16 June 2017, a Pacific Aerospace Ltd FU24 Stallion, registered VH-EUO (EUO), was conducting aerial agricultural operations from a private airstrip at Redhill, 36 km north-north-east of Bathurst, New South Wales (NSW). The operations planned for that day involved the aerial application of fertiliser on three properties in the Upper Turon area of NSW (Figure 1).

Figure 1: Accident location



Source: Google, annotated by the ATSB

At about 0700 Eastern Standard Time[2] on the morning of the accident, the pilot and loader drove to Bathurst Airport to fill the fuel tanker and then continued to the worksite at the Redhill airstrip in the Upper Turon area, arriving at about 0830. Work on the first property started at about 0900, with the first flight of the day commencing at 0920. Work on the first property continued until 1350 with two refuelling stops at 1048 and 1250. Approximately 40 tonnes of fertiliser was applied on the first job.

In preparation for the second job, fertiliser and seed were loaded into the aircraft and maps of the second job area were passed to the pilot. At 1357, the aircraft took off for the first flight of the second job. The aircraft returned to reload, and at 1405 the aircraft took off for the second flight. A short time later, at 14:06:59, recorded flight data from the aircraft ceased.

When the aircraft did not return as expected, the loader radioed the pilot. When the loader could not raise the pilot on the radio, he became concerned and drove his vehicle down the airstrip to see if the aircraft had experienced a problem on the initial climb. Finding no sign of the aircraft, he returned to the load site, while continuing to call the pilot on the radio. He then drove to the application area to search for the aircraft before returning to the load site. With no sign of the aircraft, the loader called emergency services to raise the alarm. By about 1500, police had

2 Eastern Standard Time (EST): Coordinated Universal Time (UTC) + 10 hours.

arrived on site and a ground search commenced. A police helicopter also joined the search, which was eventually called off due to low light.

The next morning, at about 0630, the search recommenced and included NSW Police State Emergency Service personnel, and local volunteers. At about 0757, the wreckage of the aircraft was found in dense bush on the side of a hill to the east of the application area. The pilot was found deceased in the aircraft. The aircraft was found approximately 17 hours after the last recorded flight data and there were no witnesses to the accident.

Figure 2: Area of operations

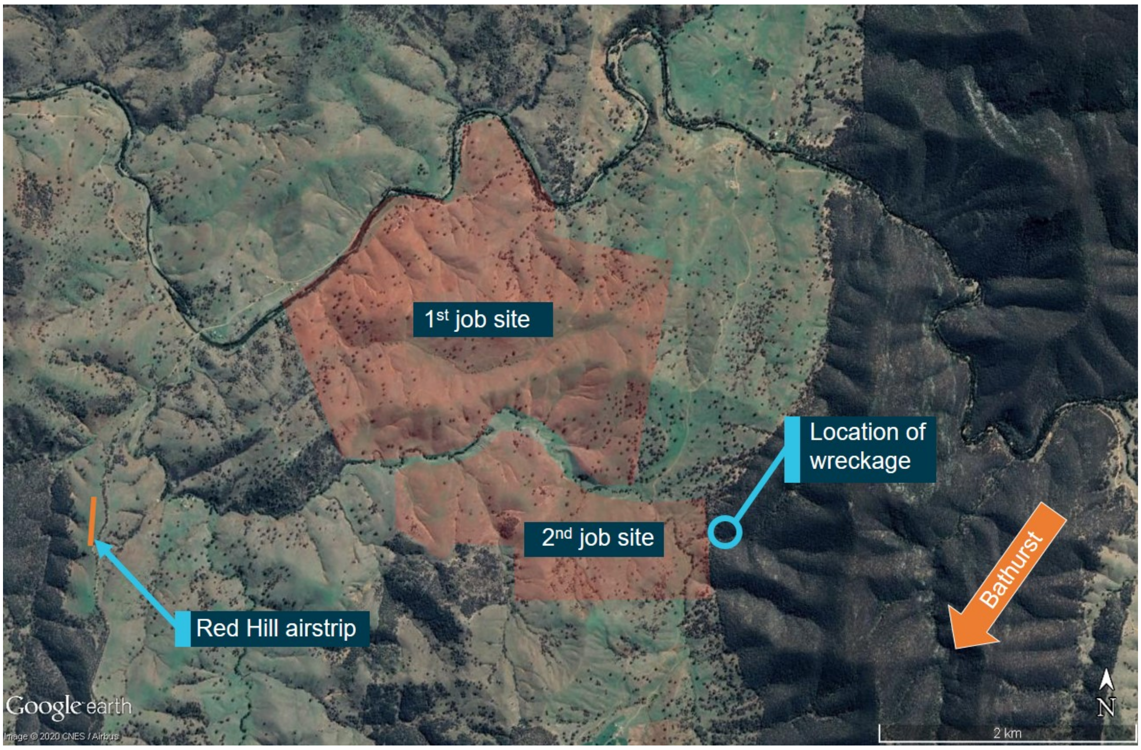


Figure 2 shows the area of operations including Red Hill airstrip and the location of the wreckage. The red shaded areas shows the approximate area of application for the first and second job sites.
Source: Google, annotated by ATSB.

Context

Pilot information

General information

The pilot held a Commercial Pilot Licence (Aeroplane) issued on 11 August 2008 and an Aerial Application Rating (Aeroplane) Grade 2. A review of the pilot's logbooks showed that his flying experience was predominately in survey operations. He had completed his low level and aerial mustering endorsements on 2 June 2009 and subsequently obtained his Grade 2 agricultural (aerial application) operational rating on 13 May 2011.

The pilot's logbook showed a total of 4,688 hours flying experience. Of this, 786 hours were on the FU-24 Fletcher aircraft and 1,001 hours were on the Pacific Aerospace Corporation (PAC) 750XL. The former of these two aircraft is a piston-powered version of the Stallion airframe, while the PAC 750XL is also a similar airframe to the Stallion, but fitted with a Pratt & Whitney Canada PT6 turboprop engine. On 19 May 2017, he obtained a FU-24 Stallion (turbine-powered) aircraft endorsement. A review of the pilot's logbook and operator flight records indicated he had accrued about 43 hours in the FU-24 Stallion, all of which were within the 30 days before the accident.

Pilot training

Regulation 61.1130 of the *Civil Aviation Safety Regulations 1998* requires that, after the initial issue of an aerial application endorsement,[3] a pilot is required to remain under direct[4] and indirect[5] supervision of an appropriately qualified pilot for at least 110 hours of aerial application operations. The initial 10 hours of this period shall be under direct supervision, while the following 100 hours is under direct or indirect supervision. The pilot's logbook stated that 10 hours of direct supervision had been completed as at 8 April 2017 and 90 hours of indirect supervision had been completed as at 18 May 2017. The pilot had accumulated an additional 43 hours of agricultural flying since being signed-off. The operator advised that these hours would have satisfied the requirements of indirect supervision required by regulation 61.1130.

The pilot obtained the aircraft endorsement for the Honeywell (formally Garrett) TPE331-powered FU-24 Stallion on 19 May 2017. The Chief Pilot reported that he flew with the pilot a couple of times during this process and assessed the pilot as being competent on the type. Exposure to the aircraft's stall characteristics and recovery methods was not part of this process, nor was it required to be.

Medical information

The pilot held a Class 1 Aviation Medical Certificate that was valid until 29 July 2017, with no restrictions. The pilot was reported to be a non-smoker who exercised regularly and rarely drank alcohol. Additionally, he reportedly displayed normal behaviour on the morning of the flight and was well-rested. He was not reported to be taking any prescription medications and had no reported medical condition that could have affected his ability to operate an aircraft that day.

A post-mortem examination identified no significant background natural disease, which could have contributed to the accident. Toxicological analysis concluded that the toxicology was also non-contributory to either the accident or cause of death.

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[3] Previously classified as an agricultural pilot rating under CAR 5 licensing regulations.

[4] Direct supervision: Performing the tasks involved in indirect supervision of the pilot; being present and able to monitor and assess the safety of the flight and communicate directly with the pilot; selecting and planning the area in which the flight is conducted; authorising the pilot to conduct the flight; and providing direction to ensure the safety of the flight.

[5] Indirect supervision: Conducting frequent surveillance of the performance of the pilot; periodically reviewing the performance of the pilot in the planning and conduct of the flight; providing feedback on the pilot's performance; knowing the pilot's area of operations and mentoring the pilot.

Aircraft information

Overview

VH-EUO (EUO) (Figure 3) was a Fletcher FU-24 Stallion agricultural aircraft manufactured in 1980 in New Zealand by Pacific Aerospace, formerly Air Parts (NZ). The aircraft was a conventional low-wing monoplane with tricycle undercarriage, aluminium construction and pronounced dihedral[6] on the outer wing panels. Side-by-side seating was forward of the wings and a hopper was located inside the fuselage, in line with the wings. EUO was first registered in Australia in 1980 and was operated in the 'agricultural' operational category, later defined as 'aerial work'. The certificate of registration was transferred to the current owner on 18 April 2017.

Figure 3: Image showing VH-EUO

Figure 2 shows VH-EUO, a turbine-powered FU-24 Stallion. In the background is a piston-powered FU-24 Fletcher.
Source: Operator.

While undergoing repairs following an accident in 1993,[7] the aircraft was modified under supplemental type certificate (STC) 209. The modification involved replacing the Lycoming IO-720 piston engine with a Honeywell TPE331 turbine engine, including associated structural and avionics modifications. The Hartzell constant speed propeller was also replaced with a McCauley C661 series propeller in accordance with supplemental type certificate (STC) 209-1. EUO was returned to service in 1996.

Following an incident in 2001, an overhauled TPE331 engine was installed and EUO was returned to service in February 2002. A review of the aircraft maintenance logbooks identified no other major repairs. Only records from 1 March 2000, however, were made available to the ATSB.

EUO was maintained by a CASA-authorised maintenance facility and in accordance with an approved system of maintenance. A periodic inspection was completed on 4 May 2017, at

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6 Acute angle between left and right mainplanes or tailplanes measured along the lateral axis.

7 See ATSB investigation 199300264

11,004.8 hours total time in service (TTIS). The current maintenance release (MR) was issued at that time, authorising EUO for aerial work operations in day VFR[8] conditions. This maintenance release was valid for 1 year or 100 hours, whichever came first. Before the first flight on 16 June 2017, the aircraft had 11,059.8 hours TTIS, meaning the maintenance release was valid at the time of the accident.

Stall warning system

The aircraft was equipped with a stall warning system, which was designed to illuminate a light in the cockpit. It also had an audible warning, which produced a steady signal approximately 5-10 kt before the stall in all configurations.

Aircraft weight and balance

The maximum take-off weight (MTOW) for the aircraft in the normal category was 2,204 kg. Operations in the agricultural category allowed for an increase in the MTOW to 2,463 kg. Weight calculations, based on performance data provided by the operator, indicated the aircraft was below the agricultural MTOW at take-off for the accident flight. Further, the aircraft was within the weight and balance envelope at the time of the accident.

Meteorological information

Area weather forecasts (ARFOR)[9] that encompassed the area of operations, together with the aerodrome forecasts (TAF) and meteorological aerodrome report (METAR)[10] for both Bathurst and Mudgee Airports, were obtained from the Bureau of Meteorology. The forecasts predicted no significant weather in the area of operations for the duration of the accident flight. The METAR for Bathurst Airport (about 34 km south-south-west of the accident site) indicated that at 1400, the surface wind was 320° (true) at 1-3 kt, with a QNH[11] of 1023.5 and the conditions were CAVOK.[12] Similar conditions were observed at Mudgee Airport (about 68 km north-north-west of the accident site) with the METAR reporting that at 1400 that the surface wind was 020° (true) at 4-6 kt with a QNH of 1022.9. Conditions at Mudgee were also CAVOK.

Observations of the conditions on the day were consistent with these reports, with the aircraft loader reporting that conditions at the time of the accident were overcast with high clouds, well above the highest ridge. He also recalled that wind on the day was light and variable.

Wreckage and accident site information

Accident site

The accident site was located about 40 km north-north-east of Bathurst, in the Upper Turon area of New South Wales (Figure 1). A ridgeline running approximately north-south was located on the eastern edge of the property where EUO was conducting flight operations on the day of the accident (Figure 4). Knights Gully lies to the east of this ridgeline, flowing northward to join the Turon River. The terrain on the west side of Knights Gully rises from about 746 m at the eastern edge of the operating area to about 1,007 m over about 1.15 km. The wreckage of EUO was

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8 VFR: a set of regulations that permit a pilot to operate an aircraft only in weather conditions generally clear enough to allow the pilot to see where the aircraft is going.

9 Area forecasts (ARFORs) were issued for the purposes of providing aviation weather forecasts to pilots. Australia is subdivided into a number of forecast areas. The accident occurred in area 20. In November 2017 ARFORs were replaced with Graphical Area Forecasts (GAFs). More information regarding ARFORs and GAFs is available from the Bureau of Meteorology.

10 A METAR is a routine report of meteorological conditions at an aerodrome

11 QNH: the altimeter barometric pressure subscale setting used to indicate the height above mean sea level.

12 Ceiling and visibility okay (CAVOK): visibility, cloud and present weather are better than prescribed conditions. For an aerodrome weather report, those conditions are visibility 10 km or more, no significant cloud below 5,000 ft, no cumulonimbus cloud and no other significant weather.

located about 220 m in from the eastern edge of the operation area and part way up an approximately 28˚ slope rising to the north. Elevation of the site was about 790 m and the aircraft was oriented with the nose toward 286˚ (approximately west-north-west). The surrounding terrain rose in both the south to north and west to east directions.

Figure 4: Topographical map showing the area of operations

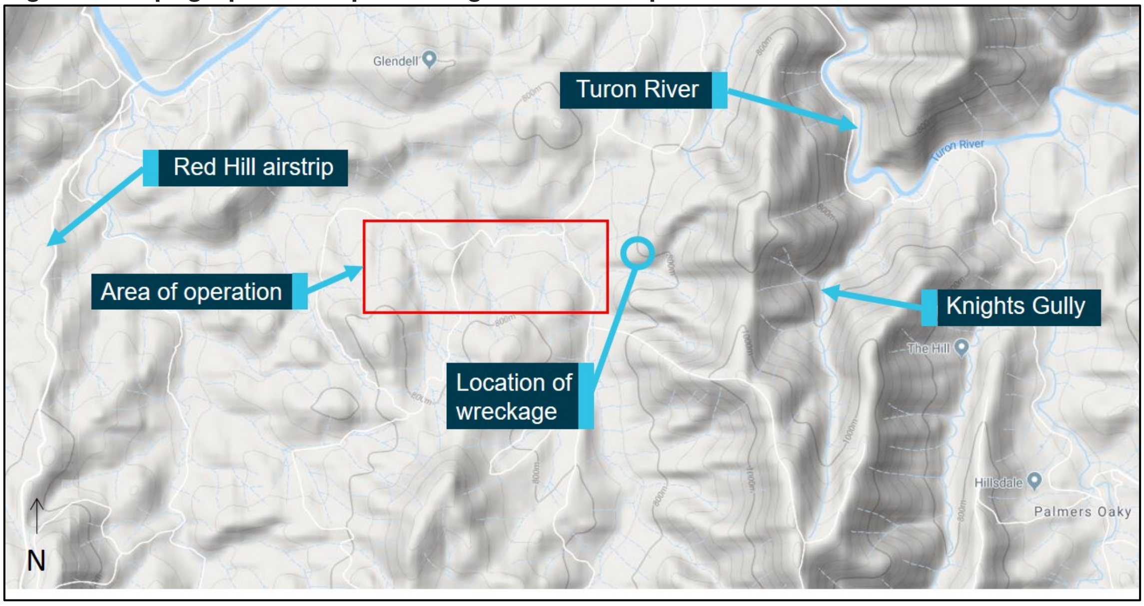

Figure 4 shows the area of operation in relation to a ridgeline to the east of the application area.
Source: Map data: Google, annotated by ATSB

The accident site was located in a wooded area, with tree heights of about 10 m (Figure 5). Site examination indicated that the final aircraft trajectory was approximately 35˚ downwards in a steep nose-down attitude. Several large trees about 3 m from the initial ground impact halted forward momentum of the aircraft.

Figure 5: The accident site

Source: ATSB

Wreckage examination

The aircraft was examined for pre-impact defects, with none identified that were likely to have influenced the accident sequence. All of the aircraft and its components were accounted for at the accident site. There was no indication of any fire. The forward fuselage, including engine and cabin, was compressed and twisted. The condition of the wreckage, with minimal structural damage to the fuselage, in addition to the short length of the wreckage trail, was indicative of a relatively low energy impact. These observations are consistent with an aircraft that had stalled at a low level and collided with terrain at low horizontal speed.

All primary and secondary flight control surfaces were identified in the wreckage trail. Additionally, all control cables were attached to either the appropriate control surface or control mechanism. Cables that were fractured were identified as having failed due to overstress, consistent with impact forces.

All primary flight instruments were identified in the main portion of the wreckage. A number of electronic devices, including a TracMap GPS (see the next section titled *Recorded flight data*) were retrieved from the accident site for further examination.

On-site examination of both the engine and propeller did not identify any mechanical defects that may have contributed to the accident. Damage to the propeller blades and a number of severed branches indicated that at the time of the accident, the engine was producing significant power.

Fuel

The aircraft was refuelled throughout the day via a fuel tanker located at the airstrip. This tanker had uplifted Jet A-1 from Bathurst Airport on the morning of 16 June 2017. The aircraft was fully fuelled the day before, as well as twice on the day of the accident. The last refuel was at 1250, approximately 77 minutes before the accident. The endurance of the aircraft was about 120 minutes. A fuel sample was not available at the accident site due to the significant disruption of the aircraft fuel tanks, however, first responders and ATSB investigators identified a strong smell of fuel at the accident site. A sample of fuel was taken from the tanker and found to be clear with no water contamination. In addition, there were no reports of fuel quality concerns from Bathurst Airport fuel users.

Hopper load

An on-site visual inspection of the aircraft's hopper identified that the hopper was approximately half-full. The operator also inspected the wreckage and advised that the amount remaining corresponded to approximately half of what the aircraft was loaded with for the accident flight, which was consistent with the operator's reporting that each application run used approximately half the loaded amount (see Figure 7 for details of application runs).

Additionally, the on-site inspection found that the hopper outlet control quadrant was at the lower 'closed' end of travel and the dump control mechanism was observed to be fully forward (closed) position. The position of these levers and the half-load in the hopper are indicative of the hopper's contents not being dumped or applied in the lead-up to the collision with terrain.

Additional information

Recorded flight data

The aircraft was fitted with a TracMap Flight GPS device. The in-aircraft device, which forms part of the TracMap job management system, logged GPS flight data as well as fertiliser application coverage data. The damaged device was recovered from the wreckage and sent to the manufacturer for download. Flight data for work undertaken on June 16, provided by the TracMap manufacturer, is shown in Figure 6 and Figure 7. When questioned about the time at which the unit stopped recording data, the manufacturer advised that the unit had a buffering time of

60 seconds. This meant that once data was recorded to volatile memory,[13] it took 60 seconds for that data to be transferred to non-volatile memory.[14]

Figure 6 shows TracMap data for the flights involved in the first job on 16 June. Work on this job started at about 0900 and continued until about 1350. During this time, two hot refuels[15] were conducted, one at 1048 and one at 1250. Approximately 40 tonnes of fertiliser was applied during this job.

Figure 6: TracMap data of the flights involved in the first job on 16 June

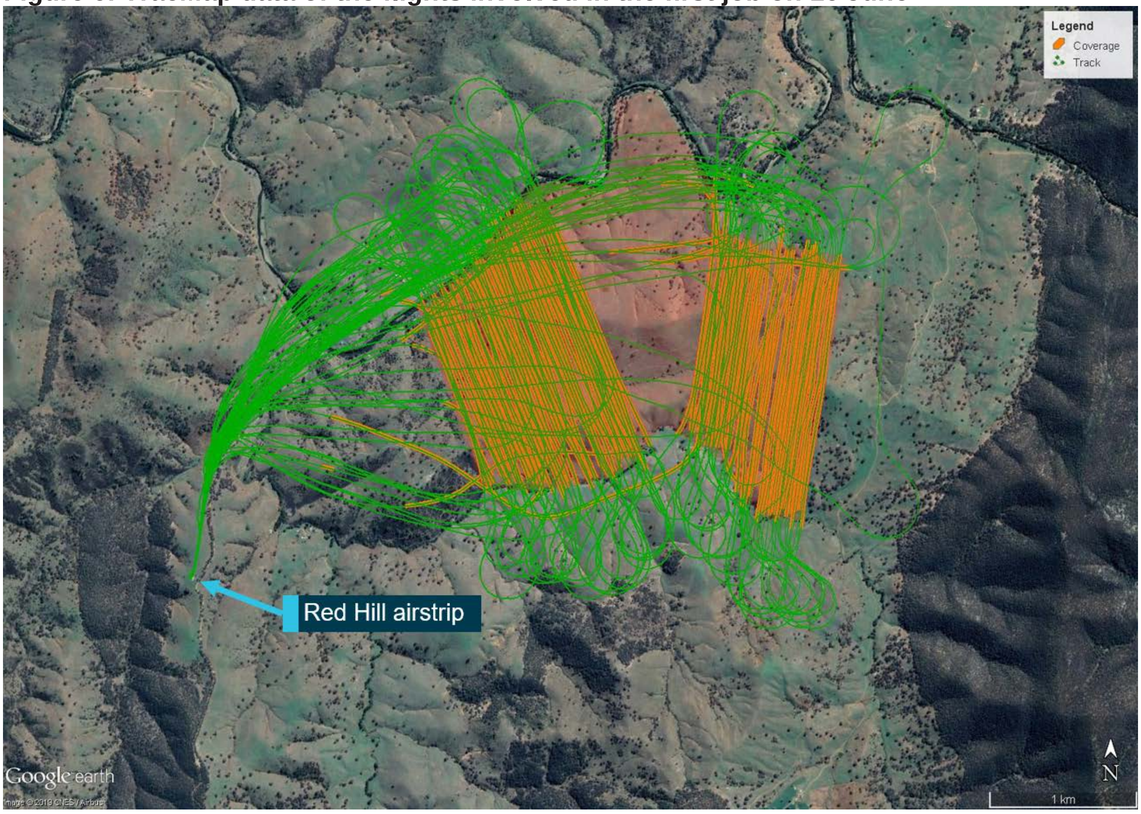

Figure 6 shows the aircraft's flight tack (shown in green) as well as the areas where fertiliser was applied (shown in orange).The red shaded area shows the approximate area of application for this job. Also shown by the annotation is the location of the Red Hill airstrip.
Source: Google, annotated by ATSB.

TracMap data for the penultimate flight and the accident are shown in Figure 7. Data for the penultimate flight (shown in white) shows the aircraft taking off to the north and turning east to the job site. The aircraft then circles, perhaps to confirm the location of the application area, and then proceeds to the east across the northern border of the application area. The coverage data, shown in orange, shows that fertiliser was applied for 49 seconds on the first run to the east. At the end of the first run, the aircraft turned to the north to avoid the ridgeline, circled back, and applied fertiliser for 30 seconds on the second run before landing to reload with fertiliser and seed.

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13 Volatile memory is computer storage that only maintains its data while the device is powered.

14 Non-volatile storage is a type of computer memory that can retrieve stored information even after having been power cycled.

15 Hot refuelling: refuelling of an aircraft with its engine or engines running.

Figure 7: TracMap data of the penultimate flight (shown in white) and the accident flight (shown in red)

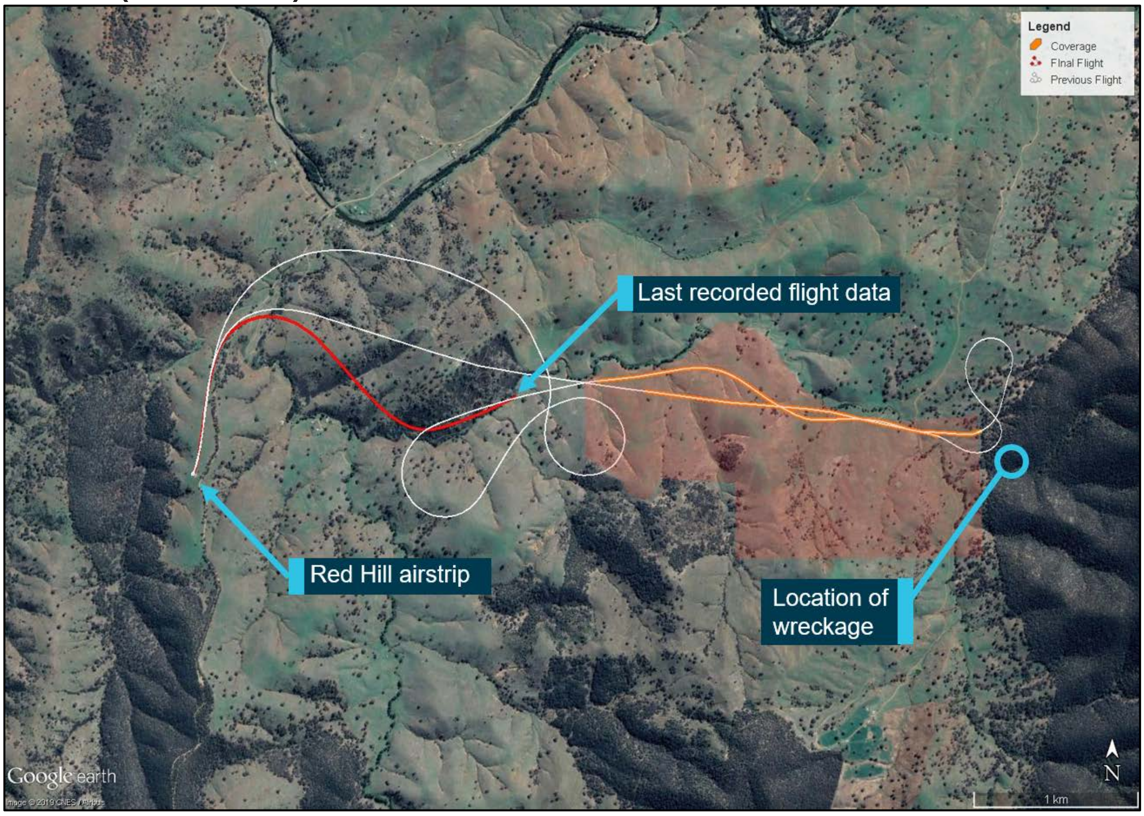

Figure 7 shows TracMap flight data for the accident flight in red and the previous flight in white. Areas on the previous flight where fertiliser was applied are shown in orange. The red shaded area shows the approximate area of application for this job. Also shown by the annotations are the Red Hill airstrip and the location of the wreckage.
Source: Google Earth, annotated by ATSB.

Data for the accident flight, identified in red in Figure 7, showed the aircraft taking off to the north at 1405. This time the aircraft turned earlier to the southeast before turning back to the northeast on a track similar to that of the previous flight. At 14:06:59, just before the aircraft reached the application area (the shaded red area in Figure 7), recorded flight data ceased. About 17 hours later, the wreckage of the aircraft was found about 3 km to the east of the last recorded position.

Analysis of the TrackMap data of the procedure turn conducted on the penultimate flight (Figure 7), as well as a number of standard procedure turns conducted on the previous job (Figure 6), indicated that it took the pilot between 30 and 35 seconds to reposition the aircraft safely onto a reciprocal track using a procedure turn. Additionally, analysis of a number of previous flights by the pilot that day indicated that application runs were conducted at an average speed of 100 kt.

Operational information

A planning meeting for the work to be undertaken on 16 June was conducted on the afternoon prior between the pilot, the loader and the property owner. Risks associated with the job were discussed and the ridge to the east of the application area was identified as a potential hazard. The Bingletree job site (shaded red in Figure 7) was significantly longer in the east-west direction, than the north-south direction. As such, the operator noted that the normal procedure for this site would be to conduct runs in an east-west direction to minimise the number of turns that would be required. The chief pilot also indicated that when undertaking work on the Bingletree site, both prior to and after the accident, the runs were conducted in an east-west-east orientation.

The operator and the chief pilot both indicated that the normal procedure would have been to cut the run short of the end of the property and turn away from the ridgeline, in either a north or south direction, and then conduct a procedure turn to reposition the aircraft for the return run. The job would then be finished with a couple of north-south runs to fill in any gaps at the end of the job site.

Figure 7 shows that this is exactly what the pilot had done on the first flight of the Bingletree job. The first application run was conducted in an easterly direction. At the end of the first run the pilot turned north, away from the ridgeline, before conducting a procedure turn to reposition the aircraft for the return run in a westerly direction. If this procedure were continued for the rest of the job, there would have been no operational reason for the aircraft to enter the area of rising terrain to the east of the application area where the accident occurred.

Safety analysis

Introduction

While top dressing a property in the Upper Turon area of New South Wales, an Airparts NZ FU-24 'Stallion', registered VH-EUO, entered an area of rising terrain shortly after the end of an application run. While repositioning the aircraft for the next application run, control of the aircraft was lost, resulting in a collision with terrain.

Site and wreckage examination did not identify any defects or anomalies that might have contributed to the loss of control. Additionally, a review of the pilot's medical records, post-mortem and toxicology results indicated that it was unlikely that the pilot became incapacitated during the flight. Therefore, this analysis will focus on the examination of the operational factors that led to the loss of control.

Development of the accident

Timing of the accident

The recorded flight data ceased at 1406:59, 2,870 m from the eastern end of the application area. Analysis of previous flights by the pilot that day indicated that application runs were conducted at an average speed of 100 kt (51.4 m/s) and that procedure turns took about 30 to 35 seconds. Assuming the aircraft travelled at 100 knots and in a straight line, it would have taken about 56 seconds for the aircraft to travel from the point of last recorded flight data to the other side of the application area.

Given the buffering time of the TrackMap, it is very likely that the aircraft collided with terrain within 60 seconds of the last recorded flight data. This leaves only about 4 seconds for the aircraft to travel an additional 220 m to the accident site, turn onto a nearly reciprocal track and impact terrain. Given the required 30–35 second timeframe previously established, it is very unlikely that the pilot had sufficient time to conduct a procedure turn before colliding with terrain. It is therefore unlikely that this manoeuvre was achieved in a controlled manner in the timeframe available.

Loss of control

On-site examination indicated that the wreckage was consistent with the aircraft aerodynamically stalling at a low altitude resulting in a low speed, low-energy collision with terrain.

The investigation explored several possible factors that may have contributed to the loss of control, including birdstrike, pilot distraction, mishandling of a procedure turn, among others. In this instance, the evidence available was insufficient to make a determination.

The loss of control occurred shortly after the end of the third application run, while repositioning the aircraft for the fourth run. While the pilot was very experienced in aircraft similar to the Stallion, he had only accrued about 43 hours in EUO. It was likely the pilot would have had stall training in other aircraft types, however, the chief pilot reported that stalling the aircraft was not included as part of the endorsement on the Stallion aircraft (nor was it required to be). It is therefore likely that the pilot had never experienced a stall in the Stallion aircraft-type. Although the Stallion was fitted with an audible stall warning system, additional training may have given the pilot familiarity with the stall characteristics of the aircraft. In this case, however, it is unknown if the absence of type-specific stall training influenced the development of the accident.

Findings

From the evidence available, the following findings are made with respect to the collision with terrain involving a FU24 Stallion, VH-EUO 40 km north-east of Bathurst, New South Wales on 16 June 2017. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

Contributing factors

- The pilot flew the aircraft into an area of rising terrain that was outside the normal operating area for this job site.
- For reasons that could not be determined, the aircraft aerodynamically stalled and collided with terrain during re-positioning at the end of the application run.

Other findings

- There was no evidence of any defect with the aircraft that would have contributed to the loss of control.

General details

Occurrence details

Date and time:	16 June 2016 – 1406 EST	
Occurrence category:	Accident	
Primary occurrence type:	Collision with terrain	
Location:	40 km north-east of Bathurst, New South Wales	
	Latitude: 33° 7'47.83"S	Longitude: 149°48'59.87"E

Pilot details

Licence details:	Commercial Pilot Licence (Aeroplane), issued August 2008
Endorsements:	Tail wheel undercarriage, Manual propeller pitch control, Retractable undercarriage, Gas turbine engine
Ratings:	Multi-engine aeroplane, single-engine aeroplane, Agricultural Pilot (Aeroplane) Rating Grade 2, low level rating.
Medical certificate:	Class 1 Aviation Medical Certificate, valid until 29 July 2017
Aeronautical experience:	4,688 hours
Last flight review:	7 November 2016

Aircraft details

Manufacturer and model:	Airparts NZ FU-24 'Stallion'	
Registration:	VH-EUO	
Operator:	Airspread	
Serial number:	3002	
Type of operation:	Aerial work (agriculture)	
Departure:	Red Hill airstrip	
Destination:	Red Hill airstrip	
Persons on board:	Crew – 1	Passengers – nil
Injuries:	Crew – Fatal	Passengers – nil
Aircraft damage:	Destroyed	

Sources and submissions

Sources of information

The sources of information during the investigation included the:

- Civil Aviation Safety Authority (CASA)
- operator
- Bureau of Meteorology (BoM).

References

Aerial Application Association of Australia (AAAA), Aerial Application Pilots Manual 3rd Edition, 2011.

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 CASA, the New Zealand Transport Accident Investigation Commission (TAIC), TrakMap, Pacific Aerospace, the operator and the chief pilot.

Submissions were received from the operator. 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 the ATSB's 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.

Terminology used in this report

Occurrence: accident or incident.

Safety factor: an event or condition that increases safety risk. In other words, it is something that, if it occurred in the future, would increase the likelihood of an occurrence, and/or the severity of the adverse consequences associated with an occurrence. Safety factors include the occurrence events (e.g. engine failure, signal passed at danger, grounding), individual actions (e.g. errors and violations), local conditions, current risk controls and organisational influences.

Contributing factor: a factor that, had it not occurred or existed at the time of an occurrence, then either:

(a) the occurrence would probably not have occurred; or

(b) the adverse consequences associated with the occurrence would probably not have occurred or have been as serious, or

(c) another contributing factor would probably not have occurred or existed.

Other factors that increased risk: a safety factor identified during an occurrence investigation, which did not meet the definition of contributing factor but was still considered to be important to communicate in an investigation report in the interest of improved transport safety.

Other findings: any finding, other than that associated with safety factors, considered important to include in an investigation report. Such findings may resolve ambiguity or controversy, describe possible scenarios or safety factors when firm safety factor findings were not able to be made, or note events or conditions which ‘saved the day’ or played an important role in reducing the risk associated with an occurrence.