Australian Government
Australian Transport Safety Bureau

Aircraft separation issue involving an Ayres S2R, VH-WBK and an unmanned aerial vehicle

37 km SSW of Horsham aerodrome, Victoria, 12 September 2013

ATSB Transport Safety Report
Aviation Occurrence Investigation
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Addendum

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What happened

On 12 September 2013, at about 0930 Eastern Standard Time (EST),[1] the pilot of an Ayres S2R aircraft, registered VH-WBK (WBK), commenced aerial agricultural operations on a property about 37 km south-south-west of Horsham aerodrome, Victoria.

At about the same time, the operator of an unmanned aerial vehicle (UAV), Sensefly eBee 178 (Figure 1), arrived at the 'Iluka Echo' (Echo) mine site to conduct an aerial photography survey of the site. After having completed his pre-flight preparations and a risk assessment of the operation, the operator heard an aircraft operating about 1-1.5 km away on a neighbouring property to the north-east of the UAV launch site (Figure 2).

Figure 1: Sensefly eBee 178

Source: Operator

The UAV operator broadcast on the area frequency advising his intention to conduct unmanned aerial photography operations over the Echo mine site for the next 4 hours, and addressed the 'ag aircraft operating north-east of Echo mine site', but did not receive a response. He then asked the mine manager to contact the farmer, who was loading the fertilizer into the hopper of WBK, to advise him of the UAV operating in the area and request that he also notify the pilot of WBK.

The UAV operator then commenced operations on the western side of the site to increase separation with WBK. The UAV conducted a series of parallel flights from north to south, progressing from the western boundary of the area towards the east, at about 390 ft above ground level (AGL).

After completing the first load of fertilizer, the pilot of WBK reported that the farmer informed him there would be an 'aircraft' conducting aerial photography over the Echo mine site, near one of the areas that he would be operating on. The pilot assumed this would be a fixed-wing aircraft

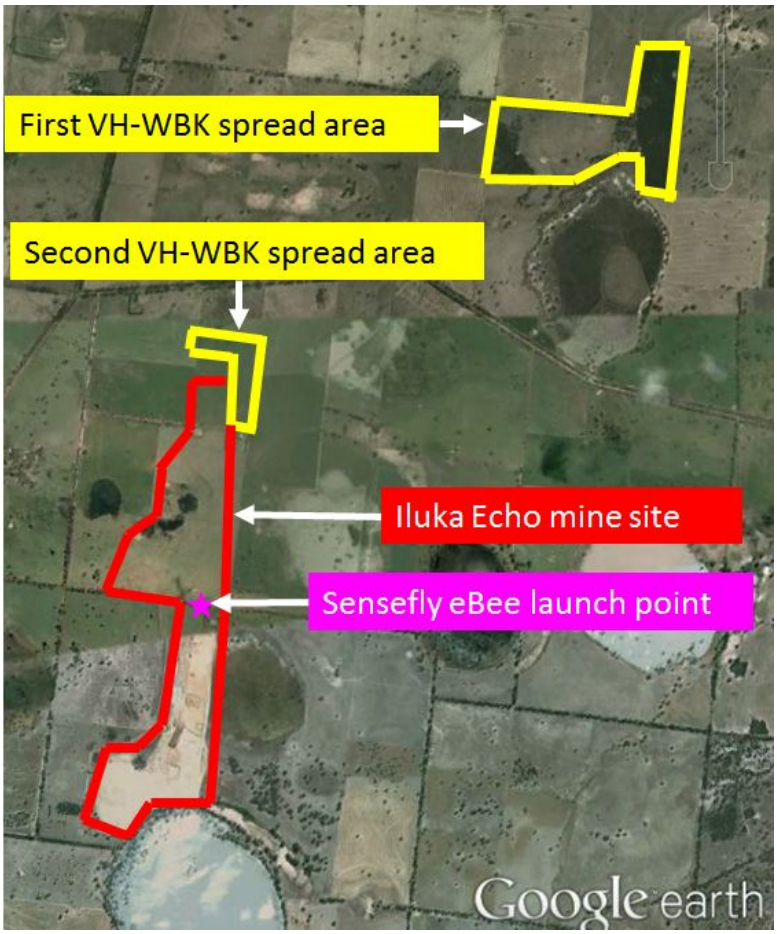
[1] Eastern Standard Time (EST) was Coordinated Universal Time (UTC) + 10 hours.

operating at or above 500 ft AGL, and intended to remain at or below 350 ft AGL to ensure separation with the fixed-wing aircraft.

At about 1000, the UAV operator heard increasing noise from WBK and observed the aircraft cross the site boundary from the north, conduct a 180° turn about 150 m north of the UAV, then complete one full 360° turn before it departed again to the north. At the time, the UAV was on approach to land, at about 380 ft AGL. The operator immediately put the UAV into a holding pattern to maintain its current position. He estimated WBK was at about 100-150 ft AGL and came within about 100 m horizontally of the UAV. He attempted to contact the pilot of WBK on the radio but did not receive a response.

The pilot of WBK reported that, after completing spreading on the first paddock, he then returned to the airstrip about 3 NM to the north-east, where the aircraft was re-loaded with fertilizer. He subsequently spread the fertilizer on the second block, about 2 NM south-west of the first area, operating at about 50-100 ft AGL. He finished operating in the area by about 1200. He reported sighting a white vehicle on the road on the mine site, but did not see the UAV at any time. The next day the UAV operator contacted the pilot of WBK and advised him of the incident.

Figure 2: Operating areas for VH-WBK and the UAV



Source: Google earth

UAV operations

The UAV was required to operate at or below 400 ft AGL but could have been granted approval to operate higher, in which case a NOTAM would be issued. All UAV operators were required to broadcast on the appropriate frequency. The Civil Aviation Safety Authority Advisory Circular AC 101-1(0), *Unmanned aircraft and rockets: Unmanned aerial vehicle (UAV) operations, design specification, maintenance and training of human resources*, is available at www.casa.gov.au/wcmswr/_assets/main/rules/1998casr/101/101c01.pdf

Pilot comments (VH-WBK)

The pilot provided the following comments:

- He did not see the UAV or hear any calls from the operator, however, it was normal procedure to turn the radio down to minimise distractions during low level operations.
- He was not aware of the procedures for UAV operations. He believed they present an additional hazard to those already encountered by pilots conducting agricultural operations, particularly as they are very difficult to see.
- He believed that a collision with the UAV may potentially have resulted in aircraft damage due to ingestion into the engine, windscreen damage or pilot distraction.

UAV operator comments

The UAV operator provided the following comments:

- If an aircraft was operating in the area, the normal procedure was to land the UAV immediately. The emergency landing for the eBee was a spiral landing at about a 60 m radius, which could take about 3-5 minutes. As WBK was below the UAV, he assessed it was safer to maintain the UAV at altitude rather than descend and potentially conflict with WBK.
- In hindsight, he should have spoken directly to the pilot to ensure the pilot understood what the UAV would be doing.
- He attempted to contact the pilot of WBK via the radio, but did not receive any response. The UAV operators were required to have a radio. Manned aircraft were not required to have a radio when operating below 5,000 ft in Class G airspace and away from certified, registered or military aerodromes.
- He visually monitors the UAV directly, or with binoculars, throughout the flight.
- If the UAV had collided with WBK, he thought it was unlikely that it would have caused any damage. Larger UAV's have a wingspan of 3-4 m and are made of carbon fibre and pose a far greater risk.
- With increasing UAV operations, it is essential that operators and pilots gain an awareness and understanding of each other's operations.

Safety action

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following proactive safety action in response to this occurrence.

UAV operator

As a result of this occurrence, the UAV operator has advised the ATSB that they have taken the following safety actions:

Industry awareness and education

The operator of the UAV has conducted a presentation on UAV's to air traffic controllers at Moorabbin Tower. They have also commenced a campaign to advise agricultural aircraft operators of their work, what UAV aircraft look like, and to establish protocols for sharing the airspace during future operations.

Safety message

This incident highlights the challenges associated with having a diverse mix of aircraft operating in the same airspace and the need for all pilots and operators to remain vigilant and employ see-and-avoid principles. The operator of the UAV reported that due to a small frontal area, a UAV

may be difficult to see and therefore a potential for conflict exists, in particular with manned aircraft operating below 400 ft AGL.

Where other aircraft may be operating in the same airspace without radios, separation is limited to see-and-avoid principles. The limitations of unalerted see-and-avoid have been detailed in the ATSB's research report *Limitations of the See-and-Avoid Principle*. The report highlights that unalerted see-and-avoid relies entirely on the pilot's ability to sight other aircraft. Broadcasting on the correct frequency is known as radio-alerted see-and-avoid, and assists by supporting a pilot's visual lookout for traffic.

Prior to commencing UAV operations, direct communication with the pilots of other aircraft in the area may increase awareness and assist in preventing similar incidents from occurring. If the pilot of a manned aircraft communicates their intentions to operate in the same airspace as a UAV, the UAV operator may be able to land the UAV or take action to avoid potential conflict. The report is available at www.atsb.gov.au/publications/2009/see-and-avoid.aspx.

General details

Occurrence details

Date and time:	12 September 2013 – 1000 EST	
Occurrence category:	Serious incident	
Primary occurrence type:	Near collision	
Location:	37km SSW of Horsham aerodrome, Victoria	
	Latitude: 36° 57.05' S	Longitude: 141° 56.92' E

Aircraft details: UAV

Manufacturer and model:	Sensefly eBee
Registration:	178
Type of operation:	Aerial work
Damage:	Nil

Aircraft details: VH-WBK

Manufacturer and model:	Ayres Corporation, S2R	
Registration:	VH-WBK	
Serial number:	T15-021DC	
Type of operation:	Aerial work	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Nil	

About the ATSB

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; and 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.

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

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

About this report

Decisions regarding whether to conduct an investigation, and the scope of an investigation, are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, a limited-scope, fact-gathering investigation was conducted in order to produce a short summary report, and allow for greater industry awareness of potential safety issues and possible safety actions.