Australian Government
Australian Transport Safety Bureau

Collision with a vehicle, involving an Air Tractor AT-502B, VH-FNX

23 km W of Hay, New South Wales, on 17 September 2015

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Aviation Occurrence Investigation
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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

Addendum

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What happened

On 17 September 2015, the pilot of an Air Tractor 502B aircraft, registered VH-FNX, was conducting aerial application (spraying) operations on a property about 23 km to the west of Hay Aerodrome, New South Wales. The spray application area consisted of a block of nine adjoining paddocks, separated by combination of irrigation channels and access roads that allowed for movement of plant and equipment. There was a single paddock included in the spray application area that joined the larger block at the eastern end, separated from the other paddocks by an irrigation channel. The pilot planned to spray the group of paddocks as a single block (Figure 1).

Figure 1: Spray application area - a block of nine paddocks with another adjoining paddock at the eastern end

Source: Google earth (supplied by the agricultural company and annotated by the ATSB)

As per normal procedure, while en route to the spray application area, the pilot had made a broadcast on UHF Channel 25 advising that spraying operations were about to commence, and also, the area where that would occur. UHF Channel 25 was monitored by employees on the property, and used for general communications.

At the time the pilot made the broadcast, there was a tractor operating in the southern part of the spray application area, and the tractor driver responded to the pilot's broadcast. The pilot determined that although the tractor was inside the spray application area, there was no likelihood of an immediate conflict with the spraying operations. Due the southerly wind, the pilot intended to commence spraying runs along the northern edge of the block and gradually work toward the south. The pilot advised the tractor driver that they would be able to safely continue in that southern area, without creating any conflict for spraying operations, for about an hour. Without hearing any other responses to the broadcast, the pilot switched to a different UHF frequency (Channel 20), in accordance with their normal practice.

The pilot commenced spraying operations at about 1100 Eastern Standard Time (EST). The pilot was flying a left hand race-track pattern, in an east-west direction; moving the pattern further south

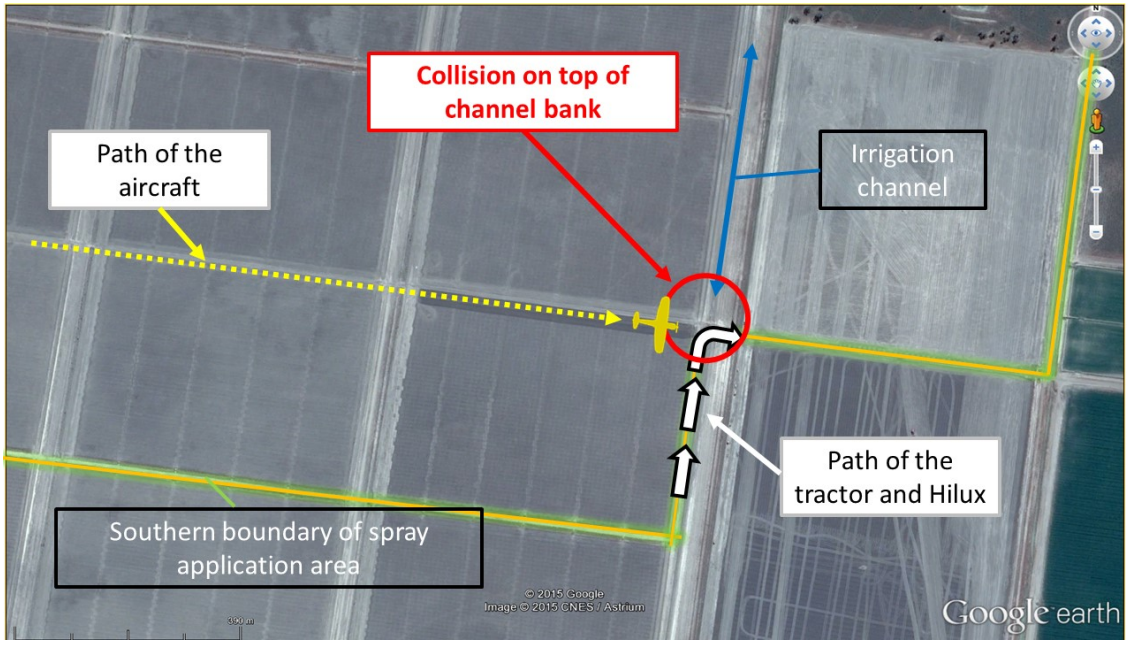
with each spray run. After a short time, the pilot departed the spray application area to reload with more chemical mixture at a nearby property.

The pilot then returned to the spray allocation area, and resumed spraying operations at about 1130. The pilot did not make another UHF radio broadcast upon the resumption of spraying operations.

At about 1145, as part of the continual southerly movement of the race-track spray pattern, the pilot was conducting a spray run in an easterly direction, along a roadway that divided some of the paddocks inside the spray application area. The pilot intended to continue the run, across the irrigation channel, and along the southern boundary of the eastern most paddock in the spray area (Figure 2).

During this run, the pilot reported seeing a white Toyota Hilux Double Cab utility vehicle turn onto an irrigation channel crossing ahead of the aircraft (Figure 2). However, the Hilux appeared to the pilot to be slowing to a stop, short of the intersection/irrigation channel crossing. The pilot assumed that the driver of the Hilux had seen the aircraft, and was stopping to allow the aircraft to continue its run over the channel crossing.

Figure 2: Layout of accident site, showing path of the aircraft, path of the tractor and Hilux along the irrigation channel bank, the south-eastern border of the spray application area, and the point where the collision occurred



Source: Google earth (supplied by the agricultural company and annotated by the ATSB)

Confident that the vehicle was stopping, the pilot continued the spray run and, as per normal routine, checked the spray pressure gauge, and momentarily looked to each side of the aircraft to confirm that no spray nozzles were blocked. As the pilot then turned their attention forward again, and commenced a short climb to clear the raised channel bank,[1] they saw that the Hilux had not stopped, but had continued along the road, turned right, and was climbing up over the raised channel bank. (Note: the agricultural company report advised that the tractor was ahead of the Hilux and already moving down the other side of the channel bank at this stage – refer section titled '*Movement of Hilux*').

[1] The pilot estimated that the channel bank was about 1.5 m higher than the surrounding paddocks. During the spraying operations, the pilot estimated that the wheels of the aircraft were about 1 m above the ground.

The pilot immediately stopped the spray and continued to climb, but was unable to clear the Hilux. The left wheel of the aircraft struck the tray headboard of the Hilux. As the vehicle and aircraft were both heading east, the aircraft struck the Hilux from behind.

Following the collision, the pilot climbed the aircraft to a higher altitude. The pilot checked that the aircraft was handling normally, including a brake pressure check, to confirm that the landing gear was still attached. The pilot saw that the driver had exited the vehicle, so made a broadcast on UHF Channel 25, advising farm personnel of the accident and requesting assistance for the driver. The driver of the vehicle responded to that broadcast. The pilot then flew back to the loading area and conducted a fly-by to enable the support crew to inspect the landing gear, prior to an uneventful landing.

The pilot was unhurt, but the driver of the vehicle sustained a shoulder injury.

Subsequent inspection of the aircraft revealed that the parts of the left landing gear were damaged, particularly in the area where the leg of the landing gear attaches to the aircraft structure. The vehicle was substantially damaged in the collision, particularly the tray headboard and roof structure on the passenger side of the cabin area (Figures 3 and 4).

Figure 3: Rear view showing damage to the Hilux headboard

Source: Agricultural company

Figure 4: Roof structure damage on passenger side

Source: Agricultural company

Movement of the Hilux

The Hilux driver had been attending to other tasks on another property (unrelated to the spraying operations) during the morning of the accident, but was aware of the spraying operations. Although the driver commented that notification regarding the spraying operations from the agricultural company was not provided until relatively late, the driver had been emailed about the spraying the day before, and the topic was again discussed on the phone on the morning of the accident. The driver was planning to assist with the logistics associated with moving the tractor from its location inside the spray application area to another part of the property. The tractor driver was relatively new to the property, so the Hilux driver intended to coordinate the move, and provide guidance to the tractor driver.

While en route to the property to coordinate movement of the tractor, the driver heard the pilot's broadcast on UHF Channel 25 regarding commencement of spraying operations. The driver recalled hearing that the pilot intended to start spraying at the northern boundary of the spray application area. The Hilux driver attempted to respond to the broadcast, but was unable to establish contact, perhaps because the vehicle was still some distance away at the time. In any case, the Hilux driver was aware that the tractor driver had responded to the pilot's broadcast.

As they prepared to move the tractor, the Hilux driver noted that the aircraft appeared to be still operating in the northern part of the spray application area (having returned from a chemical mixture reload). With that in mind, and because the planned route of the tractor and Hilux was along the south-eastern perimeter of the spray application area, the driver believed this would

keep them clear of the spraying operation. Furthermore, the Hilux driver was of the impression that the pilot was operating to the north to accommodate movement of the tractor. The Hilux driver therefore elected not to contact the pilot as they were moving the tractor, because they believed that the move could be conducted safely without disrupting the pilot.

The Hilux driver was proceeding slowly, so as to monitor the progress of the tractor ahead. The driver's attention was on the tractor as it turned right towards the east, to negotiate the raised channel crossing.

Following the tractor, the Hilux driver turned right to cross the channel. Near the top of the crossing, the aircraft collided with the vehicle from behind. The driver was unaware of the approaching aircraft until hearing the sound of the engine immediately before the collision.

Pilot and driver comments

The pilot commented that with the benefit of hindsight, it was unwise to assume that the Hilux driver had seen the aircraft and was travelling slowly for that reason. The pilot and driver both commented that the accident highlighted the importance of effective communication.

Agricultural company investigation

The agricultural company conducted a Workplace Health and Safety investigation into the accident. In general terms, contributing factors identified by the investigation related substantially to 'assumptions' and 'ineffective communication'.

The agricultural company investigation also identified that the Pesticide Application Management Plan (PAMP)[2] had expired at the end of June 2015. Notwithstanding expiry of the document, the investigation report identified some areas where, in the opinion of the investigator, PAMP instructions were not effectively applied. The report also noted that the PAMP did not require that aerial application operators use the same UHF channel as that used by farm employees, apart from a broadcast announcing spraying intentions. The report identified that this channel mismatch potentially hindered timely and effective communication.

Notification to the driver: The agricultural company reported that the Hilux driver had been emailed about the spray operations the day before the accident; and that the spray job was again discussed on the telephone the following morning.

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 safety action in response to this occurrence.

Agricultural company

As a result of this occurrence, the agricultural company (in consultation with contracted aerial application operators) has indicated their intent to revise and re-issue the PAMP, to better identify procedures, roles and responsibilities, in the interests of safety improvement. The agricultural company investigation report made a number of recommendations with respect to the PAMP. These recommendations are broadly summarised as follows:

- Issue the 2015/2016 PAMP as soon as possible (noting that the 2014/2015 PAMP had expired).

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[2] The PAMP was a document prepared by the agronomy company, intended to ensure that spraying operations (including aerial application operations) were conducted in a safe manner. To that end, the PAMP by outlined roles and responsibilities and providing instructions to all relevant personnel.

- Provide more specific instructions regarding roles and responsibilities, including the responsibilities of managers, farm employees and pilots engaged in aerial application operations (including communication requirements).
- Promulgate specific requirements with respect to buffer zones separating equipment and aircraft, and define responsibilities related to the application of those buffer zones.
- Improve relevant signage at property entry points notifying (and reminding) staff and visitors of spraying operations, movement restrictions and communication requirements.
- Require farm employees and pilots engaged in aerial application operations to operate on the same UHF channel.
- Include relevant procedures in property site instructions to provide for safe movement of farm employees, visitors and equipment when spraying operations are planned.

Safety message

This accident highlight the importance of effective communication by all parties involved with aircraft operations. Effective communication substantially reduces the risk of a misunderstanding, reduces the likelihood that false assumptions will prevail, and allows for timely action to reduce the likelihood of any confliction in the first instance.

ATSB Research and Analysis Report AR-2015-031 *Aerial application safety: 2014 to 2015 year in review*, provides statistical data regarding aerial application accident rates, and summarises a number of accidents that occurred during aerial application operations. The report includes a section that highlights the importance of communication and coordination of operations. Although the report deals primarily with inter-pilot communication, the same message relates to all parties involved with aerial application operations. The report includes a lesson learnt:

> Communication is important in parts of aerial agriculture and firefighting operations, including planning to convey information to relevant parties, and during the operation to reiterate the plan and notify parties of any new information arising during the task. Do not rely on other pilots communicating, and always scan for other aircraft even when you are at remote locations.

Organisations with responsibility related to the safe conduct of aerial application operations should ensure that all staff are familiar with planned operations (including being advised in a timely manner), and that all associated responsibilities are clearly documented and understood. Relevant documents should be regularly reviewed and updated, and the associated procedures and instructions consistently applied. Risk assessments should address the importance of effective communication.

The accident also highlights the manner in which assumptions can elevate risk. Pilots are encouraged to exercise caution, and not assume that the actions of others will necessarily be based upon a common understanding. If any doubt exists with respect to the intentions of others, pilots should adopt a safe course of action in the first instance. This is particularly important where the margin for error is small, such as in aerial agriculture operations.

General details

Occurrence details

Date and time:	17 September 2015 – 1145 EST	
Occurrence category:	Accident	
Primary occurrence type:	Collision with terrain (a vehicle)	
Location:	23 km W of Hay Aerodrome, New South Wales	
	Latitude: 34° 35.1’ S	Longitude: 144° 35.3’ E

Aircraft details

Manufacturer and model:	Air Tractor AT-502B	
Registration:	VH-FNX	
Serial number:	502B-2591	
Type of operation:	Aerial work – Aerial agriculture	
Persons on board:	Crew – 1	Passengers – Nil
Injuries:	Crew – Nil*	Passengers – N/A
Damage:	Minor*	

*** The driver of the motor vehicle involved in the collision sustained minor injuries. The motor vehicle was substantially damaged.**

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.