Australian Government

Australian Transport Safety Bureau

ATSB TRANSPORT SAFETY INVESTIGATION REPORT

Aviation Occurrence Investigation – AO-2008-014

Preliminary

Mid-air collision – 10 km NE of Wee Waa, NSW

26 February 2008

VH-ATB

Air Tractor Inc. 502B

VH-CJK

Air Tractor Inc. 502

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Figure 1: Map NSW courtesy of Google Earth.

Figure 2: Photograph courtesy of Air Tractor Inc. website.

Abstract

At 0930 Eastern Daylight-saving Time on 26 February 2008, Air Tractor Inc. 502 registered VH-CJK (CJK), whose pilot was engaged in the aerial spraying of a field approximately 10 km NE of Wee Waa township, NSW, and Air Tractor Inc. 502B registered VH-ATB (ATB), that had just departed from an airstrip approximately 13 km north-east of Wee Waa, collided. The pilot of CJK was fatally injured and the aircraft destroyed by collision forces with the other aircraft and by ground impact. It did not catch fire. The pilot of ATB was seriously injured and the aircraft destroyed by collision forces with the other aircraft, ground impact, and a post impact fire.

The investigation is continuing.

THE AUSTRALIAN TRANSPORT SAFETY BUREAU

The Australian Transport Safety Bureau (ATSB) is an operationally independent multi-modal bureau within the Australian Government Department of Infrastructure, Transport, Regional Development and Local Government. ATSB investigations are independent of regulatory, operator or other external organisations.

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 enhance safety. To reduce safety-related risk, ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not the object of an investigation to determine blame or liability. However, 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 proactively initiate safety action rather than release formal recommendations. However, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation, a recommendation may be issued either during or at the end of an investigation.

The ATSB has decided that when safety recommendations are issued, they will focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on the method of corrective action. As with equivalent overseas organisations, the ATSB has no power to implement its recommendations. It is a matter for the body to which an ATSB recommendation is directed (for example the relevant regulator in consultation with industry) to assess the costs and benefits of any particular means of addressing a safety issue.

About ATSB investigation reports: How investigation reports are organised and definitions of terms used in ATSB reports, such as safety factor, contributing safety factor and safety issue, are provided on the ATSB web site www.atsb.gov.au.

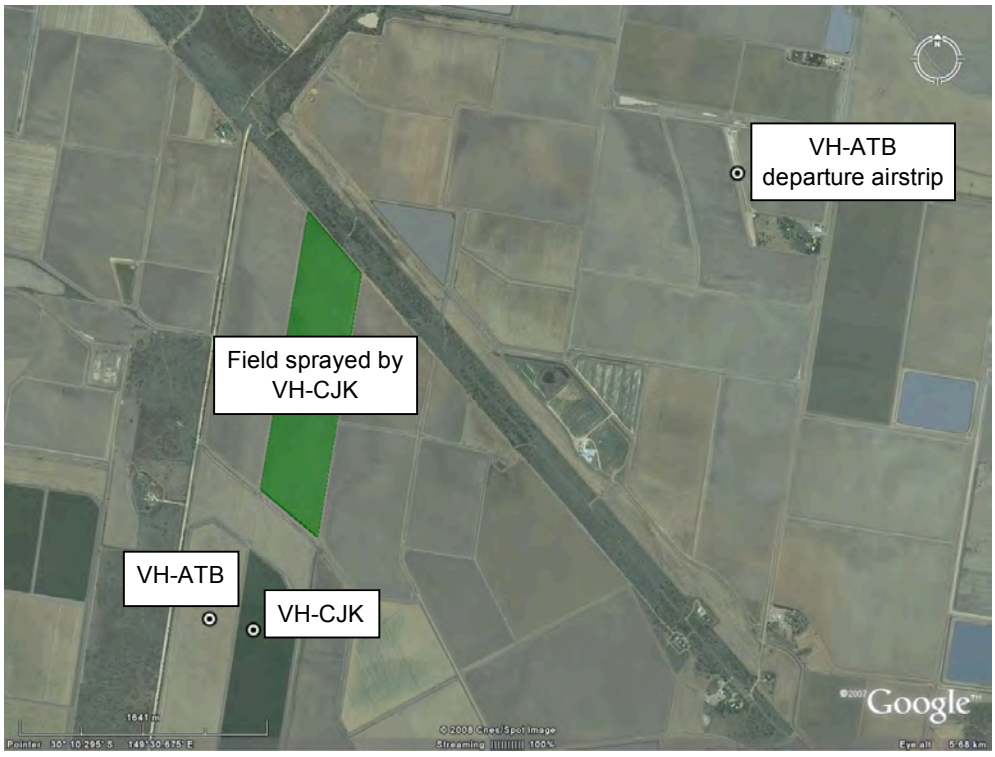
FACTUAL INFORMATION

Note: The information contained in this preliminary report is derived from initial investigation of the occurrence. Readers are cautioned that there is the possibility that new evidence may come to light that alters the circumstances as depicted in this report.

Sequence of events

At 0930 Eastern Daylight-saving Time[1], 26 February 2008, the pilot of an Air Tractor Inc. 502, registered VH-CJK (CJK), was spraying insecticide on a crop of mung beans in a field approximately 10 km north-east of Wee Waa, NSW. It was the second flight made by the pilot that morning from an airstrip 4.5 km south-west of Wee Waa, to spray that field. At approximately the same time, the pilot of an Air Tractor Inc. 502B, registered VH-ATB (ATB), departed from an airstrip 13 km north-east of Wee Waa, on a second flight to apply herbicide to a crop of sorghum on a property located 10 km south-west of Wee Waa.

Figure 1: Satellite image of accident site



The pilot of ATB reported taking off into the south-south-east and making a gradual right climbing turn toward the south-west to track to the spraying area, as he had done on the previous flight. The flight path passed just south of the field being sprayed by CJK. The pilot of ATB reported that the aircraft was climbing at 90

1 The 24-hour clock is used in this report to describe the local time of day, Eastern Daylight-saving Time (ESuT), as particular events occurred. Eastern Daylight-saving Time was Coordinated Universal Time (UTC) + 11 hours.

KIAS[2] to his usual transit height of between 500 ft and 600 ft above ground level (AGL) when the two aircraft collided. Both aircraft crashed into fields just to the south of the field being spayed by CJK (Figure 1).

The pilot of ATB was seriously injured and the aircraft was destroyed by collision forces with the other aircraft, ground impact, and a post-impact fire. The pilot of CJK was fatally injured and the aircraft was destroyed by collision forces with the other aircraft and by ground impact. It did not catch fire.

The pilot of ATB later reported that at the time, he had not realised there had been a collision and had no recollection of subsequent events. He had not sighted any other aircraft, on either flight, but thought that the collision had occurred at a height of approximately 300 ft AGL.

Witness information

Two farm workers about 1.5 km west of the airstrip from which the pilot of ATB had taken off, saw the aircraft depart normally. A short while later, they saw smoke in the area of the accident site and, suspecting that the aircraft had crashed, made their way to the area.

Several people working on nearby farms or driving along adjacent roads, heard or briefly sighted CJK, but because of the prevalence of aerial spraying in the region, none had watched the aircraft for any length of time. A farmer, approximately 2 km west of where the collision occurred, reported that he had stopped his tractor to remain clear of any spray drift and had been watching CJK for several minutes as it made reciprocal spray runs, oriented north-south, over the application area. The aircraft was partially obscured behind trees during the spray runs due to its low-level, but was clearly visible during the procedure turns[3] made at either end of the application area. He reported that the height of the turns was consistent, and that CJK had pulled-up from a north-to-south spray run and was making a left turn at the time of the collision. He reported that he had not seen the actual collision, but saw a ball of fire in the air and then two aircraft diving to the ground. One aircraft was on fire. They disappeared from his view behind an intervening tree-line, but a column of smoke arose from where one of the aircraft had collided with the ground.

Rescuers attending the accident scene initially thought that only a single aircraft was involved. They reported that the aircraft was on fire and that the pilot of ATB was seen standing some distance from the aircraft and waving to them. When they spoke to him, he was not aware there had been a mid-air collision. After realising that another aircraft had been involved, rescuers made their way to the wreckage of CJK and were attempting to remove the pilot from the upturned wreckage when ambulance personnel arrived and established that the pilot had been fatally injured.

2 Knots indicated airspeed.

3 Turn manoeuvre used to reverse the direction of flight and align the aircraft for the next spray run.

Aircraft information

The aircraft involved in the collision were both single-seat agricultural aircraft manufactured in the US by Air Tractor Inc. The AT 502 (Figure 2)[4] was powered by a single Pratt and Whitney Canada PT-6A-15AG turbine-propeller engine, driving a three-blade Hartzell propeller.

Figure 2: An Air Tractor Inc. 502 aircraft similar to ATB and CJK

CJK was an AT-502 manufactured in 1989 and had a total time in service of 7,961 hours. ATB was an AT-502B[5] manufactured in 1995 and had an estimated[6] total time in service of 5,480 hours.

Both aircraft were painted bright yellow. The only significant difference between the two paint schemes was the colour of the stripes along the fuselage, tail and wing tips. These stripes were green on CJK and blue on ATB. Both aircraft were equipped with wingtip strobe lights and a red flashing beacon. The pilot of ATB reported that the beacon always remained on, but the strobe lights were only used in darkness or in conditions of poor visibility, as they were ineffective in normal daylight. It was not known if CJK displayed any strobe lights or a beacon. The strobe lights switch was found in the central, OFF position during wreckage examination by investigators, but may have been moved during the accident sequence or removal of the pilot from the wreckage.

CJK was not equipped with a very high frequency (VHF) radio, nor was there any requirement for the carriage and use of radio in aircraft operating under the visual

4 AT-502 maximum takeoff weight (MTOW) of 4,754 kg.

5 AT-502B MTOW of 4,272 kg.

6 This figure represents the last total time in service at the previous maintenance inspection plus the pilot's recorded flying times on the aircraft since. The Maintenance Release from VH-ATB was not recovered and was presumed burnt.

flight rules in class G airspace [7] in the Wee Waa area. A VHF radio was installed in ATB. The pilot of ATB reported that the VHF radio was tuned to the common traffic advisory frequency of 126.7 MHz, but he had not made any broadcasts on that frequency. Both aircraft had ultra high frequency radios installed, but, as was the usual practice, each was tuned to their respective operator's discrete channel for communication between the pilots and their respective ground support personnel.

A pilot who had flown CJK earlier that morning, reported later that there were no defects with that aircraft. The pilot of ATB reported that the aircraft had no defects and that takeoff and climb were normal. The aircraft had full fuel and a load of approximately 1,700 L of chemical in the hopper.

Pilot information

Both pilots were experienced agricultural pilots, based in the Wee Waa district.

The pilot of CJK held a commercial pilot (aeroplane) licence and a valid Class 1 medical certificate. An entry in the pilot's log book showed that he had satisfactorily completed an aeroplane flight review on 31 October 2007. He had a total aeronautical experience of 14,078 hours, most of which was accumulated in aerial agricultural operations over a period of more than 35 years and had held a Grade 1 Agricultural Rating since 1973. The pilot had previously been involved in five reported accidents, the last of which occurred in November 1993. Two of those accidents resulted from wire strikes and the other three were attributed to mechanical problems with the aircraft. A Certificate of Type Endorsement for the Turbo Thrush/Air Tractor[8] dated 13 November 1996 was found with the pilot's personal documents. Since then the pilot had flown 3,497 hours on the aircraft type. However, Civil Aviation Safety Authority records for the pilot only recorded an endorsement for the Ayers Turbo (TPE 331) aircraft type, dated 17 November 2003.

The pilot of ATB held a commercial pilot (aeroplane) licence and a valid Class 1 medical certificate. He was endorsed on the Ayers Turbo (PT6) aircraft type and had completed a satisfactory aeroplane flight review on 25 September 2007. He had a total aeronautical experience of 8,875 hours, nearly all of which was in aerial agricultural operations and had held a Grade 1 Agricultural Rating since January 1997. The pilot reported that his experience on the aircraft type was approximately 6,000 hours.

Meteorological information

The pilot of ATB reported that the weather conditions at the time of the accident were clear, with bright sunshine and good visibility. At the time of the collision the sun's azimuth was calculated to be a bearing of 080° T and subtended an angle of 33.5° above the horizon, at ground level. The pilot reported that the wind at the airstrip was approximately 3 to 6 kts from the north-north-east and that flying conditions were smooth.

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7 The airspace in the area around Wee Waa below FL180 is classified as class G airspace.

8 Includes the Ayers Turbo (PT6).

Data from the automatic weather station at Narrabri aerodrome (40 km south-east of the accident site) that morning at 1000 recorded a wind of 11 kts from a direction of 010º M and a temperature of 26º C.

Wreckage location

The main wreckage of each aircraft was located 300 m apart in fields separated by an irrigation channel and an access road. Items of wreckage were scattered between the two aircraft wreckage sites and orientated in a north-east to south-west direction. Although the fields into which the aircraft crashed were level, the soft, irrigated soil and the closely planted crops made access to both aircraft difficult for rescuers.

The wreckage of CJK was lying in a knee-high crop of mung beans (Figure 3). The site was contaminated by a chemical spill from the ruptured hopper, and by aviation turbine fuel. The chemical (Alpha-Cypermethrin) was classified as a Group 3A insecticide and access to the site required full protective covering for a period of 48 hours after spillage.

The wreckage of CJK came to rest inverted with both wings detached from the fuselage. The right wing was intact and had sustained high velocity, vertical impact damage along its entire leading edge. The left wing was pushed rearward and was missing the outboard section. The separated section of the left wing was found approximately 80 m from the aircraft toward the wreckage of ATB. The left side of the fuselage, adjacent to the cockpit, sustained considerable damage from ground impact forces. The left horizontal stabilizer displayed high-energy damage to its tip and the left elevator had been torn from its torque tube. The left landing gear had separated from the aircraft and was found approximately 60 m from the main wreckage, beside a deep furrow that marked initial impact with the ground. Fragments of unpainted fibre-glass were found imbedded in the wheel and tyre. The right landing gear leg was with the main wreckage, but the wheel had detached on impact with the ground and was lying behind the wreckage. The engine and propeller had detached from the fuselage in the collision with the ground and came to rest approximately 10 m from the main wreckage. Examination of the engine indicated that it was producing power at the time of impact with the ground.

Figure 3: Wreckage of VH-CJK

The wreckage of ATB was lying in a soy bean crop that stood nearly chest high (Figure 4). A localised, intense post-impact fire destroyed part of the aircraft's structure and the immediate environment. A chemical spill of herbicide (Glyphosate) from the ruptured hopper had contaminated some of the surrounding crop. The chemical was not classified as a hazardous material.

The wreckage of ATB was inverted and fire had consumed the inboard half of the left wing, the centre fuselage section and the cockpit area. The right wing had been torn into two pieces, with the top cap of the front spar holding the outboard section of the wing to the fuselage. The inboard sections of the right wing and wing flap were found along the wreckage trail in the direction of the wreckage of CJK. The fin of ATB was destroyed and the rudder remained attached to the aircraft by its control cables. The horizontal stabilisers and elevators remained integral with the fuselage and exhibited ground impact damage. The left main landing gear was attached to the airframe but the right gear leg and wheel had separated and were found behind the wreckage. The top panel of the fibreglass hopper and lid actuating mechanism were found 100 m back along the wreckage trail. The engine and propeller were attached to the fuselage and displayed evidence of power being produced at the time of impact with the ground.

Figure 4: Wreckage of VH-ATB

The dense vegetation and soft soil precluded the recovery of some damaged components from the wrecked aircraft. Additionally, it was not immediately apparent as to which aircraft some of the damaged components had belonged. Many of the damaged components were of identical manufacture and painted the same colour, and further examination is continuing.

Survivability

Due to the attitude of CJK when it impacted the ground, the left side of the fuselage was deformed, breaching the integrity of the protective structure in the area of the cockpit. The attachments for the pilot's four-point harness were intact and the webbing of both the upper and lower restraint straps had been cut by rescuers attempting to free the pilot. The buckle was still fastened correctly. The seat was correctly attached to the airframe, but the tubular steel frame of the fuselage had buckled under overload. The pilot's helmet was nearby and intact, but the chin straps were found in their stowed position.

ATB impacted the ground on its right main wheel before tumbling and coming to rest inverted. The integrity of the cockpit cage remained intact, allowing a survivable space. Fire had consumed the inboard section of the left main wing and damaged the centre section of the fuselage, including much of the cockpit area. The pilot's seat mounts had failed. The lower straps of the pilot's four-point harness were burnt, leaving only their attachment points. The buckle and buckle-end fittings were destroyed in the fire. The upper restraint straps were found near the wreckage. Their buckle-end fittings were undamaged, but the webbing had been torn from their attachments. There was no fire damage to these straps. The pilot's helmet was found in the cockpit and had been burnt. Its straps were not in the stowed position.

Recorded information

Both aircraft were equipped with a satellite guidance system, known as SATLOC, used to provide accurate guidance to pilots during spraying operations. Data from the guidance system was recorded to a memory flashcard that included parameters for track, speed, altitude, time and spraying information. The memory flashcard from CJK contained data for all but approximately the last one minute and forty seconds of flight. The missing data was most likely due to limitations in electronically uploading and capturing that data in the system's memory after power to the unit was lost. Recorded information from the card showed that the pilot had been spraying the field for approximately 5.5 minutes on the second flight before the collision occurred. The data also showed that the maximum height of the aircraft during the procedure turns at the southern end of the application area were between 195 and 231 ft AGL.

The card in the SATLOC system of ATB was destroyed by fire and the recorded data was lost.

Further investigation

The investigation is continuing and will examine the following:

- an analysis of data to establish the dynamics of the mid-air collision
- visibility characteristics of the aircraft and the effectiveness of see-and-avoid procedures used by pilots engaged in aerial application operations
- survivability aspects.