Australian Transport Safety Bureau
PO Box 967, Civic Square ACT 2608
Australia

1800 020 616

+61 2 6257 4150 from overseas

www.atsb.gov.au

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ATSB TRANSPORT SAFETY REPORT
Aviation Occurrence Investigation AO-2010-069
Final

Collision with terrain, VH-KZF 25 km east of Geraldton Airport, Western Australia 14 September 2010

Abstract

On 14 September 2010, the pilot of a Cessna Aircraft Company A188B/A1 Agtruck aircraft, registered VH-KZF, was conducting aerial spraying operations about 25 km east of Geraldton Airport, Western Australia.

The pilot commenced the takeoff from an elevated, 700m long gravel airstrip on the eleventh of 12 flights, during which the aircraft did not achieve the required take-off performance. In an attempt to become airborne before the end of the useable runway surface, the pilot elected to dump some of the chemical load and continued the takeoff.

The diminished aircraft performance was such that, despite the reduced chemical load, the aircraft did not accelerate to the required take-off speed before the runway overshoot area. The aircraft made contact with a tree stump that was embedded in thick weed and likely further reduced the aircraft's ability to sustain flight. The aircraft subsequently collided with terrain a short distance from the departure end of the airstrip.

The pilot was fatally injured and the aircraft was seriously damaged by the impact forces and an intense post-impact fire.

The investigation did not identify any organisational or systemic issues that might adversely affect the future safety of aviation operations. However, the accident does provide a timely reminder of the need for performance planning and the continual assessment of the effect of changing conditions on that planning.

FACTUAL INFORMATION

History of the flight

At about 1000 Western Standard Time[1] on 14 September 2010, the pilot of a Cessna Aircraft Company A188B/A1 Agtruck (Agtruck) aircraft, registered VH-KZF (KZF), departed Geraldton Airport, Western Australia for an airstrip that was located about 25 km to the east. The airstrip was to be the base for the pilot's aerial spraying operations in the local area.

The pilot was met at the airstrip by an assistant (loader) with a truck that contained the chemical, mixing equipment and refuelling supplies for the planned spraying activities. Each flight that day required the aircraft's spray tank (hopper) to be loaded with a combined 600 L of water and chemical that was pumped from the loader's truck. That truck was located about 50 m along the runway from the take-off threshold (Figure 1).

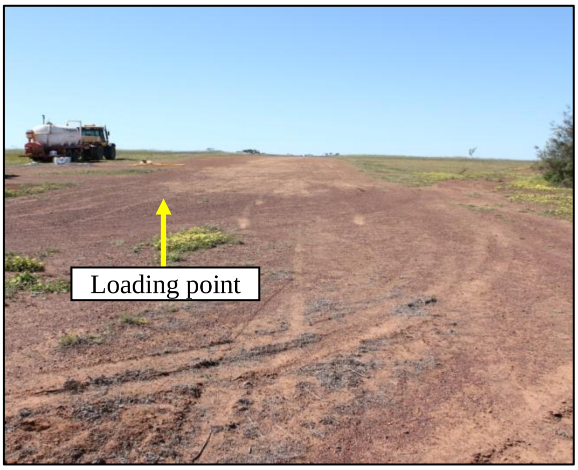
At about 1100, the loader mixed the required chemical and commenced loading it into the aircraft's hopper in preparation for the first flight. The quantity of chemical loaded was monitored by

1 The 24-hour clock is used in this report to describe the local time of day, Western Standard Time (WST), as particular events occurred. Western Standard Time was Coordinated Universal Time (UTC) + 8 hours.

the pilot via a fluid quantity sight gauge that was visible from inside the cockpit.

After loading, the pilot commenced the initial takeoff from the loading point in a south-easterly direction (Figure 1). Nine subsequent flights were successfully completed using the same runway and loading process.

Figure 1: Loading point viewed from the take-off end of runway 13



At about 1500, the aircraft was shut down for about 30 minutes to enable the pilot to refuel the aircraft and for the loader to replenish the aircraft's hopper. As the loader replenished the hopper with the chemical mix, the pilot refuelled the aircraft's left wing fuel tank. The exact quantity of fuel uplifted could not be determined.

The refuelling was finished before the required hopper load volume was reached, and the loader stopped the chemical resupply to replace the fuel hose onto the load truck. That allowed the pilot time to enter the cockpit, start the aircraft's engine, and to monitor the remaining chemical load.

It was reported by the loader that, as he could not see the fluid level in the hopper while it was being replenished, he relied solely on the pilot to tell him when the desired load volume was reached. The pilot was observed looking down in the cockpit before signalling to the loader to stop filling the hopper. The investigation could not determine the exact amount of chemical mix loaded into the hopper prior to the flight or if, during that time, the pilot was monitoring the load.

Shortly after the aircraft was replenished, the pilot commenced the takeoff from the runway loading point. Moments later, the loader heard a loud noise followed by an 'almighty crack' and observed smoke to the right of the extended runway centreline. The loader used the load truck's communications radio to alert anyone in the vicinity of the accident, and immediately drove to the departure end of the runway. He located the aircraft, which was on fire and inverted, in a treed area beyond and below the end of the airstrip.

The pilot was fatally injured and the aircraft was seriously damaged[2] by impact forces and an intense post-impact fire.

Personnel information

Pilot

The pilot was issued a Commercial Pilot (Aeroplane) Licence in 1992 and was appropriately endorsed for the operation. He had a total aeronautical experience of about 10,750 flying hours, including 8,840 hours on agricultural-type aircraft.

The pilot held a Grade 1 Aeroplane Agricultural Rating, and had operational approval to act as Chief Pilot for a Geraldton-based aerial agriculture company. At the time of the accident, the pilot was operating as a contract pilot for a different company.

An Aerial Agricultural Association of Australia (AAAA) Spray Safe Pilot Accreditation was issued to the pilot in January 1995 and he held a valid Class 1 Aviation Medical Certificate with nil restrictions.

The requirements of CASR Part 137.240[3] stated that a pilot's annual proficiency check was valid if:

> (a) he or she has satisfactorily completed a check that satisfies the criteria in subregulations (3), (4), (5) and (9); and
>
> (b) under subregulations (7) and (8), the check is valid.

Recent flight time summaries and verification that the pilot had completed a recent annual flight review were not available.

2 The *Transport Safety Investigation Regulations 2003* definition of 'seriously damaged' includes the 'destruction of the transport vehicle'.

3 http://www.comlaw.gov.au/Series/F1998B00220

The investigation was unable to determine the precise amount of flying conducted by the pilot in the 14 days prior to the accident. However, it was estimated that the pilot accrued about 60 hours of duty time and conducted about 44 hours of aerial spraying in larger, turbine-powered agricultural aircraft during that period. Additional, unrecorded flying was also reported to have been conducted by the pilot in KZF during that time.

In addition to his pilot qualifications and endorsements, the pilot also held qualifications as a Licensed Aircraft Maintenance Engineer and it was reported that he had just attained qualifications for a career outside the aviation industry.

Loader

About 3 weeks prior to the accident, the loader undertook 1 day of initial loader training, where he was shown by the operator how to use the company's chemical loading equipment. During that training, the loader completed eight aircraft replenishments under supervision. The following day, the loader successfully completed a further six replenishments for the accident pilot in KZF.

The loading throughout the day was the third time that the loader had performed loading duties in support of an actual aerial spraying operation.

Aircraft information

The aircraft was a single piston-engine, propeller-driven, low-wing aircraft that had seating for one pilot and was primarily used for aerial spraying activities. It was manufactured in the United States in 1978 and its aircraft serial number was 3279T. According to maintenance records, the total aircraft time in service was about 5,200 hours.

An overhauled Teledyne Continental Motors IO-520D engine was installed in the aircraft in May 2010, coincident with the conduct of a 100-hourly inspection. Since that time, the aircraft had been operated for about 50 hours. It was reported that, about 45 hours after the 100-hourly inspection, the aircraft's engine underwent an oil and oil filter change, which was not recorded in the aircraft's maintenance documents.

Systems and equipment

A hopper load dump handle was fitted to the aircraft as part of its spray system. To activate a chemical dump, the pilot was required to push the dump handle forward and past an over centre mechanism, opening the aircraft's hopper doors on the aircraft's under surface. Pulling the handle rearwards stopped the dump.

The aircraft was fitted with a Robertson short take-off and landing (STOL) kit that incorporated a modification to the wing flap and aileron systems. The flaps were manually operated and, when they were extended from the 0° position, both ailerons were also mechanically displaced downwards (commonly called 'droop') to increase the effective flap area. That increased the effective camber of the wings and overall lift generated by the wings at a given speed, thus reducing the aircraft's take-off distance.

The investigation could not determine if the supplemental take-off and landing information (flight manual supplement) relating to the STOL kit was included in the aircraft's flight manual. If included, that supplement would have provided pilots with amended take-off performance planning data and configuration information applicable to KZF.

Four flap settings (0, 5, 10 and 20°) were available for use as required and could be selected by depressing and releasing a button on the flap lever while moving it into position. That action enabled the selected flap position to be captured by the flap position detent.

A review of the relevant STOL flight manual supplement identified the following recommended take-off procedure and configuration setting for the aircraft:

> RESTRICTED CATEGORY[4] TAKE-OFF (Dispersal Equipment Installed)
>
> 1 Wing Flaps - 20°
>
> 2 Brakes - APPLY
>
> 3 Power - FULL THROTTLE and 2850 RPM (2700 RPM W/Prop per STC SA672NW)

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4 The aircraft was certified to operate in the Restricted Category, being a defined performance envelope at specific weights above the normal maximum operating weight.

4 Mixture SET - (lean for field elevation)

5 Brakes - RELEASE

6 Elevator Control - LIFT TAIL WHEEL and assume level flight attitude for best acceleration

7 Climb Speed - 72 MPH IAS until all obstacles are cleared

8 Wing Flaps - RETRACT GRADUALLY one detent at a time and ACCELERATE to desired speed (After clearing obstacles)

9 Enroute climb - standard procedures

It was reported that the pilot did not always use a 20° flap setting in KZF for takeoff.

Performance

The expected distance to lift off was estimated using information provided by the aircraft manufacturer and derived from the STOL manufacturer's supplementary take-off and performance charts.[5] That estimation showed that, with a maximum take-off weight of 4,200 lbs (1,905 kg), a zero headwind component and a flap setting of 0°, adequate runway existed for takeoff within the available runway length. Other variables that act to increase the take-off ground roll distance by varying the drag and friction affecting the aircraft and its acceleration, have not been considered.

It was reported by other pilots, and described in the AAAA's *Aerial Application Pilots Manual* that pilots were trained to, and should recognise and address a number of other factors that affect aircraft performance and that may result in the need to dump a chemical or other load. Those factors included:

> …poor judgement, miscalculation, unexpected meteorological variations or a combination of these and other factors.

Pilots were cautioned in the AAAA's manual that, if any doubt existed as to an aircraft's performance, then the pilot should, without hesitation, dump the entire agricultural load to allow the aircraft time to accelerate within the remaining runway.

Fuel

The aircraft had two 98 L bladder-type wing fuel tanks that were interlinked and therefore acted to self level the amount of fuel in each tank. Both wing tanks were reported to have been filled at Geraldton Airport before the pilot departed for the airstrip.

The loader reported that the aircraft was refuelled at the airstrip from drums that were previously used to store aviation oil. The drums themselves had been refuelled on the morning of the accident from a Geraldton fuel facility.

The pilot was reported to have refuelled the aircraft's left wing tank from those drums three times prior to the accident. A witness stated that, during the last refuel, the pilot was careful to look into the wing fuel tank, taking time to ensure that the tank was not overfilled. The loader could not recall observing the pilot testing a sample of fuel from the wing fuel tank drain after refuelling.

Fuel sample tests of the drum stock fuel after the accident indicated higher-than-normal gum[6] levels.

The remaining fuel in the drums was reported to have been subsequently used by the operator in other aircraft with no reported abnormal engine indications. Fuel from the Geraldton fuel facility was also used by multiple other aircraft with no reported problems. The investigation concluded that the quality of the fuel for the flight was not a factor.

An aviation fuel manufacturing company stated that airfield refuelling representatives should follow the available guidelines in respect of the management and use of drum fuel stock. Those guidelines included that only drums that were marked with the appropriate product stencilling should be filled with that product. That would prevent contamination from any previous product in a drum, and the possible incorrect identification of the product in a refilled drum.

Meteorological information

The airstrip did not have, and nor was it required by regulation to have a weather-reporting facility

5 The estimation was based on the conditions as stipulated in the performance charts; such as a level, dry, hard runway surface.

6 A term used to describe viscous residues that mainly form as a result of the slow oxidation of the fuel.

or a windsock to assist pilots in determining the wind direction and strength. The nearest aerodrome with recorded observed weather data was at Geraldton.

The Bureau of Meteorology weather facility at Geraldton Airport generated routine weather reports (METAR). The Geraldton 1400 METAR indicated a wind from 130° true (T) at 11 kts and a temperature of 23 °C. The Geraldton 1530 METAR was issued at about the time of the accident and indicated CAVOK[7] conditions, that the wind was from 170° T at 16 kts and that the temperature was 21 °C.

The wind affecting the day's spraying activities was reported by the loader to have been consistently from the south-east. No wind gusts were recalled by the loader as affecting the operation.

The loader stated that, during his interaction with the pilot in support of the two previous flights, the pilot discussed a decrease in the wind speed and the possibility that it might reduce the effectiveness of the spray application. In response, it was decided to reduce the planned 18 flights that day to a total of 12.

Communications

The pilot's mobile telephone records showed the usage of that phone during the day's operations. The frequency of activity increased significantly in the 30 minutes immediately prior to the accident, including nine calls with a total duration of about 11 minutes. Two of those calls were within minutes of the accident.

It was reported common for the pilot to be texting on the mobile phone while sitting in the cockpit waiting for the chemical or other applicant to be loaded.

Airstrip information

The 700 m gravel airstrip was aligned in a south-east to north-west direction of 130/310° magnetic (M) along a plateau. The departure end of runway 13 was elevated about 20 m (65ft) above the accident site.

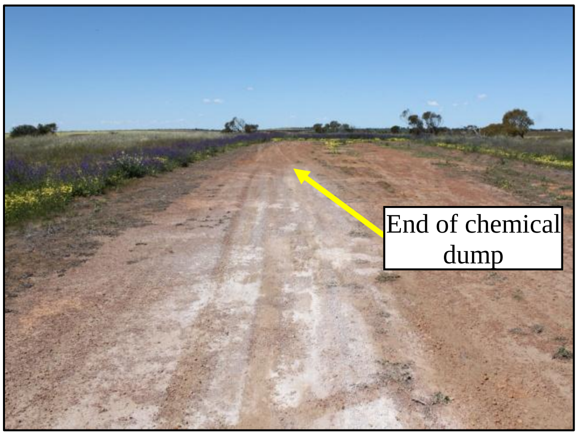
Pilots who had previously operated from the airstrip reported that rocky areas protruded through the surface, making the runway rougher than normal. That resulted in increased vibration through the aircraft during the take-off roll.

The loader reported that prior to the accident, the pilot commenced the take-offs from the loading point and that the aircraft used about two thirds of the available runway before becoming airborne.

Runway 13[8] was reported used for all takeoffs and landings that day.

During the investigation a 15 m long area of dried, white crystalline deposit was observed about 90 m before the end of the runway (Figure 2). That deposit was consistent with the dried chemical being used on the day. The spread of the chemical deposit was indicative of the pilot activating and then stopping a chemical dump from the aircraft's hopper. More of the dried chemical was identified around the accident site, indicating that the entire hopper was not dumped on the runway.

Figure 2: Dried chemical deposit viewed toward the departure end of runway 13

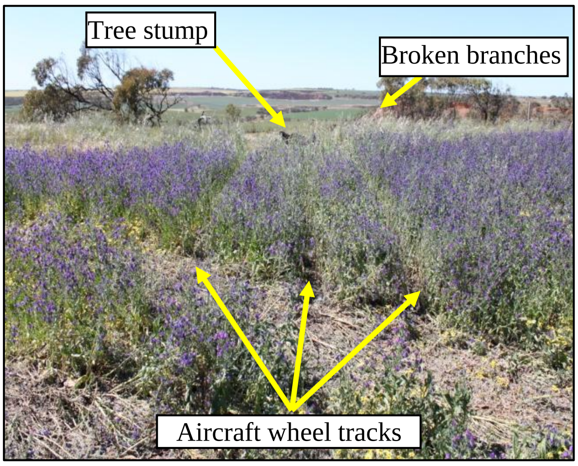


The overshoot area at the departure end of runway 13 was an unprepared surface that contained a shattered tree stump and showed evidence of three aircraft wheel tracks. A number of trees were located just beyond the end of the plateau and to the right of the aircraft's wheel tracks (Figure 3). Various broken branches from those trees showed red paint transfer that was consistent with the red paint markings on the aircraft (see Figure 4).

7 CAVOK indicated that the visibility at Geraldton Airport was 10 km or more and that there was no significant cloud below 5,000 ft at the aerodrome.

8 The runway direction was 130°M.

Figure 3: Overshoot area at the departure end of runway 13



Wreckage and impact information

The wreckage was located about 100 m from the end of the runway in a treed area that was about 20 m below the airstrip and 25° to the right of the extended runway centreline.

Ground scars made by the aircraft during the impact sequence indicated that the leading edge of the aircraft's right wingtip impacted the ground first. Compression damage to that wing and the inverted aircraft wreckage indicated that the aircraft collided with the ground in an estimated 90° right wing-low, nose-down attitude. The confined wreckage distribution indicated a relatively low horizontal velocity at that time.

All of the key aircraft components were identified at the accident site.

An intense post-impact fire consumed the fuselage and the inboard sections of the left and right wings. The tailplane, which included the vertical and horizontal stabilisers, sustained minimal damage (Figure 4).

Figure 4: Aircraft wreckage

The flight control systems were determined to have been capable of normal operation pre-impact. The flap lever was engaged in the 20° flap position. Both flap surfaces were also at a flap setting of 20°.

The position of the elevator trim tab was close to full aircraft nose-down deflection. Given the design of the trim system, and the relatively undisrupted rear fuselage, that trim tab position was likely consistent with its setting at impact.

It was reported by a pilot with experience in KZF that the nose-down trim position that was used for landing was also used as a reference setting prior to commencing a takeoff. If required, the aircraft's trim could be adjusted during the take-off roll. It was also considered by that pilot that adequate control authority would exist during takeoff in the event that the trim was inadvertently positioned in a full nose-down position.

As a result of the severe fire damage to the cockpit area, no useful information was recovered from the instrumentation or switch positions. The pre-impact setting of the park brake could not be established. The brake pads and discs exhibited normal wear with no evidence of excessive metallic heating due to braking.

On-site examination of the propeller indicated that the engine was producing a degree of power and that it was rotating at the time of impact. The amount of power could not be determined.

A number of aircraft components, including the engine, propeller, and brake discs were recovered from the accident site for later technical examination. Those examinations found no evidence of any mechanical malfunction that might have contributed to the development of the accident.

Medical and pathological information

The pilot's post-mortem and toxicology reports were benign in respect of their possible contribution to the development of the accident. The post-mortem report noted that the pilot sustained multiple injuries as a result of the accident, including to the head.

The pilot was reported to not be wearing a helmet for the flight.

Fire

An intense post-impact fire that was fed by fuel from the aircraft's ruptured bladder-type fuel tanks inhibited initial attempts by operational personnel and rescuers to approach the wreckage.

Additional information

Spraying operations

It was reported to be common for pilots to use their past agricultural spraying experience and knowledge of an aircraft's performance when determining the load limit for a particular takeoff. Similarly, pilots stated that to establish the maximum load that could be uplifted from an airstrip, they would often commence operations using a fuel and chemical load that they knew would allow for a successful takeoff. If, after the first takeoff, the full length of the runway was found to not be required, there was the option to increase an aircraft's load on the next flight. That ensured the use of the maximum available runway and time spent in the air spraying.

It was reported that, prior to pilots exiting an Agtruck aircraft, it was common practice to retract the aircraft's flaps and apply the park brake. Retracting the flaps allowed easy access to the cockpit via the wing, and the application of the park brake ensured that the tail of the aircraft did not move and collide with the load vehicle, which was parked nearby during reloading/refuelling.

Pilot distraction and the use of mobile phones

Research on distraction and attention has highlighted the role of mobile phones in motor vehicle accidents and the effect various other stressors may have on performance.[9] There were reports from other agricultural operators that the use of mobile phones was becoming more prominent in this sector and that, in many cases, they were preferred over the use of ultra-high frequency radio communications.

ATSB investigation report AO-2008-014[10] highlighted the issues surrounding the use of mobile phones in the cockpit and the effect it may have on pilot distraction. Other investigation agencies, such as the New Zealand Transport Accident Investigation Commission, have identified safety issues in relation to mobile phone use by pilots. As a result, a number of safety recommendations that sought to address those issues were issued (available at http://www.taic.org.nz/).

Life event stress

The pilot was reported to be a very busy person who had various stressors in his life. Those included new career aspirations and personal and life stressors. Hobbs (2001) identified 'life event stress' as:

> ...stress resulting from significant life events such as divorce, financial worries and the like [which] can reduce general well being and increase the susceptibility to some illnesses. Personal worries can also make it more difficult to keep attention on the task at hand. People who are experiencing significant life events may be distracted by intrusive thoughts, particularly when workload is low.

ANALYSIS

Aerial spraying operations are, by their nature, often conducted from remote locations that provide for limited forecast weather information, airstrip data and obstacle information. As a result, agricultural pilots need to remain vigilant both during the spray application and while preparing the aircraft for the next flight. Regular monitoring and assessment of the factors that influence operations will determine the success of a flight. Failure to do so can increase the risk of error in an environment that already has reduced error margins.

There was no direct evidence as to why the pilot was unable to achieve the same take-off performance that was achieved on the previous flights that day. This analysis will explore some of

9 Available at http://www.rospa.com/roadsafety/info/mobile_phone_report.pdf

10 Available at http://www.atsb.gov.au/publications/investigation_reports/2008/aair/ao-2008-014.aspx

the factors that existed on the day of the accident and any effect they may have had on the flight.

Aircraft configuration and airstrip characteristics

Examination of the aircraft identified that the aircraft flap lever was captured in the 20° flap-down position at impact. However, the pilot might have adjusted the position of the flaps throughout the take-off sequence and it was not possible to establish when the flap was selected during that sequence.

The take-off performance had been sufficient for the previous 10 takeoffs and was estimated to have been more than adequate for the weight of the aircraft, the runway characteristics, and the reported weather conditions. On that basis, the investigation concluded that, if the aircraft had performed normally and was handled appropriately, the pilot should have been able to avoid the tree stump and other obstacles.

Aircraft weight

It was probable that the pilot intended to take off with a combined water/chemical load of 600L, as was the case for the remainder of the day. The action by the pilot to signal the loader to recommence loading suggested that the pilot had identified the amount of water/chemical in the aircraft's hopper, and that the target load of 600L had not yet been reached.

The pilot's mobile phone records suggested that the pilot may have been making phone calls at about the time that the loading was taking place. Had that been the case, the associated distraction could have adversely affected the pilot's monitoring of the replenishment and resulted in the hopper being inadvertently filled to more than 600 L. Any additional load would have decreased the aircraft's take-off performance and increased the runway required.

The action by the pilot to dump some of the water/chemical load in the last 90m of the runway indicated that the pilot was aware of the diminished take-off performance. Had the pilot dumped the entire load at that time, the resulting additional take-off performance may have enabled the aircraft to clear the obstacles at the end of the runway.

The exact amount of fuel onboard the aircraft for the flight could not be established. However, the care taken by the pilot to not overfill the left wing tank during the refuel, and intention to conduct an additional two flights before flying to Geraldton without further refuelling, suggests that the left wing fuel tank was probably full. In that case, there was sufficient fuel on board the aircraft for the flight.

As the exact quantities of fuel and water/chemical mix uplifted prior to the accident flight could not be quantified, the aircraft's take-off weight could not be determined.

Engine power loss

Due to the extensive impact and fire damage, it was not possible to determine if the engine was capable of developing the power required for a successful takeoff. However, the damage to the propeller, which was probably in part due to contact with the tree stump, and lack of any evidence of a mechanical engine malfunction, indicated that at least a degree of engine power was available at that time.

Any damage to the propeller would have decreased its propulsive efficiency relative to the engine power being developed, further reducing the aircraft's take-off performance and ability to climb away.

Meteorological conditions

The investigation was unable to determine if, prior to the flight, the pilot re-assessed and accounted for the reported reduction in wind speed. The commencement of the takeoff from the position of the load truck indicated that the pilot either felt that he still had sufficient take-off performance from that position, or had made other contingencies to facilitate the takeoff.

Fuel storage

It could not be determined why the fuel samples from the load truck's fuel hose returned higher-than-recommended gum levels. However, the use by the pilot of fuel that had been stored in disused aviation oil drums increased the risk that the fuel would not be suitable for the intended application.

Distraction

While the effect of mobile phone use in this instance could not be determined, research has indicated that phone usage does affect attention, especially during routine tasks such as driving. Therefore, it could be expected that the use of mobile phones by pilots during aerial application would similarly impact on those operations and should be discouraged.

In this instance, any distraction could have: impacted on the pilot's ability to monitor the chemical load; have affected or interrupted his preparation for the takeoff, including flaps selection and the release of the handbrake; and have impacted on his monitoring and consideration of the effect of the changing weather conditions. The life stresses affecting the pilot at the time increased the distraction risk.

Conclusion

The investigation did not identify any organisational or systemic issues that might adversely affect the future safety of aviation operations. However, the accident does provide a timely reminder of the need for performance planning and the continual assessment of the effect of changing conditions on that planning.

FINDINGS

From the evidence available, the following findings are made with respect to the uncontrolled collision with terrain that occurred 25 km east of Geraldton Airport, Western Australia on 14 September 2010 involving Cessna Aircraft Company A188B Agtruck, registered VH-KZF. They should not be read as apportioning blame or liability to any particular organisation or individual.

Contributing safety factors

- There was insufficient aircraft performance to successfully take off within the available runway distance.
- The aircraft contacted a number of obstacles beyond the useable runway surface, which diminished the available take-off performance and the ability to sustain flight.

Other safety factors

- The aircraft was refuelled from drums that were not recommended for the storage of aviation grade fuel.
- The pilot was not wearing a helmet.

SOURCES AND SUBMISSIONS

Sources of Information

The main sources of information during the investigation included the:

- loaders of the aircraft
- operators of a number of agricultural aircraft
- the helicopter and Robertson short take-off and landing (STOL) kit manufacturers
- Civil Aviation Safety Authority (CASA).

References

Aerial Agricultural Association of Australia. (Version 6). *Aerial Application Pilots Manual*. Canberra, ACT: Author.

Hobbs, A. (2001). *Attention. Student manual: ATSB human factors for transport safety investigators*. Canberra, ACT: Australian Transport Safety Bureau.

The Royal Society for the Prevention of Accidents. (2010). *The Risk of using a Mobile Phone While Driving.* Birmingham: The Royal Society for the Prevention of Accidents.

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 aircraft operator and maintenance provider, the aircraft manufacturer, the airstrip owner, the manufacturer of the Robertson STOL kit, the loader, and CASA.

No submissions were received from those parties.