
# NZ Agricultural Aviation

## Activity and Safety Update

## September 2016

Image: Associated Press Photo/The Gleaner, Darrin Phegley, July 2013

Around 9,000 fewer agricultural flying hours have been reported for the first half of 2016 compared to 2015. While some statistics returns are still to be submitted, it's clear that there has been a significant reduction in activity in the

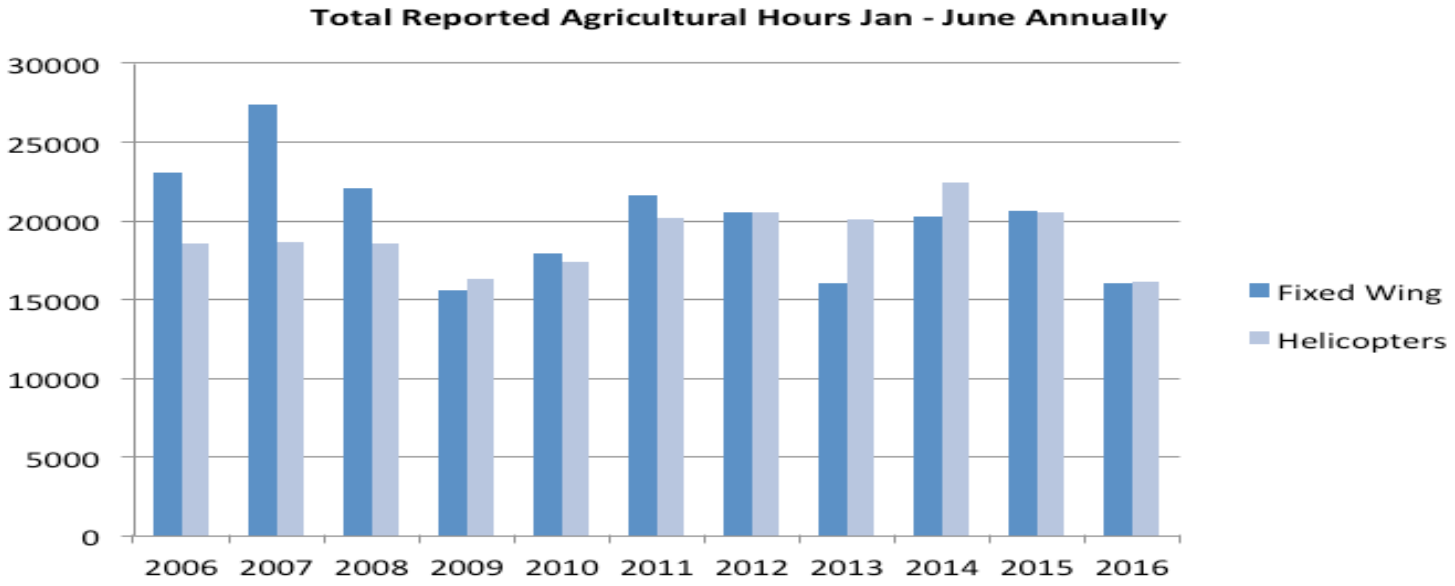


Figure 1: total reported agricultural hours Jan - June annually

CAA CIVIL AVIATION AUTHORITY OF NEW ZEALAND Te Mana Rererangi Tūmatanui o Aotearoa

NZAAA Aviation in Agriculture

sector for 2016 to date. The reduced activity is also evident in the reported agricultural statistics. Helicopter operators have reported 11,900 fewer tonnes for the first half of 2016 than 2015; fixed wing operators have reported 81,700 fewer tonnes:

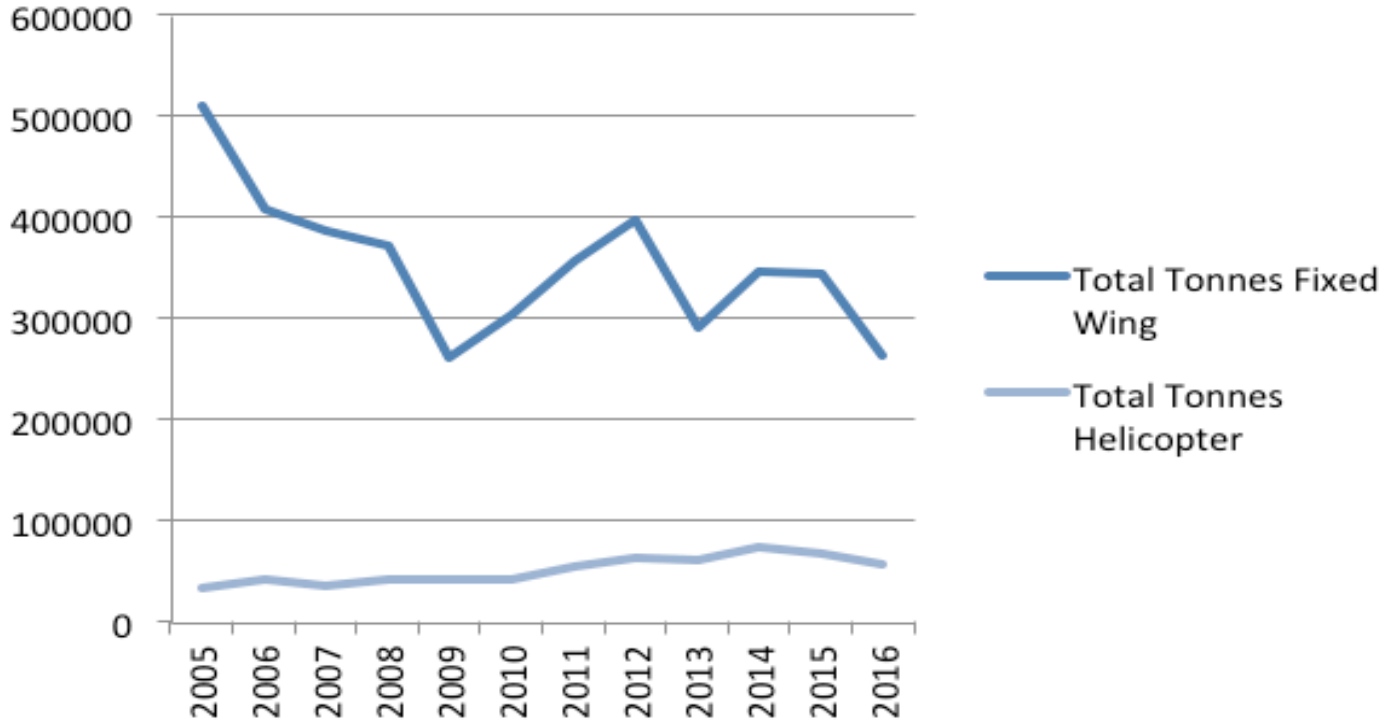


Figure 2: total reported agricultural product applied (tonnes - solid and liquid) Jan - June annually

**Safety Performance**

The agricultural aviation accident rate continues its overall downward trend in 2016 for both fixed wing and helicopter operations. The 12-monthly accidents/100,000 hours figure for fixed wing aircraft sits at 2.16 and 6.59 for helicopters (as at June 2016):

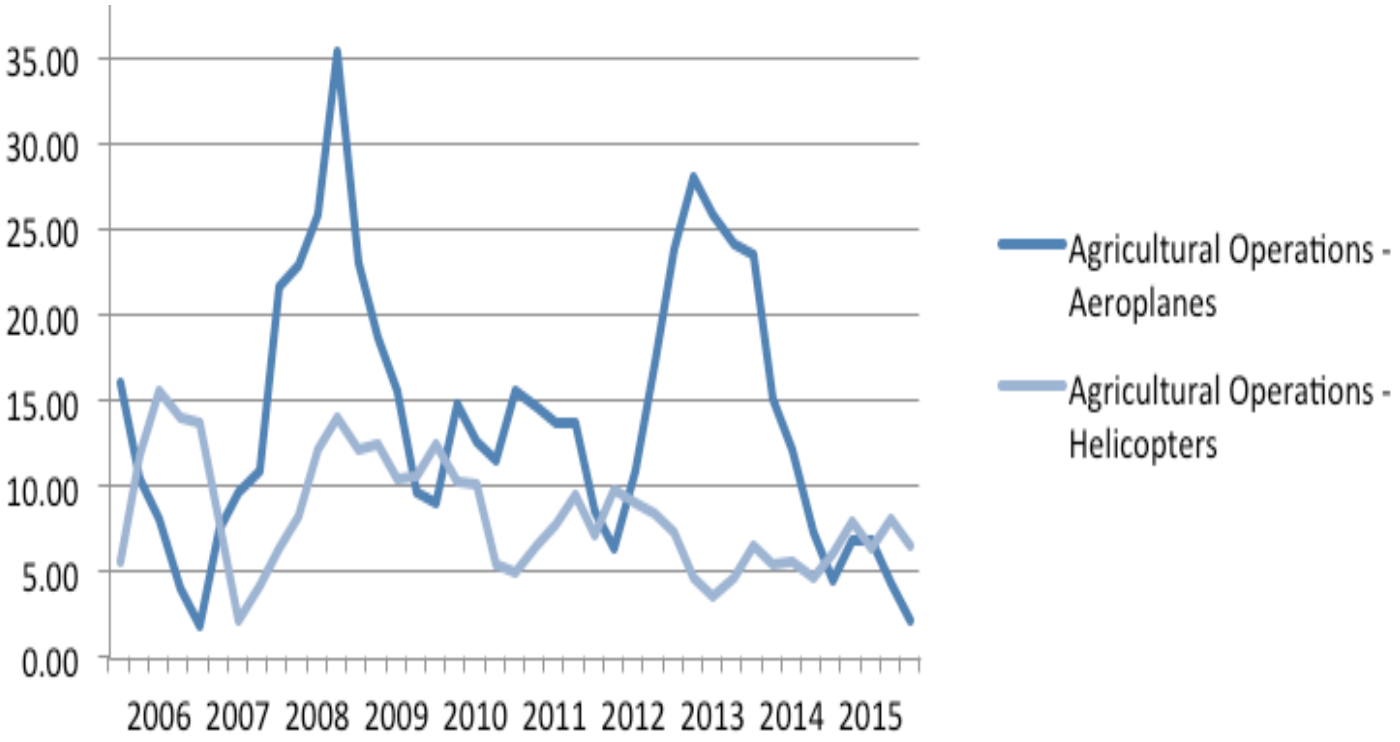


Figure 3: 12-monthly agricultural accident rates (accidents/100,000 hours)

The 3-yearly accidents/100,000 hours figure for fixed wing aircraft is currently 9.34 and 6.35 for helicopters:

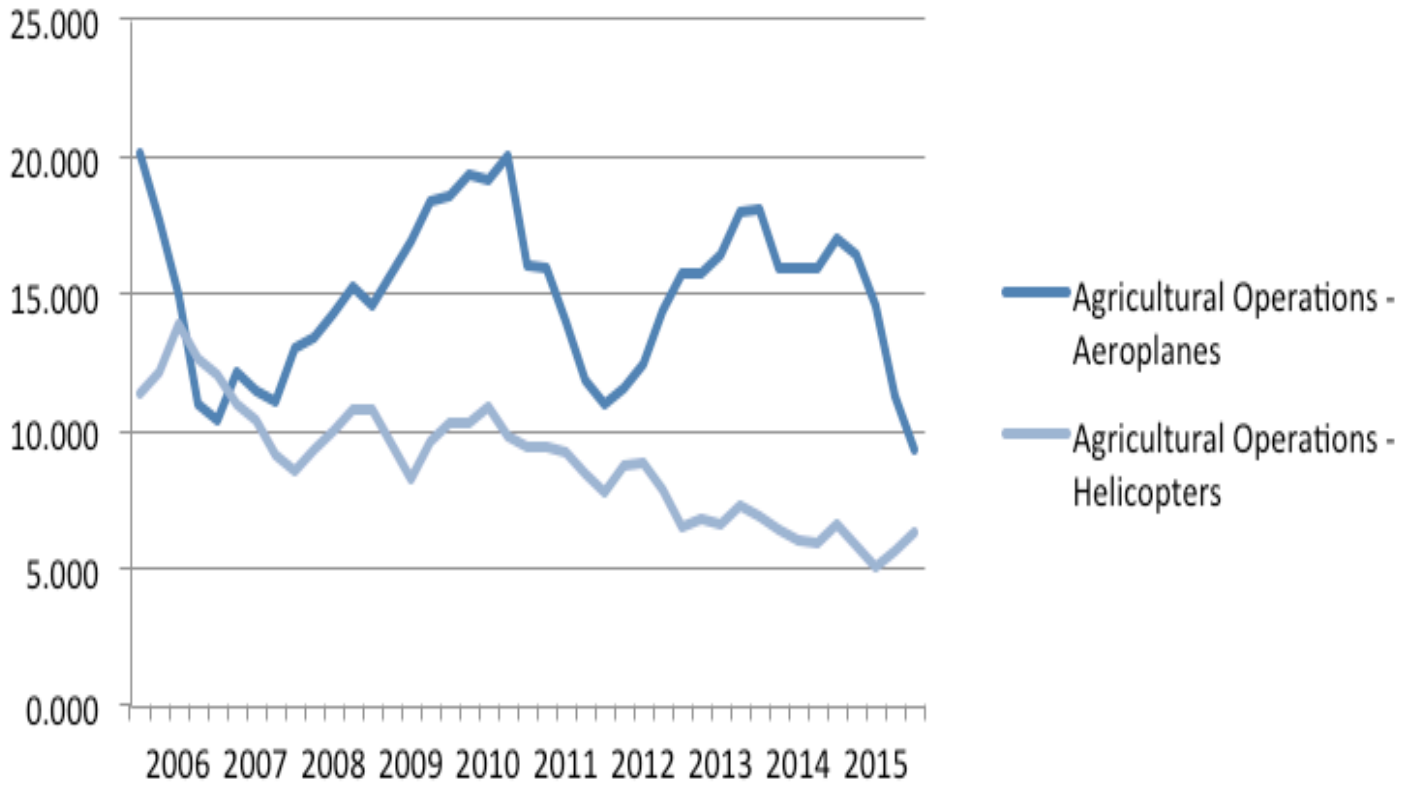


Figure 4: 3-yearly agricultural accident rates (accidents/100,000 hours)

## Accidents and Incidents

in 2016 to date there have been three accidents and four incidents reported in the agricultural aviation sector.

## Accidents

25 January 2016

Hawkes Bay

R44

Collision/strike - tree

**Details:**

The helicopter sustained a main rotor blade strike on a tree while spraying gorse below it. No vibration was felt, the pilot landed the helicopter immediately and noted some blade damage. The operator's investigation identified that as a new employee to the company the pilot may have been attempting to spray every weed/gorse bush to complete the task as well as possible. They also noted that agricultural training may not have covered the importance of keeping a good distance from hazards. The operator undertook to re-emphasize situational awareness training with all pilots.

6 April 2016

Taumaranui

Cresco

Collision/strike - vehicle

**Details:**
The loader truck drove into the aircraft while loading fertilizer damaging the flap.

30 May 2016

Gisborne

750XL

Collision/strike - fence

**Details:**
The aircraft failed to clear a fence 100m from the end of the airstrip. The aircraft sustained damage underneath the left hand outer panel, aileron and wing tip fairing. A jettison was initiated prior to impact. The pilot could see no visible damage and the aircraft was still controllable so he elected to land back on the airstrip to ascertain the level of damage.

## Incidents

16 January 2016

Te Kuiti

Cresco

Jammed stabiliser

**Details:**
The Cresco's elevator jammed solid moments after the pilot landed on a newly metaled airstrip. On inspection an aluminium tab was found stuck in the plastic protector on the leading edge of the stabiliser. The strip had been metalled and rolled but had loosened-up over the course of the job, causing the tab to become jammed in the stabiliser and also causing a few minor 'cuts' on the underside of the stabiliser.

23 March 2016

Southland

R44

Ground handling

**Details:**
The incident occurred during a helicopter spray operation. On lift off and crossing a sheep fence a thumping sound and jerking movement was noticed by the pilot which went away once clear of the fence. A precautionary landing was carried out. Inspection revealed that the suction hose was still attached to the skid pump.

2 June 2016

Taranaki

Bell 206

Collision/strike - tree

**Details:**
During agricultural spraying operations, the spray boom clipped a spar (dead standing tree) in the forestry block. A precautionary landing was carried out. The pilot reported that he had carried out a full reconnaissance flight of the spraying block before the job and was aware of the lone spar. It was early in the morning and the sun was coming up into the flight path. In addition they reported they were having trouble with a partially

fogged window and the GPS unit was causing some distraction. While there was no damage caused to the spray boom or the aircraft, the operator undertook to distribute a notice and had a briefing with staff about the hazards of early morning spraying and distractions in the cockpit.

Image: operator's image of the dead tree (spar)

## Other Incidents/Defects

9 April 2016

Tauranga

MD500E

Main Rotor Blade Defect

**Details:**

While spraying the pilot felt excessive vibration through the helicopter. He carried out a power-on landing and shut down. Subsequent investigation of the main rotor system revealed that one of the main rotor leading edge blade abrasion strips had separated in flight. Further investigation revealed defects in the abrasion strips of all four other blades. Two showed signs of lifting while the other two exhibited voids outside of acceptable criteria.

CAN 27-009 was issued on 7 April regarding this issue.

21 June 2016

Feilding

Cresco

Elevator torque tube

**Details:**

During agricultural operations the pilot became aware of limited left-hand aileron control, and landed the aircraft. An inspection revealed that the pilot's right-hand side elevator torque tube was broken and the section bent sufficiently to interfere with aileron operation - indicated by witness marks on the lower aileron control quadrant. The cause was identified as metal fatigue (17,700 airframe hours on the aircraft), which was likely exacerbated by cockpit occupants standing on the torque tube to enter/exit the cockpit. This defect report resulted in an Emergency Airworthiness Directive for Crescos and Fletchers - available here.

Elevator Torque Tube P/N 242646 (Item 14) – Fractured area.

# Agricultural Aviation Safety

**The role of pilot experience**

We know that agricultural aviation pilots are exposed to more risk than pilots in other sectors. Ag pilots do more takeoffs and landings on air strips of variable quality, operate at very low altitudes amongst many physical hazards, in changing weather conditions. The work is repetitive, fatiguing, and demands a huge amount of the pilot's attention. When we talk about staying safe and performing well in this type of environment, the experience of the pilot is frequently identified as one of the most important factors.

In his book 'The Killing Zone' pilot Paul Craig desribes experienced pilots as those who have survived their own ignorance. He writes:

> *"I survived my own ignorance, but others were not so fortunate. Some pilots along the way did not learn from their mistakes, but unfortunately were killed by their mistakes."*

Since 2000 there have been 208 agricultural aviation accidents including 21 fatalities. 128 of these occurred in fixed wing aircraft; 80 in helicopters. Was inexperience a factor? Not as often as you might think. We have just undertaken an analysis of fixed wing agricultural accidents and the results are surprising. In 52% of the accidents, the pilot had over 10,000 hours total time. More inexperienced pilots, those with fewer than 2000 hours, accounted for 16% of the accidents. For helicopters the picture is a little different. There, 17% of the accidents involved 10,000+ hour pilots while 35% involved pilots with less than 2000 hours. These are surprising results considering what is known about experience and expertise. The '10,000 hour rule' refers to the finding by some researchers that on average, 10,000 hours of practice at


something makes an individual an expert, or master, of it. In other words, 10,000 hours of being exposed to a long list of situations and scenarios and learning how to deal with them is what makes someone an expert. According to this theory it's the 10,000+ hour pilots that should be the least likely to have accidents. Those 10,000 hours of building expertise should ensure they are the best at managing the hazards listed earlier. So what is going on? Is experience not all that it's cracked up to be?

To investigate we can use the fixed wing accident data. The first step we took here was to develop accident categories, as they apply to agricultural flying in New Zealand. This was based on the accident categories developed by the

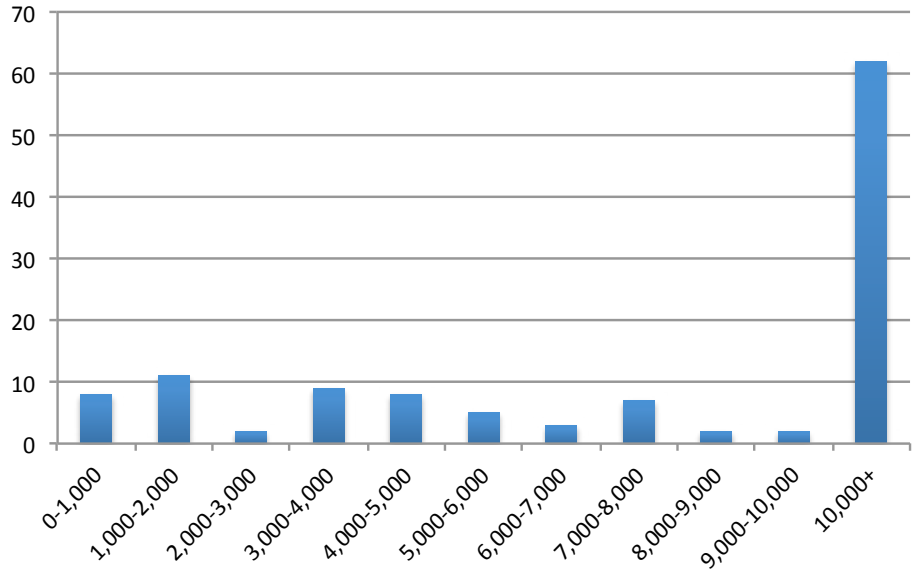


Figure 5: Number of fixed wing agricultural aviation accidents by total pilot flight time

Commercial Aviation Safety Team.
We came up with six categories of accident with 33 sub-categories (for helicopter operators, please note that we're working on the same for the rotary accident data).
The categories and their definitions are as follows:

***Abnormal Runway Contact***

This includes all accidents where there is 'abnormal' contact with the airstrip surface. it includes hard landings, overshoots and undershoots, other runway excursions, off-centre landings, and ground loops.

***Collision - Terrain/Obstacle/Object***

These are accidents involving collision with terrain or other obstacles including wires, trees, fences etc. while in flight. The aircraft must be under the control of the aircraft at the time of the collision.

***Fuel***

Accidents involving fuel starvation, exhaustion, and contamination are included in this category.

***Ground Handling and Ground Collision***

In this category are accidents occurring on the airstrip itself, including those that happen during loading. Collisions with vehicles, animals etc. on takeoff and landing are also included.

***Loss of Control***

In this category, the accident is initiated by the pilot's loss/partial loss of control over the aircraft. Stalls are included, so are accidents due to weight and balance issues and environmental conditions such as density altitude and windshear.

***System/Component Failure or Malfunction***

These are accidents due to the failure of the aircraft's varios mechanical/electrical/flight control/airframe components and systems. The failure of the component or system must be the initial point in the accident sequence.

| Accident Category | Total Accidents |
|---|---|
| Loss of control | 34 |
| Abnormal runway contact | 28 |
| Ground handling/ground collision | 25 |
| System/component failure | 24 |
| Collision - terrain/obstacle | 14 |

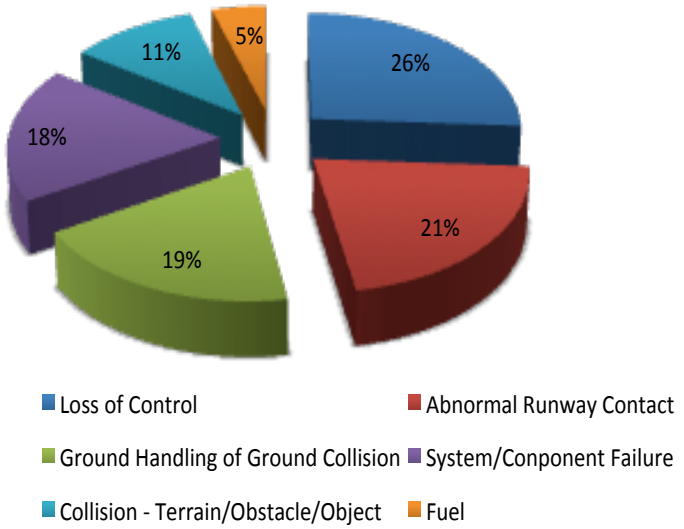


Figure 6: proportion of fixed wing agricultural accidents by cate-

| Accident Category | 10,000+ | <10,000 |
|---|---|---|
| Loss of control | 31% | 19% |
| Abnormal runway contact | 18% | 30% |
| Ground handling/ground collision | 19% | 18% |
| System/component failure | 21% | 11% |
| Collision - terrain/obstacle | 8% | 16% |

For the 10,000+ crowd, the main categories of accident have been loss of control and system/component failures. That supports the idea that experience actually does protect against accidents - mechanical failures are generally not the fault of the pilot and are not related to their level of experience. Nearly a third of their accidents, however, involved loss of control - more on this in a minute.
In contrast the less experienced group, the sub-10,000 hour pilots, had abnormal runway contact as the largest proportion of accidents. Interestingly, they had around half the percentage of accidents involving system/component failure than the more experienced group, so a higher proportion involved aircraft handling and other human factors. Let's take stock of what this

means: more experienced pilots have fewer human operator-related accidents than less experienced pilots, but the difference is slight at 10%.
These New Zealand agricultural aviation accident statistics are similar to those of the USA. In a 2014 report (available here) the NTSB found that:

> *"The top three defining events (for accidents) were in-flight collision with an obstacle, loss of aircraft control, and system or component failure... because it is consistently one of the most common (and often fatal) accident types, obstacle collision remains a top industry concern."*

## Loss of Control Accidents

If this is the biggest category of accident for very experienced pilots, then what are the causal factors behind it? A loss of control accident means that the pilot partially or fully loses control of the aircraft and it collides with the ground or some other obstacle. Control can be lost for a number of reasons, including stalls, encounters with severe windshear, or weight and balance problems. In fixed wing agriculture operations, the vast majority (76%) occur on takeoff. In the accident investigation summaries below the main causal factors behind these are explored.


13 December 2008


Tarata


Cresco


Loss of control

**Details:**
The aircraft was engaged in topdressing operations from a farm property near Tarata, approximately 14 nautical miles south-east of New Plymouth Aerodrome. The aircraft loader driver became concerned when the aircraft had not returned to the airstrip, and after climbing a small hill, saw that the aircraft had suffered an accident approximately 600 metres from the departure end of the airstrip. The pilot was killed. The investigation determined that the aircraft crashed after takeoff when it failed to achieve the required climb performance and struck a fence which severely damaged the elevator control cable and rendered the aircraft uncontrollable. There was a trail of lime leading up to the fence and the jettison lever was found in the full jettison position. Some 150kg of lime remained in the hopper.

Figure 7: the accident scene.

It was determined that the aircraft was likely overweight for the prevailing conditions, which lead to the collision with the fence and subsequent damage to the elevator control cable. Approximately 20 minutes before the accident time (11:55am) there had been a change in wind direction which may have introduced a tailwind component and possibly turbulence during takeoff. The weather was forecast to deteriorate further with the approach of a low pressure system later in the day. The pilot was also due to start extended leave on completion of the job. Both of these elements may have introduced some pressure to spread the remaining lime and complete the job. Lastly, the windsock had not

been positioned in an appropriate location at the airstrip to provide the pilot with the best possible wind information for take-off and landing. The full report is available here.


21 May 2009


Pahiatua


GA200C


Loss of control

**Details:**
Shortly after takeoff on a topdressing operation, the aircraft sank and hit a fence at the end of the airstrip. The aircraft sustained minor damage to the outer panel aileron and flap on the port side. The investigation determined that the pilot had not determined the wind strength and direction and consequent performance issues attached to the operation of the aircraft.


27 March 2002


Taihape


Cresco


Loss of control

**Details:**
The Cresco had been operating off the strip for about two and a half hours, and was on its fifth flight since refuelling. It became airborne at the same point as on previous takeoffs, but shortly after takeoff, encountered “sink”. The pilot was unable to prevent the aeroplane colliding with the fence at the end of the strip and touching down in the next paddock. He applied reverse thrust which reduced the effects of subsequent collisions with further fences and a set of cattle yards.
Conditions had been calm up to the time of the accident, and the pilot was certain that there was no power loss. The most likely cause was a tail wind gust during a critical moment of the takeoff.

## Loss of Control: Lessons Learned

All of these take off accidents are caused by pilots who are out of tune with the weather that is going on around them, and what is forecast by the met service. Wind comes down the hill as the day goes on.

1. What is the forecast 2000 ft wind and where are the isobars indicating?
2. What are the leaves on the trees indicating & water on the dams 500 ft above the strip showing?
3. Compare air speed vs. ground speed on the GPS you can pick up even 2 kts well above the strip.
4. Use the same approach path each load, and have a touchdown point. Did you land short or over the touch down point? Be honest with yourself. Did I miss the touch down point because of slack standard or are the conditions on the change?
5. Landing roll is another indicator. Did the aircraft slow sooner or take more stopping?

Ask yourself, what’s going on here? All of this information is available to the pilot at any time where a wind sock will show nothing. Is the strip susceptible to sea breeze or is the wind forcast to come in behind you? Thinking all the time if you’re not sure, reduce the load until the conditions have settled. It makes no different to the job and increases your safety margin.

***Load the aircraft for the conditions on the day.***