Pointing to safer aviation

Autumn 2022

# vector

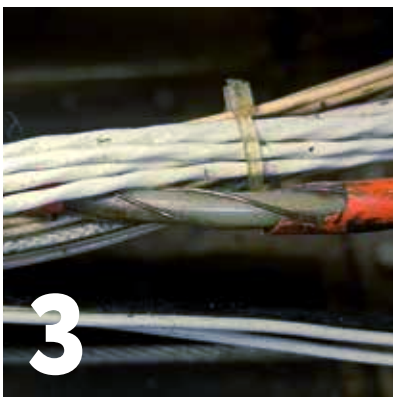
## FLYING AROUND **VOLCANOES**

Ageing aircraft wiring

The value of preparedness

The proper use of s13A

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




**// AGEING AIRCRAFT WIRING**


**// THE VALUE OF PREPAREDNESS**


**// THE PROPER USE OF s13A**

Cover photo: Mount Ruapehu, November 1995.
Photo courtesy of Lloyd Homer/GNS Science/VML 3253.

The enormous ash clouds generated by the violent eruption in January of the volcano Hunga Tonga-Hunga Ha'apai shows what a risk to aviation such events are. See our cover story on page 11.

# In this issue...


**// FLYING AROUND VOLCANOES**




vector
CIVIL AVIATION AUTHORITY OF NZ

**PUBLISHED BY THE** Engagement and Communications Unit of the Civil Aviation Authority of New Zealand, PO Box 3555, Wellington 6140.

Tel: +64 4 560 9400
Fax: +64 4 569 2024
Email: vector@caa.govt.nz

Published quarterly at the beginning of each season.

**Design** Gusto.

**PUBLICATION CONTENT** Unless expressly stated as CAA policy, the views expressed in *Vector* do not necessarily reflect the policy of the Civil Aviation Authority. Articles are intended for safety education and to stimulate discussion, and nothing in *Vector* is to be taken as overriding any New Zealand civil aviation legislation, or any statements issued by the Director of Civil Aviation, or the Civil Aviation Authority of New Zealand.

**LETTERS TO *VECTOR***
Reader comments and contributions on aviation safety are welcome. Let us know your thoughts by emailing vector@caa.govt.nz. We'll try to publish a selection in each edition, although they may be edited or shortened.

We'll only publish ideas and observations contributing towards safer aviation.

**FREE DISTRIBUTION** *Vector* is distributed to all New Zealand flight crew, air traffic controllers, aircraft maintenance engineers, aircraft owners, most organisations holding an aviation document, and others interested in promoting safer aviation. For flight crew and air traffic controllers, an aviation medical certificate must be held, and a New Zealand address given, to receive *Vector*. Holders of pilot or parachutist certificates issued by Part 149 certificated organisations can also apply to receive a free *Vector*.

*Vector* also appears on the CAA's website – subscribe to our email notification service to receive an email when it is published, **aviation.govt.nz/subscribe**.

**CHANGE OF ADDRESS** Readers receiving *Vector* free of charge should notify info@caa.govt.nz of any change of address, quoting your CAA participant number. Paying subscribers should notify Vertia.

**PAID SUBSCRIPTIONS** *Vector* is available on subscription only from Vertia, www.vertia.co.nz, email: info@vertia.co.nz, or freephone 0800 GET RULES (0800 438 785).



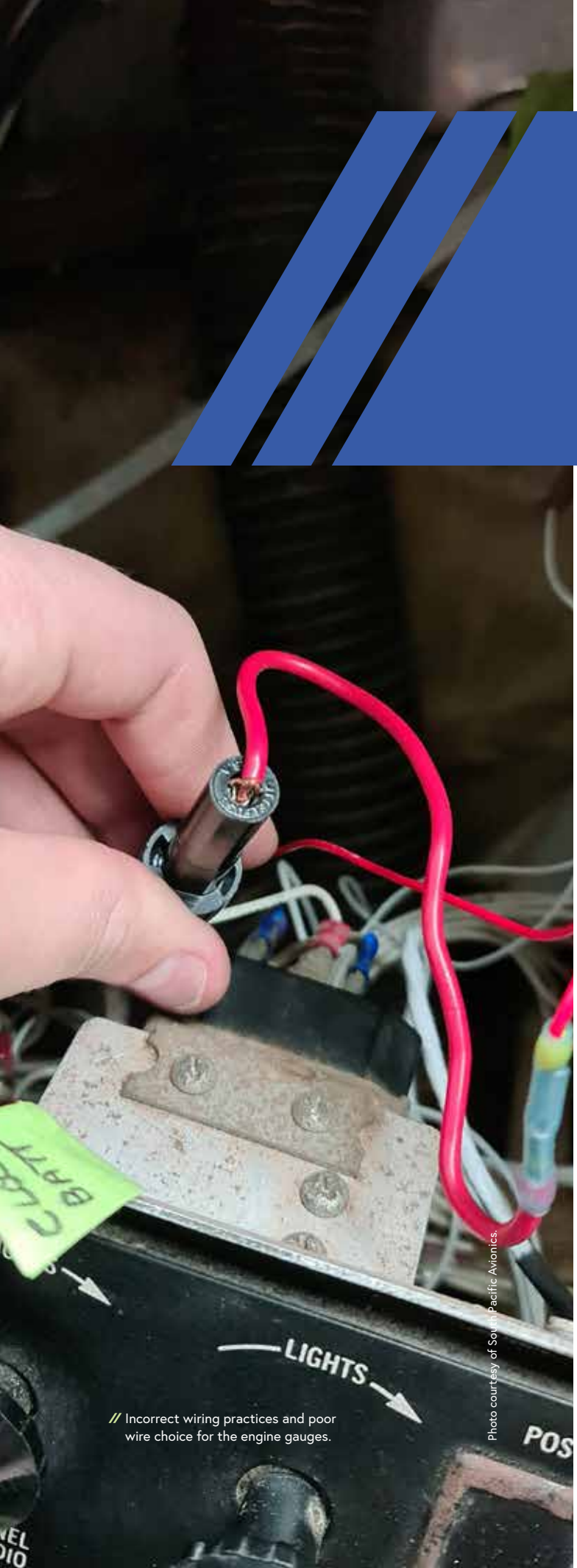


New Zealand Government

ISSN 1173-9614

# AGEING AIRCRAFT WIRING

// By Philip Hutchings, South Pacific Avionics




// Incorrect wiring practices and poor wire choice for the engine gauges.

Photo courtesy of South Pacific Avionics.

## It can't be easily seen but that doesn't mean it's working properly.

Aircraft wiring is sometimes compared to the circulatory system in the human body.

A network of arteries, veins and capillaries extend, in bundles, branches and even on their own, to the furthermost parts of the body carrying life-supporting blood and oxygen.

In the same way, wiring in an aircraft carries voltages and signals to every part of the airframe and engines, and all the way to the wing tips and top of the fin.

The human body cannot function without a circulatory system. An aircraft cannot function without a working wiring system.

But, as with our veins, which are largely unseen and simply presumed to be working, we often don't worry about our aircraft's wiring until it gives us problems.

A great number of the GA aircraft in New Zealand, however, are now over 30 years old. So should we be inspecting the wiring system in our aircraft *before* it gives us problems?

### What happens as wiring ages

The wiring originally installed in older aircraft has been subjected to different environmental conditions – hot and humid to cold and icy – that it was not designed to forever withstand.

It was also never designed to resist the environmental onslaught of modern-day synthetic lubricants and cleaners. »

As a consequence, it's degrading. Wires chafing against each other, incorrectly supported in the wiring harness, and rubbing against pipes or aircraft structure all eventually cause wire insulation to deteriorate. It eventually fails one way or another by having an open circuit, or even more seriously, a short circuit.

Wiring harnesses are also subject to the buildup of lint or metal shavings, and exposure to certain oils, fuels or other lubricants – from a leaking pipe, or accidental spillage during a routine maintenance activity.

Items and techniques used 30 years ago to repair wiring did not seal the repair from the environment, leading to likely failure sooner or later.

(Incidentally, the wiring in modern aircraft has much better insulation properties. Proof of this is the difference in weight between the wiring of the different eras. Newer wires are noticeably lighter. The conductor specification, however, is still the same.)

## Under the radar

I recently asked a well-known member of the New Zealand aviation community if people were concerned about what lies behind their instrument panels. He felt that most owners were oblivious.

Is it time for a change of heart by aircraft owners? I believe owners need to encourage their engineers to inspect the wiring system thoroughly and report any defect they identify. I think owners, being their own maintenance controllers, should insist on their LAMEs fixing any wiring defects properly or replacing that wiring.

## Still not convinced?

Here are some facts that might persuade you.

In 1996, TWA flight 800, 12 minutes into a flight between New York and Paris, exploded, killing 230.

**// An aircraft cannot function without a working wiring system. //**

Although the source of the explosion was never absolutely confirmed, the investigation concluded an electrical failure had ignited a nearly empty centre wing fuel tank in the 25-year-old aircraft.

Two years later, a Swissair MD-11 crashed off the coast of Nova Scotia, killing all 229 on board.

The Transportation Safety Board of Canada concluded the crash was the result of faulty wiring igniting the flammable insulation above the cockpit.

Around this time there was also a growing suspicion at the US National Transportation Safety Board that wiring failures were likely present on all ageing aircraft across the globe – including military aircraft, commercial airliners, private jets and helicopters.

So in 2002, it established a working group to evaluate the wiring harnesses on 39 aircraft, across eight different models.

The working group concluded the aircraft were in overall good condition, but that there were instances of:

- inappropriate wiring repair
- incorrect routing of modification wiring
- inappropriate clamping and wiring support
- structural contact, and
- lack of a 'clean as you go' philosophy (illustrated by the presence of lint, dust and debris in between wiring bundles).

// Wiring bundle attached to a flight control cable – note the metal shavings on the wire.

Photo courtesy of South Pacific Avionics.

The working group identified a whopping 2,256 such issues. On 39 aircraft.

A review of occurrences reported to the UK CAA between 1997 and 2002 indicated that damaged or deteriorating electrical wiring was a causal factor in 221 events.

## In New Zealand

In the last 10 years, according to reports to the CAA, there've been about 220 incidents attributed to faulty wiring, and some of those due to ageing.

A good number of those have been discovered by a 'haze' in the cockpit, the smell of electrical burning, a failure of a system, or a warning light.

Many have been the result of poorly secured wiring looms or broken terminations. Others have been due to chafed insulation due to the loom resting on mechanical control cables.

There have also been failures of relays and contactors and circuit breakers.

## Time to reconsider?

Most of the ageing aircraft electrical programmes have been directed at larger aircraft but not so much at general aviation aircraft.

In GA there've been mechanical ageing inspections which have focused primarily on corrosion and airframe fatigue in ageing aircraft.

So is it time to consider the following?

- Is it widely understood that aircraft wiring is an important consideration in the maintenance, repair and modification of ageing aircraft?
- What are the causes of ageing wiring?
- What are the consequences of ageing in wiring systems?
- Is the continuing airworthiness of wiring being considered adequately by those doing inspections and new installations in aircraft?
- What are potential solutions to manage ageing wiring?
- How best can operators and maintainers be informed about the importance of maintaining airworthy wiring?
- Is the maintenance/repair of wiring perceived as being too costly?

## Circuit breakers

Circuit breakers also deteriorate over time.

The main purpose of a circuit breaker is to protect the aircraft wiring should a short circuit occur.

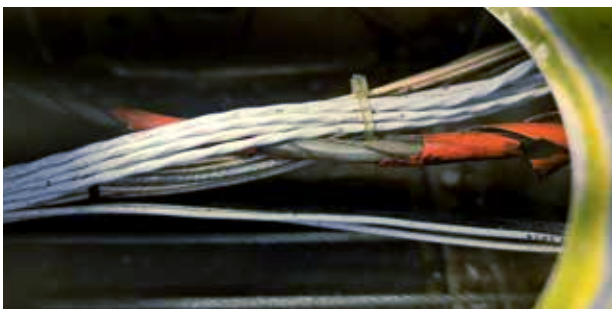


Photo courtesy of South Pacific Avionics.

// Incorrect routing of additional wiring has a pipe running through the middle of the wiring bundle.

The airworthiness standard for circuit breakers is that, if an overload or circuit fault exists, the device will open the circuit regardless of the position of the operating control.

A degraded circuit breaker that fails to trip clearly doesn't meet this standard.

Faulty circuit breakers are considered one of the key sources of electrical arcing. As aircraft age, the likelihood of an arcing event increases.

Older circuit breakers are, at times, very difficult to trip manually, due to corrosion on the contacts or build-up of grime inside the mechanism.

Exercising (cycling) of circuit breakers under no load will help remove any possible internal surface corrosion.

Several circuit breakers, such as those in some Cessna aircraft, cannot be manually cycled, due to their design. It's difficult to test these circuit breakers in-situ so, after a period of time in service, it's appropriate to replace them. This also applies to switches and other electro-mechanical devices.

I would, therefore, strongly recommend inspection and possible replacement as part of the aircraft's scheduled maintenance.

## // REFERENCES

*Aging Aircraft Wiring: A proactive management methodology* by Vasileios Tambouratzis, June 2001

*Best Practices Guide for Maintaining Aging General Aviation Airplanes* endorsed by AOPA (USA), AAA (USA), EAA (USA) and FAA, September 2003

*Aging Aircraft Electrical Wiring Inspections* by Ric Peri, Aircraft Electronics Association, January 2004 and March 2021

*CASA AWB 24-011 Issue 1, Aircraft Circuit Breaker Maintenance and Operation*, April 2016

Comments or queries? Email **warren.hadfield@caa.govt.nz**

Photo courtesy of Lionel Green.

// Lionel Green's gyrocopter was destroyed on impact.

# THE VALUE OF **PREPAREDNESS**

When the worst happened, a personal locator beacon was just one tool in Lionel Green's 'should the worst happen' toolkit.

On 4 November 2021, gyrocopter pilot Lionel Green was flying towards Burkes Pass in South Canterbury, when he encountered "a gusty 45 kt wind and an extremely strong downdraught".

Lionel turned back to Pukaki aerodrome but was unable to keep directional control and lift, and rapidly descended. "At one point we were losing over 1000 feet a minute".

He flew the gyrocopter all the way to the ground, managing to avoid obstacles. The machine was destroyed in the ground impact, but amazingly, Lionel and his passenger, Glen, sustained only minor injuries.

After moving Glen safely away from the machine and making sure there was no risk presented by the site they'd ended up on – livestock or power lines, for instance – Lionel went looking for the personal locator beacon.

"I'd strapped it to the back of my seat, but it had been thrown out by the impact. Note to self, more secure strapping needed. Fortunately, it's brightly coloured and I found it lying on the ground about 30 metres away."

He activated the still operating – and clearly robust – beacon and RCCNZ (Rescue Coordination Centre) leapt into action, immediately making the first of Lionel's two listed 'distress' calls – to his wife, Rebecca. When they couldn't get hold of her, they phoned his son, Anthony. "Is your dad likely to be flying today? Is he likely to be flying in the Burkes Pass area?"

## Flight following

The reason RCCNZ staff couldn't contact Rebecca was that she was already calling the police.

Lionel has the free but uncertified flight-following app, "Glympse", that Rebecca checks in with every now again to monitor his frequent trips – just checking where he is and how long it might be before he gets home.

During this flight she noticed that, unexpectedly, the aircraft was going more and more slowly, then doing some turns. Then it registered zero groundspeed.

She dialled 111.

"I like to have this flight-following app," says Lionel. "Because the PLB has to be manually triggered and, if for some reason you can't do that, it's good to have this back-up.

"But I'd also never rely on this app alone. It does have its limitations and needs cellphone coverage, which can be patchy in more remote areas of the South Island. It's no replacement for a certified flight-following service like the one supplied by Airways. I also can't expect someone to be watching it constantly.

"So the PLB is an absolute necessity."

Lionel says dealing with RCCNZ "humbled" him.

"It made me very proud to live in this country. Those guys at the rescue coordination centre do a fantastic job – their communication was a well-oiled machine.

"They had the rescue services on the way within minutes. Even an off-duty fire officer from Burkes Pass heard the call and drove over.

"Within 20 minutes we had fire, ambulance and police all with us."

But the PLB and the flight-following app aren't the only things Lionel has in his little case of 'just in case' support.

"I'd also spoken to the people at Pukaki airfield and told them what I was doing and my intended route.

"And I also have two other people that I always let know where I'm going, when I expect to get there, and my intended route.

"One of them is a helicopter pilot and the other is an Air New Zealand pilot. They take it quite seriously. I text, 'Hey, I'm leaving Pukaki now' and then I might be at the top of the mountains and send them a photo. "Hey, this is where I am now", and then I'll text them both when I land. If they haven't heard from me within half an hour of my intended landing, they're both on to me, 'Hey, where are you, you okay?'"

That's some system – doesn't he feel sometimes he's overdoing it a bit?

"No I don't. I think it's all part of good airmanship. You've got a responsibility to keep yourself safe and your passenger safe.

"What do I say to my passenger if they're injured out in tiger country? 'Oh, I've got no beacon and I haven't told anyone where we were going and I haven't told anyone what time to expect us back'."

"You've also got responsibilities to the people looking for you, to make it as easy as possible and as risk-free as possible to find you."

Lionel says his preparation made the RCCNZ job "quite straightforward" according to one officer.

"Without all that preparation and flight-following back-up, it might have been that night or the next morning before anyone found us. I know people have died waiting for help." ⟫

Photo courtesy of Lionel Green.

// Having a personal locator beacon meant help was with Lionel and his passenger within 20 minutes.

## Easy as

It may not be a legal requirement but having a PLB is, according to Lionel, a no-brainer.

"They've got a fantastic app to register the beacon," he says.

"You can go in any time you like, edit it, update your details, change the distress call phone numbers, anything you like."

In his methodical way, Lionel makes sure his details are kept current with **beacons.org.nz**.

"One of the RCCNZ guys was telling me that a PLB had been activated and when they rang the distress numbers listed by the beacon's owner, it turns out the aircraft the beacon was registered to, had been sold six years earlier. The new owner had never re-registered it.

"What's the point of having a beacon and uncurrent details?"

Lionel says that, at a bare minimum, pilots should let someone know what they're doing, their destination, the route, and the time they expect to arrive.

"Then keep that line of communication open, especially if your plans change," he advises.

He says he learned his own lesson some years back, when he told someone all those things, then, because it was such a beautiful day, changed his plans – without letting anyone know back at the base aerodrome.

"I returned later than I had anticipated to a very worried group. One was really distressed because she'd lost a family member in a flying accident some years before.

"That taught me the value of having all communication lines open – and a PLB.

"You never think you'll ever have to use it – that's how I felt, anyway. But I'm glad to have been prepared when the worst did happen."

## // MORE READING

Read the *Vector Online* article "Overdue. Now what?" about RCCNZ's response in a search and rescue situation. Go to **aviation.govt.nz/vector-online**.

Comments or queries? Email **vector@caa.govt.nz**

# THE PROPER USE OF s13A

Section 13a is a valuable emergency exemption from the rules – but it's not an everyday operational tool.

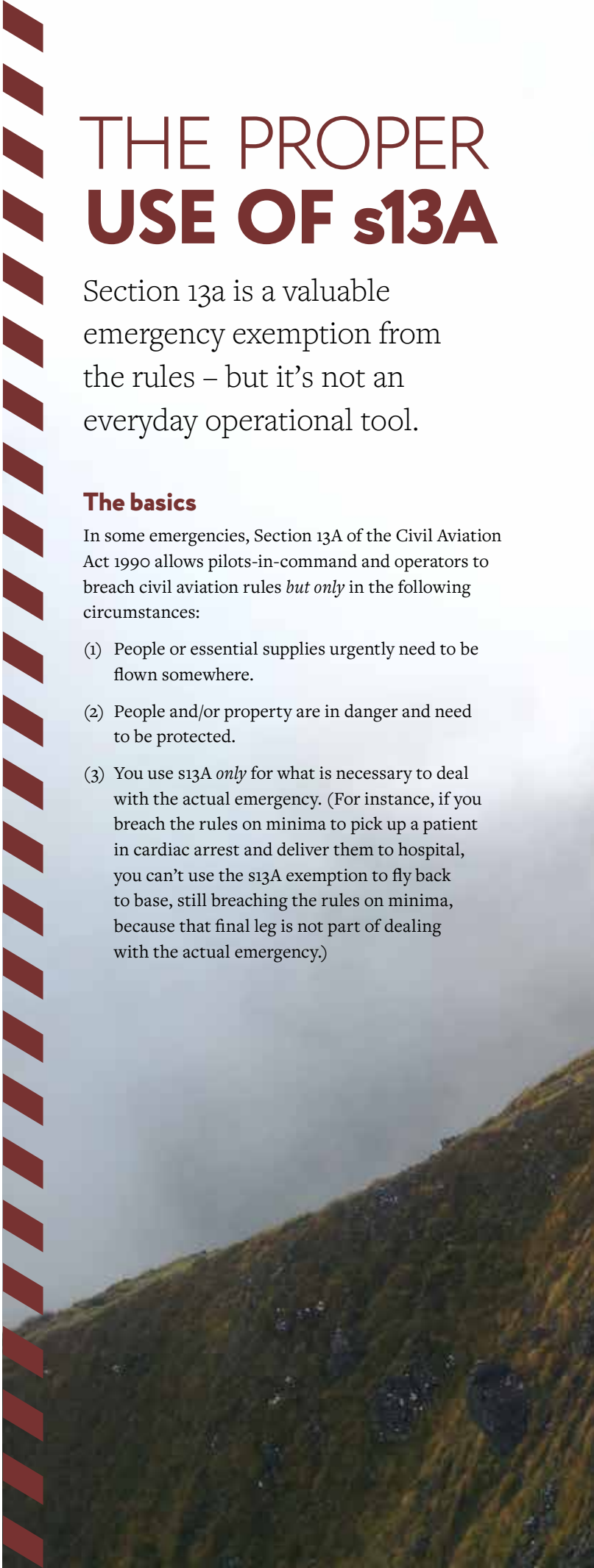
## The basics

In some emergencies, Section 13A of the Civil Aviation Act 1990 allows pilots-in-command and operators to breach civil aviation rules *but only* in the following circumstances:

(1) People or essential supplies urgently need to be flown somewhere.

(2) People and/or property are in danger and need to be protected.

(3) You use s13A *only* for what is necessary to deal with the actual emergency. (For instance, if you breach the rules on minima to pick up a patient in cardiac arrest and deliver them to hospital, you can't use the s13A exemption to fly back to base, still breaching the rules on minima, because that final leg is not part of dealing with the actual emergency.)



(4) There are no other reasonable means to alleviate or avoid or help with the emergency.

(5) The degree of danger involved in breaching the rules is clearly less than the degree of risk involved in failing to attend to the emergency.

(6) The aircraft is registered.

(7) The aircraft is airworthy.

(8) The pilot is lawfully allowed to fly the aircraft.

(9) The relevant air traffic control service is notified immediately of the breach of the rules.

(10) The Director is notified as soon as practical via the s13A report.

## Don't be pressured

A 'tasking agency' (for instance, Fire and Emergency, district health boards, RCCNZ) can supply information to help an operator decide whether or not to fly, but that agency has no power to say to the operator or pilot, "Make the flight and use the s13A to breach the rules".

The executive officer of Aviation New Zealand, Bill MacGregor, says it's the operator or pilot who has to shoulder all responsibility for making a flight that may require a s13A report.

"We don't want people getting into a situation where the tasking agency influences their decision, and they end up making a flight, inappropriately. Because it's them, not the agency, who'll have to wear that," Bill says.

CAA Investigator Jason Frost-Evans agrees, saying the s13A is used solely at the discretion of the pilot-in-command (PIC), or the operator.

"The main areas where a PIC or operator can rely on information provided by other parties are in assessing whether there's a threat to life or property, and what the alternative available means are to deal with that."

Jason says if attending to emergencies is an operator's daily business, they should be resourced and equipped to the level that they don't have to routinely use an s13A to operate.

And yet, of the 139 section 13a reports since 2017, 134 were related to air ambulance work.

"The s13A is primarily for unforeseen events," says Jason. "Perhaps you're a pilot being called on to do what you can to help because you happen to be flying near to a sudden disaster. That's where s13A may be warranted.

"Emergency services should have sufficient risk processes and resources in place to deal with most emergencies safely, without the need to breach the rules on a regular basis."

## Emergencies and restricted aircraft

"Operators of an aircraft with a restricted certificate of airworthiness should think very carefully before using their aircraft in an emergency," says Bill MacGregor.

"There are a number of limitations to operating such an aircraft and s13A may not release them from those limitations." »

Photo courtesy of Amalgamated Helicopters (NZ) Ltd.


Photo courtesy of Amalgamated Helicopters (NZ) Ltd.

// When Amalgamated Helicopters receives a callout – from LandSAR, for instance – it carries out a risk assessment, then checks with the tasking agency as to the critical nature of the emergency.

Those limitations are noted in the aircraft flight manual and relate to airworthiness.

"If your aircraft has a restricted certificate of airworthiness, the difference between an emergency arising in flight versus one arising when the aircraft is still on the ground is important," says Jason.

"Let's say the emergency arising in flight is one that makes the aircraft unairworthy. The pilot needs to be able to take the safest course of action to ensure the safety of those on board. That potentially includes continuing the flight.

"If the aircraft is still on the ground, and it has airworthiness limitations or is otherwise not airworthy, it cannot be flown under the provisions of s13A.

"This makes sense because – while the pilot and operator are responsible for ensuring an aircraft is airworthy – they're not necessarily qualified* to make decisions about to what degree the airworthiness issue is a direct safety issue."

## Operator obligations

Rule 135.553 requires operators to establish a training programme to make sure crew members are trained and competent to "perform their assigned duties".

And if assigned duties include emergency operations, the training programme should cover those operations, including the use of section 13A.

This should be supported by an 'emergency situation action plan', as required by rule 135.91, and the associated risks and mitigations should be addressed in the SMS.

"So the pilot can say, 'I did this assessment under our SMS, and I assessed that the risk to life, limb, and/or property (in the emergency) was greater than the risk of flying. I've gone through a formal process, I can justify what I did, and I reported it under 13A," says Bill.

"Operators involved in emergency work like search and rescue, or medevac, or firefighting should make sure their pilots and crews have a short, easy-to-use 'what if' flow chart to assess whether the use of s13A is appropriate.

"We want operators and pilots to actually think this through, and not just react with, 'Oh, it's an emergency, we've got to go, and fast'."

Operators should, at the very least, ensure their crew are aware of s13A and what it's for, Bill says.

"They need to realise that it's not something that should be automatically invoked to justify the unjustifiable.

"It's not a 'get out of jail free' card for PICs or operators."

## // MORE READING

To read more, go to **legislation.govt.nz**, search on Civil Aviation Act 1990, and scroll down to 13A *Duties of pilot-in-command and operator during emergencies*.

* Assuming they're not also LAMEs or working under the authority of a Part 145 certificate.

# FLYING AROUND VOLCANOES

The enormous ash clouds generated by the violent eruption in January of the volcano Hunga Tonga-Hunga Ha'apai shows what a risk to aviation such events are.

Located astride the crash zone of the Australian and Pacific plates, New Zealand has some of the world's most dramatic landscapes – formed by violent earthquakes and powerful volcanic eruptions.

Volcanic eruptions in New Zealand may seem rare, but on geological timescales, New Zealand is one of the more active volcanic regions in the world.

Over the last few million years, New Zealand's volcanic activity has been largely confined to the Taupō Volcanic Zone (TVZ), which extends northeast from Ruapehu to Whakaari/White Island.

There are two styles of volcanic activity in the TVZ. The first includes relatively frequent explosive eruptions from cone volcanoes, such as Whakaari/White Island, Ngauruhoe, Te Maari and Ruapehu. The other eruptions come from the caldera volcanoes in the Rotorua-Taupō area (Ahi Tupua) but these are much less frequent; every one to two thousand years.

In the last 50 years there has been an average of one eruptive episode each year from the cone volcanoes in the TVZ. These explosive eruptions have produced a wide variety of volcanic ash plumes, ranging from weak ash plumes rising a few tens of feet above the volcano to those reaching around 20,000 feet. The larger ash plumes have all been capable of causing significant disruption to aviation. »

// Hunga Tonga-Hunga Ha'apai volcanic activity, 2015.

Photo courtesy of Stephen Sherburn/GNS Science/VML 147670.

## Getting the latest information

When a significant change in volcanic activity is identified, a change in volcanic alert level (VAL) is communicated through a Volcanic Activity Bulletin (VAB) at **geonet.org.nz**. The VAB will also advise of the current aviation colour code – the ICAO universal volcano activity description system for aviation.

A VAB may also be issued to update on current activity, even if there's no change to the VAL or aviation colour code.

"The VABs are the most up-to-date summaries of activity at our volcanoes," says GNS Science volcanologist Brad Scott. "The VAB are found on the GeoNet website, **geonet.org.nz**."

Pilots can also receive a notification on their phones when a new VAB is issued if they download the GeoNet app and ensure the volcano notifications are turned on.

A volcanic eruption can occur with little to no useful warning, recently evidenced by the 2019 tragedy at Whakaari/White Island, and the violent eruption of Tongan volcano Hunga Tonga-Hunga Ha'apai in January.

Even without an eruption, it can be dangerous flying around or near volcanoes.

"Even when quiet," says Brad, "some of our active volcanoes give off a lot of gas and water vapour, and this can seed local meteorological clouds."

"The odour from volcanic gases can also enter a cockpit possibly causing pilots and their passengers to become nauseous. And those gases can also potentially trigger a response in people with a predisposition for respiratory issues."

## The effect on airspace

Changes in volcanic activity also affect how the airspace is managed in New Zealand.

"Volcanic Hazard Zones (VHZ) are designated airspace around New Zealand's more active volcanoes," says CAA Aeronautical Services Technical Specialist Hamish McKoy.

"Published on the visual navigation charts, these provide protection to aircraft from sudden debris and ash hazards that may happen without warning.

"The CAA may also designate a temporary VHZ if another New Zealand volcano was to suddenly become active."

When the VAL moves through level 2 or higher for a particular volcano, the Christchurch NOTAM office will publish a NOTAM including a change in the size of the VHZ. The NOTAM will also refer the reader to the latest VAB issued by GNS Science for that volcano.

Finally, if volcanic ash is detected in the atmosphere, MetService will issue volcanic ash SIGMETs and volcanic ash advisories. These alert operators to the observed and forecast areas of airborne volcanic ash. Further, GNS Science will provide ashfall maps via the GeoNet site, indicating which areas may experience ash deposits – important for airport operations, highlighting possible ashfall clean up that may be required.

// Mount Ruapehu volcanic eruption, and Mount Ngauruhoe, at sunrise, 19 June 1996.

## Pilot obligations in volcanic hazard zones

It's important that pilots understand their obligations when entering a volcanic hazard zone, as outlined in rule 91.137. These obligations include entering only during the day and in VMC conditions, and only after the pilot – having reviewed the relevant published information – is satisfied the flight will not be affected by volcanic hazards.

Volcanic Air's Tim Barrow has operated sightseeing flights for many years, taking in the sights of the North Island's volcanic landscapes.

"My advice is pretty simple really: check the VAL and aviation colour codes for the area you're working in.

"And if the pilot identifies any steam or ash in the atmosphere, they should stay well upwind of the plume."

CAA Safety Investigator Jason Frost-Evans emphasises the importance of risk management processes.

"For private flying, pilots should consider volcanic hazards as part of their threat and error management. Check the NOTAMs and use official aviation weather products as well as any others you find useful.

"For most commercial flying, operators must take a more formal approach which includes suspending or restricting operations when a hazardous situation develops.

"The Health and Safety at Work (General Risk and Workplace Management) Regulations 2016 require that risks associated with remote or isolated work, and substances hazardous to health must be managed using the hierarchy of controls – eliminate the risk, substitute the risk, engineering controls, administrative controls, and finally, if some risk remains, personal protective equipment."

## For more information

The CAA's safety education team has recently published a new Good Aviation Practice (GAP) booklet, *Flying around volcanoes*. This booklet is intended to help pilots understand some of the hazards they may encounter when flying in New Zealand's volcanic regions. Download a digital copy from the CAA website, or email **publications@caa.govt.nz** for a printed copy.

For more information on New Zealand's Volcanic Ash Advisory System, or any other questions or comments, email **paula.acethorp@caa.govt.nz**.

## // GNS SCIENCE

GNS Science is the designated ICAO State volcano observatory in New Zealand. It monitors New Zealand's active volcanoes, through the GeoNet programme.

GNS Science uses a range of monitoring equipment to better understand what's going on at each of New Zealand's active volcanoes. This data is converted into useful information for the public, as GNS Science volcanologist Brad Scott explains, "The information GNS provides ranges from activity update bulletins to learning material on volcanic hazards, monitoring, eruptions and volcano types. Monitoring data collected by GNS is also available online for the public to view".

Go to **gns.cri.nz > learning > science topics > volcanoes**.

Photo courtesy of Lloyd Homer/GNS Science/VML 3548.

# AIRCRAFT CLEANING

// By Brendan Odell, CAA Airworthiness Inspector

Regularly washing your aircraft is the first line of defence against corrosion.

New Zealand is surrounded by oceanic winds, and it receives moderate rainfall and good lashings of UV-laden sunshine. For aircraft structures, paints and plastics, this is a pretty tough environment.

One of the easiest and most cost-friendly steps to reduce the harmful effects of salt and other contaminants on your aircraft, is simply to wash it regularly. Washing with the right materials on a regular basis can massively reduce the occurrence of corrosion.

For this reason, large aircraft maintenance programmes generally incorporate a washing schedule, which is called up for action, just like any other task on the aircraft.

When it comes to washing salt-laden structures, delay allows the unchecked onset of corrosion.

So create a cleaning schedule, based on the utilisation of your aircraft, and stick to it.

## Wet washing

If regular aircraft washing is to keep corrosion at bay and preserve the paintwork, it's just as important the products, tools and materials you use support the same goal. The last thing you want to do is wash corrosive detergent residue into lapjoints and under fasteners.

I recall some years ago, when an aircraft maintainer in the North Island sourced some very strong detergent – normally used for cleaning industrial chip fryers – and found it very effective in degreasing aluminium surfaces, especially where carbon accumulations from exhaust gases had collected.

You can guess the results – the stuff was extremely corrosive. We were fixing major corrosion issues for years afterwards on those aircraft.

Also, as the term implies, wet washing typically involves lots of water. Mind how you use a pressure washer – the intensity of the water stream can damage aircraft paint, skin, plastics, electrical components, and so on.

Protecting sensitive components and (where specified) following manufacturer's procedures is very important.

// Washing with the right materials on a regular basis can massively reduce the occurrence of corrosion. //

## Environmental considerations

If you're removing oil and carbon residue, consider the potential damage done to the environment if that residue is channelled into the stormwater system.

The runoff in stormwater pipes discharges into the nearest stream, lake, underground soakhole or beach, also potentially ending up in our groundwater aquifers. Such toxins will do their bit to threaten wildlife and ecological systems.

It could also contribute to the degradation of the quality of water used for stock watering and domestic supplies.

Therefore, for regular wet washing of a fleet of aircraft, it's appropriate (and in most cases required by council by-laws) that a wash pad is constructed and fitted with an adequately sized oil/water separator. This allows accumulated oil to be regularly and safely removed, without threatening the environment.

## Choosing your products

Use products recommended by the aircraft manufacturer. If they or recommended alternatives are unavailable, or there are no recommendations made, select a product as close to pH neutral as possible (about 7). A product with a pH of 11, for example, will almost certainly damage aluminium, steel and various alloys.

With washing comes waxing. Many aircraft manufacturers recommend commercially available waxes. Avoid using any kind of orbital polisher on and around protrusions such as static ports, rivets, hinges, doors, corrugated metal surfaces, and antennas.

Make sure you cover the static ports, vents, pitot tube ends, and antennas before you start washing or waxing. Remember to remove anything covering these after washing and waxing. Ensuring drain holes in flight controls, fuselage and other areas are clear will make sure that the very contaminants you want to remove, drain safely away.

As your aircraft's paint ages, or if your aircraft sits outdoors for an extended time, you need to be even more diligent with surface cleaning and protection.

Abrasion, caused by normal environmental contaminants, will eventually create micropits in the paint's surface, which will trap dirt and moisture.

That combines to further accelerate paint degradation. This can be mitigated with regular washing – in New Zealand conditions, about every 30 days is a good starting point. »

Photo: CAA/Pen Mackay.

// Regular washing of your aircraft will keep corrosion at bay and preserve the paintwork.

## Dry washing

Giving your aircraft a bath may not be possible on some airfields for environmental reasons, or because of limited access to water. (Washing an aircraft does use a tremendous amount of water. On large aircraft, the numbers are staggering – more than 9,500 litres of water to clean a Boeing 777 and more than 11,300 litres of water to clean an Airbus A380!)

Luckily these large aircraft receive water washes only four or five times a year. The rest of the time they undergo dry washes – something that's an option for all types of aircraft.

As indicated by the name, little or no water is used. A liquid cleaning product is first applied manually to the entire external surface of the aircraft. Typically, clean microfibre fabric is then used to remove the cleaning product which has dried to a film, removing the dirt along with it and leaving the aircraft clean and polished.

Dry wash materials are applied with spray, mops or cloths, and removed by dry mopping or wiping with clean, dry cloths. The aircraft is left with a fine protective film allowing the painted surface to retain a longer-lasting gloss and shine. It's important to understand that the dry wash method of aircraft cleaning isn't suitable for removing heavy deposits of carbon, grease, or oil, especially in the engine exhaust areas.

Remember – keeping your aircraft clean is the first line of defence against corrosion, so do it regularly and properly. The benefits outweigh the hard work!

Comments or queries? Email **brendan.odell@caa.govt.nz**

## // ADVICE FROM THE PROFESSIONAL

### The windows

Todd Hooper, CEO of aircraft cleaning company Kiwi Shine Worx, says windows need to be treated with extreme care.

"Don't go aggressively at trying to remove bug carnage from the windows, including using excessive pressure. Light daily cleaning should avoid the bug acids and proteins etching into the windscreen surface.

"This can be done by simply leaving your approved cleaner soaking the window, then do a first wipe with nil or low hand pressure, gently removing soaked and loosened debris. Follow up with a second application of the cleaner and give it another wipe, then wipe dry.

"Always use an up-and-down wiping and drying motion – a circular motion can scratch the window, possibly distorting your view outside, particularly in the sun. Use a high-quality cleaning towel, such as a 1100 GSM microfibre cloth."

### The interior

Todd says cleaning the aircraft interior needs as much care as with the exterior.

"There's a huge range of interior materials – from fabric to timber to vinyl – all of which fatigue over time," he says.

"Those materials are prone to a huge number of contaminants such as UV rays, dirt, dust, oils – including body oils – stains and spills, and moisture. If you use the wrong cleaner, perhaps full of damaging chemicals, that contamination can speed up, leading to premature fatigue of the materials. And replacement or refurbishment can be expensive."

Todd also says to follow the aircraft manufacturer's instructions and do your research before first lifting a cloth.

"You've got to be careful with fabric cleaning products because, at altitude, some chemicals can produce vapours.

"Fire retardant properties of aircraft interior materials can also be adversely affected by the application of inappropriate cleaning products."

He also recommends using gloves and eye protection to prevent any possible reaction to the product.

"Also, with COVID-19 almost part of our day-to-day, some commercial interiors could possibly need more of a regular cleaning schedule."

Todd says not all interior areas need the same degree of 'decontamination'. "The cockpit can be subject to pretty heavy contamination," he says. "But the baggage area usually needs only a light detail."

# **LOW FLYING** OVER WEST MELTON

Pilots approaching Christchurch or taking their time to gain height on leaving should not be relying on the takeoff and departure exception to rule 91.311.

A recent aviation-related concern submitted to the CAA referred to low flying over West Melton – once a rural area and now a populated township.

It complained that aircraft often fly over West Melton township (the West Junction VRP) at what appears to be below 1000 ft, or even 500 ft.

The submitter had two concerns. Firstly, in an engine or control failure event, low-flying pilots might have very little time to react, above what is now a built-up area. Secondly, there's the possibility of a collision between a low-flying aircraft and a UA (drone) which, the submitter said, commonly fly up to 400 AGL above West Melton.

Arrival procedures into Christchurch state aircraft must fly at "1500 ft AMSL or below". This doesn't cancel, however, the requirements of rule 91.311 *Minimum heights for VFR flights* which says,

*A pilot-in-command of an aircraft must not operate the aircraft under VFR over any congested area of a city, town, or settlement, or over any open-air assembly of persons at a height of less than 1000 feet above the surface.*

However, this minimum height rule clearly doesn't apply to aircraft arriving or taking off.

"It's possible that pilots are flying too low over West Melton, on the basis they're departing from, or approaching, Christchurch," says CAA South Island Aviation Safety Advisor Carlton Campbell.

He advises pilots not to be "bullish" about the rules for taking off and landing.

"You can't keep pushing it for extended distances. West Melton cannot be considered part of the NZCH take-off or landing phase, so legal height must be conformed with."

Legally, pilots must be 1000 ft AGL above such a community, and at West Melton the airspace ceiling for the airspace is 1500 ft AMSL.

"Given that West Melton aerodrome is 305 ft AMSL, West Junction is likely similar. Therefore, pilots have a gap between both legal heights of about 200 ft to fly above the township and below the upper limit of the airspace.

"Pilots need to actively manage this 200 ft gap, so as to not infringe height over the town, while not breaching airspace above."

Carlton says similar situations apply to many aerodromes around the country.

"At one point, aerodromes such as North Shore, Paraparaumu, Taieri and Motueka, were sited in quite rural areas, but development has now surrounded those sites (and many others) and pilots must comply with height restrictions.

"Apart from the safety aspect, 'flying neighbourly' and minimising noise will avoid raising the ire of the residents below, and avoid future restrictions or curfews that communities may try to include in district plans.

"Don't be selfish with your flying privileges, and potentially contribute to the detriment of our children and grandchildren's flying in the future."

---

Comments or queries?
Email **carlton.campbell@caa.govt.nz**

# HAPPY LANDINGS

A stressless landing is way more likely if you monitor the advisory lights and fly a 3-degree approach.


Photo courtesy of Phil Craig.

// On profile, at Walsh Memorial Scout Flying School.

In the past three years, there have been 1065 reported occurrences during the approach phase of flight – including missed approaches, go-arounds and abnormal approaches.

"Wind conditions nothwithstanding, those statistics reflect a potentially concerning number of non-stabilised approaches," says CAA Aviation Safety Advisor Carlton Campbell.

"There are many factors in a stable approach – configuration, speed and power setting – but one of the most important is using the 3-degree glideslope.

"It means you'll clear obstacles on your approach and reach your aim point."

## It's about discipline

Ab initio pilots are taught to fly a 3-degree profile at a stable speed. And that's exactly how even the largest jets are landed.

The 3-degree profile is safest, no matter what size the aircraft, says Massey University School of Aviation CFI, Paul Kearney.

"There's a common belief that a shallow profile helps a pilot land on the right spot.

"But the shallow profile normally just takes you past your landing point. A 3-degree profile will put you more accurately on it.

"Apart from clearing obstacles in most situations (on rare occasions, unusual obstacles or terrain make it unfeasible) the 3-degree glideslope is also the safest for gliding to the runway if the engine fails and, if also at a stable speed, for 'flying neighbourly' by abating aircraft engine noise.

"But the main reason for flying a 3-degree approach is about discipline.

"It takes more skill to fly a 3-degree profile than just flying in at any steep or shallow angle," Paul says.

Carlton Campbell says discipline with the approach profile is important because the consistency enables the pilot to recognise early changes in any variables such as wind, power and flap application.

"Over time, the eye gets attuned to the 3-degree profile and you can apply it in any circumstances to achieve your aim point on any surface," he says. "You can recognise that profile even where the aids – such as the advisory lights – are not available."

## Using the PAPI lights

The Precision Approach Path Indicator (PAPI) is the runway-side set of four lights guiding pilots down a 3-degree glide path and crossing the threshold at 50 feet – generally considered the safest height for landing on 'the spot'. Four red lights, you're too low; four whites, too high. Two red and two white is the ideal.

Paul Kearney says there's a misconception that the PAPI is only for the use of large aircraft.

"If you look at Paraparaumu as an example, the PAPI there is set up at 3-degrees and a threshold crossing height of 50 feet. A pilot of any aircraft landing at NZPP could use the PAPI lights to set themselves up on the correct slope to land at the correct spot."

## From the lights to the markings

The accuracy of the PAPI wavers the closer to the ground you get. So the advice is, at about 200 feet AGL, move from monitoring what the lights are telling you, to scanning for the runway touchdown markings – 'fixed distance markings' – and where your aircraft is in relation to them. »


// It's not just jets that can use the 3-degree profile.

Photo courtesy of Yuvraj Kaintel/instagram.com/xwb.aviation.

## // Once a pilot has a clear picture in their mind of the 3-degree profile they'll find it easy to fly at any runway. //

The Summer 2018–19 edition of *Vector* advised, "Fixed distance markings consist of a rectangular marking on each side of the runway centreline, 300 m from the threshold. Each rectangular marking is composed of a series of thin longitudinal stripes. This is where you should aim to touch down. These markings work on the assumption that you pass over the runway threshold at a height of 50 feet."

Some VFR pilots believe it's best to land as short as possible on the runway, to give plenty of distance to stop. But the internet is awash with videos of planes landing too short, and ploughing into stockbanks, or even hitting cars.

Carlton Campbell says if pilots use the 3-degree profile which gives them the 50 ft clearance over the threshold, and they land short, it's not as much of a threat as if they aim at the threshold and land short.

"You may take out the fence!"

### The role of instructors

Paul Kearney says that using approach aid systems such as PAPI, if available, to help the student learn what the profile should look like is very much encouraged in flight training.

"The instructor can always ask ATC to turn the PAPI off to check if the student has the picture in their mind of the correct stable 3- degree approach profile.

"As instructors we could take more time to explain, and even more importantly, show, a pre-solo student exactly what the term 'profile' means.


// Chipmunk at Walsh Memorial Scout Flying School clearly coming in at least 50 feet across threshold.

Photo courtesy of Phil Craig.

"In their first straight and level lesson, we take time to show exactly what the term 'attitude' means. But in my experience of examining flight instructors, we get into the circuit and constantly use the word 'profile' without really understanding or showing the student what it means.

"The 3-degree approach profile is *the angle between the aircraft and the touchdown point* on the runway. An instructor can very clearly show this angle by starting slightly low on the base leg then entering a shallow climb while the student watches the angle rapidly change.

"Once a pilot has a clear picture in their mind of the 3-degree profile they'll find it easy to fly at any runway, irrespective of how far away the aircraft is from the runway, or when to start the descent if joining on the final leg."

Comments or queries?
Email **carlton.campbell@caa.govt.nz**

# CLOSE TO THE EDGE

From the beginning of 2019 to the end of 2021, there were 904 reported airspace busts in New Zealand – that's almost one a day. All but 13 were into controlled airspace.

The CAA receives reports of airspace busts on a weekly basis.

"It could be an aircraft that inadvertently enters controlled airspace," says Deputy Chief Executive for Aviation Safety David Harrison. "Or it'll be an aircraft that doesn't make a radio call and goes straight through a mandatory broadcast zone, or an aircraft that's 1000 feet higher than what it was cleared for[1]."

About half of the airspace busts are made by solo training flights, but the other half are made by general aviation flights – both recreational and commercial.

David is now encouraging GA and student pilots to "fly consciously" well away from uncontrolled/controlled airspace boundaries.

The issue has been thrown into focus by the work the CAA has been doing with Queenstown airport users on the new Air New Zealand ATR procedures.

The new procedures have a higher navigation accuracy, but because of that, David says, the ATRs get quite close to the boundary of controlled airspace and the general aviation area.

"It's not just about Queenstown, however," says David. "The statistics indicate this is an issue throughout New Zealand."

Latest figures indicate the two aerodromes most frequently subject to airspace busts are Christchurch and Hamilton.

"It's also not just about the boundary between controlled and uncontrolled airspace, or between smaller fixed-wing recreational aircraft and passenger transport aircraft," says David.

"It's also about the boundaries between general aviation areas, restricted, and danger areas.

"It's your responsibility to give yourself a buffer if you're flying close to an airspace boundary. ⟫

Photo courtesy of Queenstown Airport.

// New Air New Zealand ATR procedures at Queenstown have a higher navigation accuracy, and get quite close to the boundary of controlled airspace and the general aviation area.

1 "Unauthorised altitude penetration"

"Otherwise, you could be quite close to traffic in controlled airspace without actually realising it."

David says some of the problem is exacerbated by pilots' increasing trust in technology.

"There's such a huge reliance on, say, moving maps and GPS in the aircraft, that it encourages pilots to fly closer to the edge of airspace than they would without those devices.

"That's all well and good, but – particularly as a VFR pilot – you're meant to be looking out the window. You should know your position in relation to airspace boundaries and the actual ground you're over."

David says there's also the risk that airspace data on a moving map might be out-of-date.

"A lot of airspace is designed off prominent visual features, like roads or big factories – things a pilot can easily identify.

"So regardless of having a moving map, you should be looking outside because that's a really good way of keeping a certain distance away from boundary trouble."

David says that, while flying close to the uncontrolled/controlled airspace boundary is permissible, the danger is the aircraft unwittingly wandering across that boundary.

He likens it to the centreline of a road.

"It's permissible to drive just to the left of that white line, but most people would think that was a pretty dangerous thing to do, because it's easy to dawdle over it, and if an approaching car is doing the same thing..."

David says proper preflight planning is essential.

"Pilots should know where they're going to fly and think about all the airspace considerations *before* their flight – identify those prominent features that will help you stay clear of the airspace boundaries."

The statistics indicate most airspace busts happen during the cruise – about four times as many as during the climb.

"The cruise is where pilots tend to relax a bit," says David. "But stay ahead of the aircraft, know where you are, and always be anticipating what you have to do next.

"Otherwise, you lose situational awareness, and end up with little idea of where you are – including near busy controlled aerodromes."

---

Comments or queries?
Email **david.harrison@caa.govt.nz**

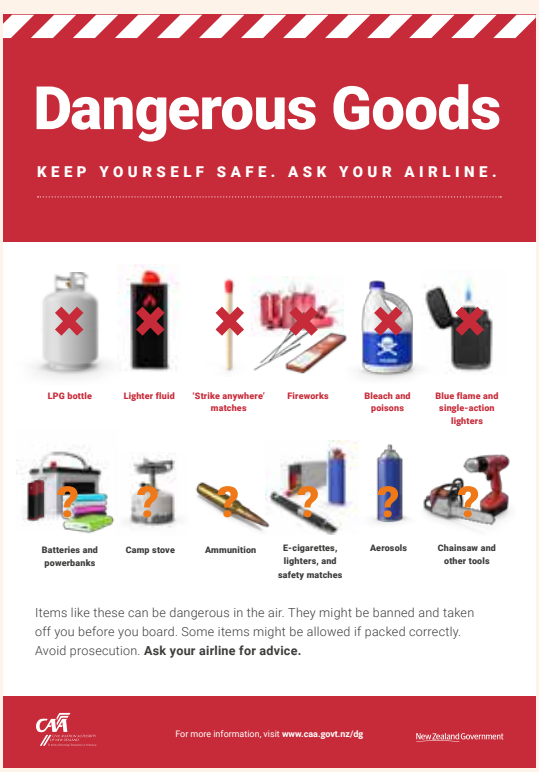
# DANGEROUS GOODS AC HAVE YOUR SAY

The CAA is in the middle of a massive project to make the carriage of dangerous goods easier to understand.

The revamped Advisory Circular AC92-2 (*Carriage of dangerous goods on domestic VFR flights in unpressurised aircraft not exceeding 5700 MCTOW*) will soon be out for public consultation.

Go to **aviation.govt.nz/subscribe** and sign up to 'Part 92' to be notified when the advisory circular is ready for comment.

The AC includes guidance on rule 92.11 *Exceptions* (that's carriage of DG by police, carriage of class 1



explosives for avalanche control, and carriage of DG for the recreational use of passengers). It also has guidance on carrying dangerous goods for medical use in flight, procedures for carriage of DG by helicopters operating in remote areas and by underslung load, and it contains lists of commonly carried DG items.

## Simplifying it

The updated AC92-2 is part of a large CAA project to make it easier to understand the rules on carrying dangerous goods. Part 92 *Carriage of dangerous goods* sets out the legal requirements of flying with DG aboard. This is, in turn, based largely on ICAO's *Technical instructions for the safe transport of dangerous goods by air*, which isn't the easiest document to understand and apply.

Consequently, there's been significant misunderstanding of this issue, and we recognise the difficulties involved – particularly for smaller operators and private pilots – which is why the advisory circular has been simplified.

## Help with writing manuals

Also being drafted is a new advisory circular, designed to help operators write their dangerous goods manuals, or that section of their exposition dealing with dangerous goods. This AC will have a template which should reduce the time and effort needed to create a manual, and it should also greatly improve the quality of the manuals already in use. We'll let you know when this draft AC is ready for public consultation.

## More relevant training

Parts 119 and 141 DG training organisations should now be reassessing their programmes, after ICAO introduced competency-based training for staff handling DG.

Competency-based training (CBT) is a major step forward because it makes training requirements more relevant to the nature of each operation and the items they actually carry.

In many cases, training organisations will need to submit to the CAA an amended exposition to align with CBT requirements.

There's guidance on this in the rewritten AC92-1 *Dangerous goods training* (published in November 2021).

## Consistent advice

CAA staff are also being trained to ensure DG issues are dealt with consistently and in accordance with established procedures. This is an area we're aware was not done particularly well in the past.

## Reporting

To help CAA make robust decisions about where most risk lies, it's really important you report all dangerous goods incidents. Those incidents include DG that are incorrectly declared, packaged, labelled, marked, or documented, as well as incidents that damage the packaging or something else, or cause the contents to spill or leak.

To report such an incident, complete a CA005 *Occurrence report* form at **aviation.govt.nz/forms**, and email to **isi@caa.govt.nz**.

Or mail a completed print version
PO Box 3555, Wellington 6011.

Or use the online reporting form available via **aviation.govt.nz/report**.

For more information on reporting, have a look at Part 12 *Accidents, Incidents and Statistics* and Advisory Circular AC12-1 *Mandatory occurrence notification and information*.

## Suggestions?

If you have a concern or suggestion outside of the advisory circulars, email CAA's senior advisor for dangerous goods. **jim.finlayson@caa.govt.nz**

# LETTERS TO VECTOR

## Basics

I've just finished reading the Spring 2021 *Vector* magazine and want to say that it's the best one I've read in terms of relevant real information transmission.

Well done, I think the team that are producing this magazine have nailed it.

Regarding the article *Not drowning in the tech*, it all comes down to the basics – aviate, communicate, navigate.

The new generation have so many aids at their fingertips they've forgotten the basics.

It's great to have the latest glass cockpit technology but it all comes down to the common rules of aviation.

It's a huge responsibility on the new generation of instructors to say, 'this is a great plane, but do you understand what you're looking at? Do you have the mental capacity to take in the information that's being presented?'

A simple scan of 'old school' instruments is easier than full glass cockpit G1000 displays.

The sad thing is that the pilots are not looking out of the windows.

*Pete James, Queenstown*

## Calls

The article, *Slow down those radio calls* (Spring 2021) was very timely. Correcting garbled radio communication is the responsibility of instructors and I believe I'm beginning to hear improvements.

However, I often find myself having to resort to "station calling…" or "aircraft reporting at…" to establish contact with other aircraft.

Interestingly, I find transmitters of garbled call signs rarely respond to efforts to establish contact.

Clear and precise pronunciation of the full, three-letter, opening call sign makes it a lot easier to target a request for clarification or to pass on information, like a change of runway-in-use for inbound traffic entering the circuit.

*Glen Morgan, Dunedin*

## Installing

Regarding the section about installing devices in the article *Not drowning in the tech* (Spring 2021). I run a carry-on ADSB IN device in my Jabiru ZK-CLX which links via Bluetooth to a Samsung Android tablet. This tablet is housed in a protective case.

The aircraft also has a magnetic compass affixed to the top of the instrument panel, on the aircraft centre line.

I've noticed that a major compass deflection, in the order of 30 degrees or more, occurs if the tablet – in its case – is placed on the panel within about 15 cm of the compass.

This error is, in large part, caused by small magnets within the case which secure the tablet and case lid.

In normal flight the tablet is kept well away from the compass. Otherwise, a great deal of navigational confusion is likely to arise.

So, it would be good practice to check before flight that carry-on devices like phones, tablets – and especially their cases – don't cause compass errors.

*Max Saunders, Wellington*

## // DEAR VECTOR...

Reader comments and contributions on aviation safety are welcome. Email **vector@caa.govt.nz** or the specialist whose name appears at the bottom of most articles. We may edit or shorten letters, or decide not to publish.

## SOMETHING NEW – *PRACTICAL FLYING GUIDES*

The CAA is launching a new series of online educational material called *Practical Flying Guides*, to be found at **aviation.govt.nz > licensing and certification > pilots > practical flying guides**.

As with the *Good Aviation Practice* booklets, the guides will be very pragmatic in nature, but will dive deeper into their respective topics.

The material is not mandatory or compliance-orientated, such as in the case of an advisory circular, but will describe in detail practical flying technique.

The first of these guides is *Visual Navigation*, which includes dead reckoning navigation, dealing with enroute weather, diversions, 'lost' procedures, inadvertent entry into IMC and night navigation.

Because navigation is a time-based activity, time management techniques are thoroughly described. These techniques will not only help in navigating, but also greatly assist in the overall management of the flight, including the threat and error management."

For instructors, a new navigation section is being developed for the updated *Flight Instructor Guide*, to be released shortly.


## VECTOR ONLINE

Read our special online *Vector* stories at

**aviation.govt.nz/vector**

Some articles have been featured in print issues of *Vector* magazine and some are unique to the website.

Some of those website-only stories are written articles, and some of the latest ones are audio stories.

So you can read – and hear – the CAA and members of New Zealand's aviation community give their opinions and advice about safe flying and engineering.

## OCCURRENCES DASHBOARD

These are the number and type of occurrences reported to the CAA, 1 October 2021 to 31 December 2021.

### Occurrence type

| | |
|---|---|
| 14 | **Aircraft accident** |
| 27 | **Aerodrome incident** |
| 338 | **Aviation-related concern** (for example, complaints about low flying) |
| 314 | **Airspace incident** |
| 341 | **Bird strike** |
| 232 | **Defect** |
| 6 | **Dangerous goods occurrence** |
| 10 | **Hang glider accident** (includes 5 paragliding accidents) |
| 198 | **Operational incident** (anything not fitting into any other category, for example, a go-around) |
| 12 | **Navigation installation occurrence** (for example, a transmitter failure) |
| 0 | **Parachute accident** |
| 9 | **Promulgated information occurrence** (for example, inaccurate weather information) |

## AVIATION SAFETY ADVISORS

Contact our aviation safety advisors for information and advice. They regularly travel around the country to keep in touch with the aviation community.

**John Keyzer** – Maintenance, North Island
027 213 0507 / john.keyzer@caa.govt.nz

**Mark Houston** – North Island
027 221 3357 / mark.houston@caa.govt.nz

**Neil Comyns** – Maintenance, South Island
027 285 2022 / neil.comyns@caa.govt.nz

**Carlton Campbell** – South Island
027 242 9673 / carlton.campbell@caa.govt.nz

# ACCIDENT BRIEFS

More accident briefs can be seen on the CAA website, **aviation.govt.nz** > **safety** > **aircraft accident briefs**. Some accidents are investigated by the Transport Accident Investigation Commission, **taic.org.nz**.

| Tecnam P2006T | |
|---|---|
| **Date and time:** | 22-Feb-2021 at 16:30 |
| **Location:** | Oamaru |
| **POB:** | 2 |
| **Damage:** | Minor |
| **Nature of flight:** | Training dual |
| **Pilot licence:** | Commercial pilot licence (A) |
| **Age:** | 68 yrs |
| **Flying hours (total):** | 4000 |
| **Flying hours (on type):** | 23 |

A dual instructional flight in asymmetric circuits was being carried out. The student hadn't flown the aircraft for nearly three months, so a normal circuit was completed prior to the asymmetric lesson commencing.

During the second circuit while the student was flying the aircraft, the instructor simulated an engine failure.

The instructor reported that the student was having difficulties in controlling the aircraft, so they required significant input from the instructor.

Before landing and on final approach, the student remembers the instructor verbalising the checks for carb heat, pitch and undercarriage, however the undercarriage was not confirmed down. A gear-up landing resulted.

During the operator's occurrence investigation, causal factors identified were a high workload for the instructor due to the student's performance in handling the aircraft, and the audible gear warning system did not provide a warning to the crew. The failure of the gear warning system to operate was due to a loose wiring connection. This prevented the gear warning system from activating when full flap was selected with the gear retracted.

**CAA occurrence number 21/929**

## ACCIDENT NOTIFICATION

24-hour 7-day toll-free telephone

**0508 ACCIDENT** (0508 222 433)

**aviation.govt.nz/report**

The Civil Aviation Act 1990 requires notification "as soon as practicable".

| Robinson R44 II | |
|---|---|
| **Date and time:** | 15-Dec-2020 at 11:20 |
| **Location:** | Te Kuiti |
| **Nature of flight:** | Agricultural |
| **Flying hours (total):** | 16016 |
| **Flying hours (on type):** | 6917 |
| **Last 90 days:** | 81 |

During an ag spraying operation, the helicopter flew through a set of power wires. A precautionary landing was carried out. There were no injuries – however there was damage to the main rotor blades and mast.

The helicopter was on the last load of the spray job and spraying downhill at slow speed under wires when a judgmental error was made with regard to trying to spray the last bit of gorse, resulting in the helicopter cutting through two lines. Instantly knowing he had cut through the lines, the pilot landed with power and reported no excess vibration after the strike while doing so. No hard landing was reported as part of this occurrence. An engineer was sent out to inspect the damage and reported damage to one blade beyond limits. The helicopter was transported out on a trailer for repair.

The pilot in this incident was highly experienced and works in an area where wires and obstacles are an everyday hazard. His regular work and hours flown in this area make the likelihood of encountering a wire more likely than in other areas of operation. This incident was an unfortunate error of judgment, but one he has learnt from.

Additional risk controls were put in place for operations around and under wires, including the following procedure:

Before going under wires, hover up to the wire and ensure the below is done before flying under:

- There is at least 5 metres' clearance both above and below the helicopter.
- Check that there is no ground obstacles, or other wires in close proximity.
- Note a physical marker on the ground as a reference to work to, or place a marker.
- If the wire is too low, change nozzles to droppers and spray above wire.

**CAA occurrence number 20/6573**

# GA DEFECTS

GA defect reports relate only to aircraft of maximum certificated take-off weight of 9000 lb (4082 kg) or less. More GA defect reports can be seen on the CAA website, **aviation.govt.nz > aircraft > GA defect reports**.

**KEY TO ABBREVIATIONS:**

**AD** = airworthiness directive
**NDT** = non-destructive testing
**P/N** = part number
**SB** = service bulletin
**TIS** = time in service
**TSI** = time since installation
**TSO** = time since overhaul
**TTIS** = total time in service

## Cessna A185F

### Main wheel hub

| | |
|---|---|
| **Part number:** | 161-30 |

After completing a flight, it was discovered that the right main wheel hub was cracked. The tyre remained inflated and there was no damage to any other part of the aircraft.

The maintenance investigation was unable to determine why the hub had failed, however, historical damage was considered a possibility. The wheel assembly was replaced and the aircraft returned to service.

**CAA note:** The Cleveland Component Maintenance Manual for External Design Wheels and Brakes, page 318, Section D. Inspection, provides the following guidance: "Replace any cracked or excessively corroded parts. Small nicks, scratches, or pits may be blended out and polished with fine sandpaper. Treat and repaint per paragraph 4 Brake and Wheel Refinishing."

CAA occurrence number 21/4652

## Robinson R44 II

### Sump/baffle

| | |
|---|---|
| **Part model:** | IO-540-AE1A5 |
| **Part manufacturer:** | Lycoming |
| **Part number:** | 56A21692/56G23399 |
| **TTIS hours:** | 2899.3 |

During investigation of metal contamination of engine oil, inspection found the baffle in the sump wearing into the oil delivery tube. The sump was inspected and found seviceable. A new baffle was fitted and clearances confirmed.

The engine had been received for repair in accordance with SB480F due to metal contamination of oil. The metal contamination was found to be due to spalling of camshaft lobes and tappet body faces. The camshaft was found to have been modified in accordance with Aviation Power Supply STC/13/21E/1.

Camshaft Spalling is not an uncommon issue with Lycoming Engines. STC/13/21E/1 modified camshaft is supposed to reduce this issue. The engine repaired with new Lycoming Camshaft and tappets. STC/13/21E/1 removed.

CAA occurrence number 21/4456

## Bell 206L

### Main rotor mast assembly

| | |
|---|---|
| **Part model:** | 206L |
| **Part manufacturer:** | Bell |
| **Part number:** | 206-040-014-105 |
| **ATA chapter:** | 6300 |
| **TSI hours:** | 992.4 |
| **TSO hours:** | 992.4 |
| **TTIS hours:** | 3411.65 |

The main rotor mast nut was found loose on the main rotor mast bearing. The locking plate failed to lock, allowing the nut to become loose. The lock plate was screwed and lock wired to the nut, which was found intact and satisfactory on arrival.

A detailed inspection was completed on the pole threads and bearing. No movement was found on the mast pole and the nut was re-torqued, new locking plate installed and engaged with castellations.

Internal castellation on lock plate 206-040-113-005 failed allowing the nut to move. The mast nut was re-installed after inspection and torqued, backed off, and retorqued. This process was done three times to ensure correct seating of the bearing and correct torque achieved. A second check was carried out before a new locking plate was installed.

In future, when installing the nut and lock plate, a three-step torque process and second check will be carried out.

CAA occurrence number 21/3865

## Eurocopter AS 350 BA

While carrying out an inspection of the Timken main rotor mast shimming, the main rotor mast lower bearing retaining ring was found snapped and had lost a locking tooth. The mast had done 973 hours since it was last disassembled.

Lock rings are a known weakness in the Timken bearing assemblies, and an 800-hour inspection and re-torque has been introduced as a result.

The aircraft OEM is aware of the issue and a long-term fix is available, but this requires replacing the entire mast assembly.

CAA occurrence number 21/3953

# Access to controlled airspace is changing

## You must be equipped by 31 December 2022

# Install ADS-B

**Apply for your ADS-B grant (OUT and IN) at**

**ads-b.aviation.govt.nz**

new southern sky

ads-b

Photo credit: istockphoto.com/milosradinovic