July / August 2004

VECTOR

Pointing to Safer Aviation

Over the Limit

Winter Anticyclone

Cellphones in Flight

Beware of Winch-launched Gliders

CAA
CIVIL AVIATION AUTHORITY OF NEW ZEALAND

VECTOR CAA NEWS

Published by: Published by: the Communications and Safety Education Unit of the Civil Aviation Authority of New Zealand, P O Box 31–441, Lower Hutt, New Zealand. Tel: +64–4–560 9400, Fax: +64–4–569 2024, Email: publications@caa.govt.nz. Published six times a year, in the last week of every odd month.

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Design: Gusto Design & Print Ltd.

Publication Content

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ISSN 1173-9614

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Over the Limit

This is the first in a series of articles aimed at addressing the high agricultural aircraft accident rate. It will discuss the dangers of overloading to maximise productivity, particularly with respect to aircraft structural design limits and performance. While it is pitched at operators and pilots of agricultural aircraft, there are aspects that will be relevant to pilots of other aircraft too.

Hung Load

The aircraft was engaged in topdressing operations from a farm property near Paiaka. After about 13 loads the loader driver started encountering lime that had been affected by moisture, and in an effort to make it flow, the loader bucket was used to mix the dry product with the damp product.

Shortly after takeoff, and as the loader driver was preparing to refuel the aircraft and check its hopper for lime build-up, the aircraft could be heard operating under what sounded like full power. (Note that the aircraft previously had fertilizer build up around the hopper box, requiring removal on several occasions. On one recent occasion the loader driver and pilot had to clean out part of a previous load that had 'hung up' in the hopper.)

The loader driver saw the pilot bunt the aircraft in an apparent attempt to dislodge the load. The aircraft then disappeared behind intervening terrain into a valley, some 1500 metres from the sowing area. A muffled explosion was heard and smoke was seen on the skyline.

A reconstruction of the final flight path was undertaken with an aircraft of the same type. The load consisted of the pilot and passenger, nominal fuel, but no fertilizer. It was found that in the valley where the accident occurred, full power was required to clear the ridge at the end.

A large quantity of lime was found at the accident site. It is possible that a portion of the previous lime load may have still been in the hopper when the new load was added, resulting in an overloaded aircraft.

The pilot could have found himself in a cul-de-sac situation, with an overloaded aircraft, no room to complete a reversal turn, and insufficient climb performance to clear the terrain ahead. A 'hung load' was encountered, probably resulting from the damp product bridging over the hopper doors; despite bunting manoeuvres, the pilot was unable to discharge the hopper contents. The bunting manoeuvres may have also resulted in a height loss, thereby exacerbating the situation.

Overloading – A Common Theme

Most agricultural pilots have at some time found themselves with insufficient airstrip length to get airborne or that their aircraft has not had the performance to out-climb the terrain ahead. A jettison of all or part the load has been required to regain control of the situation. Unfortunately, in the above case the pilot did not have that option.

A recurring causal factor in many agricultural accidents has been a lack of takeoff and/or climb performance due to overloading. Most would agree that there are currently too many incidents and accidents related to overloading and that it is time to look seriously at why they are happening.

The increasingly competitive nature of the agricultural industry has meant that many operators are under considerable commercial pressure to carry the maximum possible productive payload. The introduction of turbine-engine aircraft, in conjunction with the Part 137 overload allowance, has meant that they have been able to do this. While this has greatly improved productive efficiency, it has introduced problems such as: marginal aircraft performance and undesirable handling characteristics; airframe structural considerations; and undercarriage fatigue failures.

Airframe Loading

Design Limitations – The Basics

All aircraft are designed within a set of load parameters that will ensure structural integrity provided that the pilot operates within the specified flight envelope. What are these parameters, and why is it so important to remain within them? Let's start by revising the basics.

Design Limit – The maximum in-service loads (G limits) that can safely be placed upon the airframe. These will be specified

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as positive or negative G limits in the Flight Manual. Values for both flaps-up and flaps-down configurations will usually be given. (Note that the flaps-down G limits are normally significantly less and need to be taken into account when manoeuvring in gusty conditions with flap extended). It is very important to realise that loads exceeding the design limit may result in permanent damage to the airframe, such as bending or buckling.

Safety Margin (MS) – Is calculated by dividing the maximum allowable load, by the actual applied load, and then subtracting 1. As long as the MS is greater than zero, the structure should not fail. The size of the MS provides a measure of how much reserve capacity the structure has relative to the applied load. For example if the MS under a certain load was calculated to be 0.1, the load could be increased by 10%. If the MS was 0.01, the load could only be increased by 1% before damage occurred.

Ultimate Limit – The point above which (the designer has calculated) the airframe is likely to fail. Every aircraft design must have an in-built safety margin to avoid structural failure at the design limit load; otherwise flying it would be a very dangerous proposition indeed. Thus, to provide a safety margin, the ultimate limit is normally 1.5 times the design limit load.

MAUW – The maximum weight at which the aircraft is certified to operate, as determined by design calculations, and checked during flight testing by the manufacturer. The MAUW defines the maximum loads (design and ultimate) that the airframe is designed to withstand safely, and for which the Flight Manual procedures are proven.

Load Factor – The load factor is determined by the aircraft's acceleration in the vertical. Load factor is often measured in G and shown on a G-meter. In level flight it is 1.0, where lift equals weight; in a turn or pitch-up manoeuvre, the load factor increases to provide the vertical acceleration necessary to manoeuvre the aircraft. The size of the acceleration force is determined by the speed of the aircraft upon entering the manoeuvre, and how hard the pilot pulls on the control stick. Thus, the pilot is able to keep the load factor under the design limit load by either flying more slowly or using less aggressive control inputs – or both.

Some pilots are in the habit of using electric elevator trim with flap extended to maintain altitude when turning. These trims are powerful and should be used with caution to avoid inadvertently overstressing the aircraft.

VA – The speed above which full or abrupt control movements must not be made. Full control movements at speeds above VA may induce G loads on the aircraft in excess of its design limit load. At light weights the aircraft is quite responsive, and VA may be quite low. As weight is increased, the aircraft's response rate to a given control deflection becomes less (due to its greater inertia), so the speed at which limiting G loads are encountered becomes higher. Therefore VA increases with increasing weight, up to a maximum at MAUW.

A convenient way to think about VA is:

- **above VA = aircraft can be over-controlled.**

VNO – The speed above which the aircraft must be operated in smooth air only. It is denoted by the start of the yellow arc on the ASI. The lift developed by the wings is a function of speed times angle of attack. If a strong upward gust were to be encountered while travelling at high speed, the angle of attack and thus lift would increase suddenly, exceeding the wing's design limit – or even the ultimate limit. To avoid this, the designers set a VNO that provides a margin against gust loadings:

- **above VNO = gusts can damage the airframe.**

Note: Aircraft designed to Federal Aviation Rule (FAR) 23 are required to withstand a vertical gust of about 29 knots. It is possible that stronger gusts could be encountered in mountainous areas of New Zealand **when ferrying to or from a job**, so choose your cruising speed accordingly.

VNE – The never exceed speed. This speed is determined by the designer for various reasons such as drag loads on the primary structure (wings, fin, landing gear), secondary structure (antenna, fairings), or structural instability (flutter, buffet, compressibility effects):

- **above VNE = airframe damage may occur, even in still air.**

Remember that the above limitations have been worked out by the manufacturer and the regulator at aircraft MAUW.

Photo courtesy Dustan & Kinge

Flight Beyond MAUW

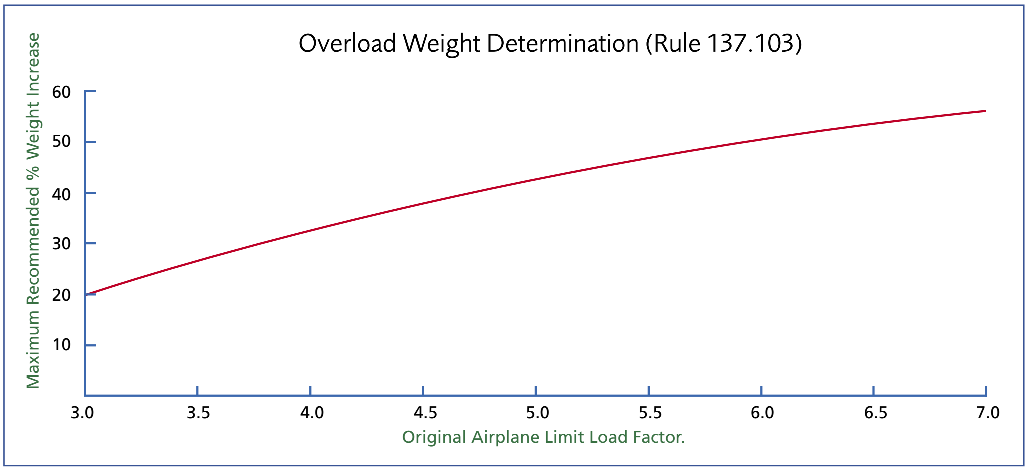
As will be discussed later, Civil Aviation Rules, Part 137 *Agricultural Aircraft Operations*, permits aircraft carrying out agricultural operations to exceed the MAUW under certain circumstances. As the stress experienced by the wings is a function of mass and G-loading, the rule allows the pilot to trade some of the aircraft's G-load capability (design limit load) for useful load carrying potential. The overload weight determination graph (rule 137.103, Appendix B) is based solely on the aircraft's structural strength and does not consider climb performance or takeoff and landing distances. It also does not consider the undercarriage, for which the design limit condition is usually landing at MAUW. Rule 137.103 does, however, require that the pilot take factors like density altitude, airstrip length, slope and head/tailwind components into account and adjust the new takeoff weight accordingly.

So what happens to VA when the design limit load is reduced when operating at weights above MAUW?

VA does not increase, and remains approximately the same as MAUW VA, because the design limit is proportionally reduced.

What happens to V_{NO}?

V_{NO} should decrease as MAUW is exceeded. The more heavily laden aircraft is less able to rise up to an oncoming gust, (less gust alleviation) forcing the wings to take more load. This is a little bit like loading your car with bricks and then driving over a speed hump. Although the ride inside the car may be smoother, the deflection of the tires and shock absorbers will be much greater. For this reason, an aircraft loaded beyond MAUW should not be operated above the MAUW V_A.



Of course with the overloaded weight increase, V_S has increased and consequently the flight envelope is reduced from all sides. A great deal of care is required to handle the aircraft.

Airframe Fatigue

So far we have talked about the importance of operating within the design limit load of the aircraft. Now we must consider the cumulative effects of stress on the airframe during the repeated takeoffs, turns, and pull-ups at the high weights that agricultural operations can involve. The large number of landings, often onto rough and sloping airstrips, also adds to this.

Each one of these manoeuvres can be considered an event which puts a cumulative stress on the airframe. Because the airframe of an agricultural aircraft is made of metal, these stress cycles slowly but surely damage it, and cause it to become fatigued in much the same way that a piece of thin metal does if you repeatedly bend it – eventually it will snap.

The rate at which the airframe fatigues is directly proportional to the number and size of events. For instance, a heavy landing or a sudden pull-up in turbulence at weights above MAUW will accelerate (assuming that the event does not exceed the ultimate load limit) the airframe towards its finite life.

A useful analogy made by Bernie Lewis at the 2003 NZAAA Conference illustrates this. He likened it to placing a pebble in a jar for every stress event. The airframe will fail when the jar becomes full. Most of the pebbles will be small, representing the everyday stresses and strains of operating an agricultural aircraft, but some will be large, signifying an overstress event that has gone unchecked. Each event in itself will not necessarily cause a failure, but will compound to gradually weaken the airframe so that it is more likely to fail, for instance, should the aircraft inadvertently penetrate turbulence.

It is important to remember that, once a stress event has occurred, no matter how well the airframe is treated thereafter, the damage can never be reversed.

The rate at which an airframe will fatigue is influenced by many factors:

- Operating at high weights
- Operating outside the Flight Manual V speeds
- Heavy landings
- Increased ground-air-ground cycle rates
- Operating in a turbulent environment
- Repairs and modifications (unapproved)
- Corrosion and structural degradation

The effects of fatigue can be reduced by:

- Adherence to the Flight Manual MAUW, G limits and V speeds
- Manoeuvring the aircraft conservatively
- Avoiding operations off rough surfaces
- Correct landing technique
- Avoiding flight in heavy turbulence
- Proper maintenance (pilot and engineer vigilance of aircraft condition)
- Awareness of airframe fatigue issues

It is important to remember that the fatigue life of an airframe is finite and that it **will** fail, in time, when repeatedly subjected to cyclic loads. The time to failure is determined by **how** the aircraft is operated. A fatigue event may not affect you at the time, but it could be **catastrophic** for the next pilot who flies the aircraft.

So far there has only been one major in-flight airframe failure in New Zealand attributed to fatigue caused by overloading. This occurred to a DC-3 in 1973, when it crashed from the starboard main plane separating in flight. The cause of the in-flight separation was from the development of wing cracks consistent with overstressing.

Although there has only been one documented accident, this does not mean that there is unlikely to be another one soon; we must not become complacent. As some older aircraft reach the end of their working life, the pilots who fly them are entering untested territory. Since these aircraft were **never** designed or flight tested by the manufacturer at weights **above** MAUW, we can **not** be certain of the time to failure.

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Design Limit Case Studies

The following examples illustrate the relationship between aircraft weight, load factor and the design limit load. By comparing the wing loads associated with a + 1 G level flight and a + 3 G manoeuvre for an aircraft at MAUW (3000 lbs) and 20 percent above MAUW (3600 lbs). For each example, the aircraft has a design limit load of 4500 lbs per wing.

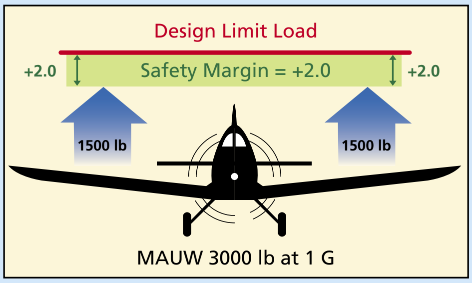
Case 1 illustrates the aircraft at MAUW, flying straight and level with a safety margin of + 2. If the aircraft is then put into a + 3 G manoeuvre, the load on the airframe is still within the design limit (Case 2). However, things become somewhat different when an additional 20 percent of MAUW is added. In Case 3, the extra weight reduces the safety margin to + 1.5, however, no structural problems may occur until the overloaded aircraft is required to perform a + 3 G manoeuvre as in Case 4.

This could be typical of a sudden pull-up at the end of a sowing run to avoid wires, or when a less strenuous manoeuvre is attempted in conjunction with an unexpected gust. At the higher weight, the +1.5 margin of safety when straight and level at +1 G (Case 3) suddenly becomes negative, and the airframe is overstressed (Case 4). The pilot may be unaware that this has happened, and the event could go unreported to the maintenance provider. In the overloaded situation, the aircraft would only be able to be manoeuvred to + 2.5 G. Although the manoeuvre has taken the airframe to its design limit load, it is still safe, albeit just!

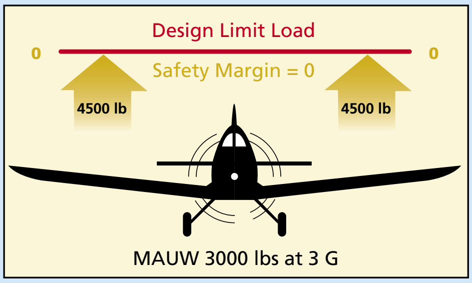
This is a good reason why agricultural aircraft should be fitted with G-meters. The pilot can simply check the maximum reading after a high-G manoeuvre has been flown and report any exceedance to the maintenance provider.

All aircraft are designed to structural limits based on safety margins at weights certified in the Flight Manual. The above examples illustrate how, if you go above those weights, you eat into the safety margins and leave little buffer to allow for unexpected – ie, sudden manoeuvres and/or gusts.

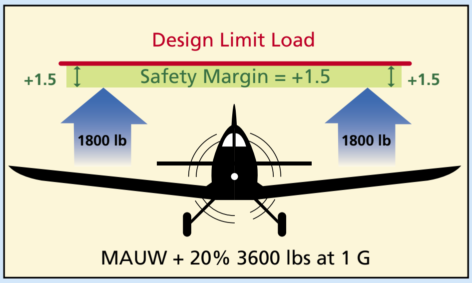
Case 1



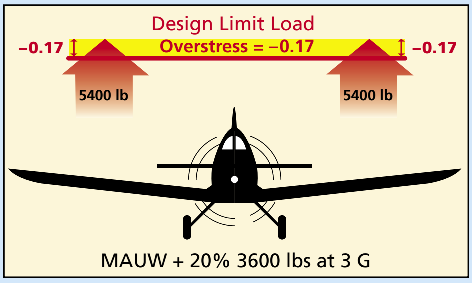
Case 2



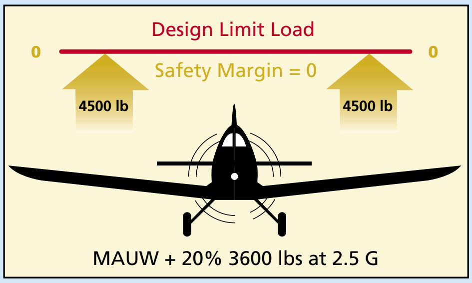
Case 3



Case 4



Case 5



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Undercarriage Failures

There have been approximately 30 reported undercarriage defect or failure incidents on agricultural aircraft over the last seven years – a fairly high failure rate in engineering terms. Many of these have occurred during the takeoff phase from rough airstrips. It is thought that high takeoff weights and poor airstrip surfaces are combining to cause accelerated fatigue of undercarriage components. This is not surprising, as they were never designed to operate off rough surfaces at such high weights. This is yet another reason why it is not a good idea to exceed the manufacturer's MAUW.

Note also that, if the aircraft has to turn to line up with the takeoff path after loading, this can cause an undue side load on the undercarriage and accelerate the fatigue process.

Performance and Handling

So far we have concentrated on the effects of overloading from the point of view of design limit load and airframe or undercarriage fatigue.

An equally critical area that needs to be considered is that of reduced performance and altered handling characteristics. The accident statistics support this. There have been approximately 17 accidents over the last six years where a lack of performance (possibly due to overloading) was identified as a causal factor.

Most pilots will be familiar with the effects of increasing weight up to MAUW on aircraft performance and handling (refer to the *Takeoff and Landing Performance* GAP for generic rules-of-thumb on performance). But perhaps they are less familiar with what happens when the certificated normal category MAUW is exceeded.

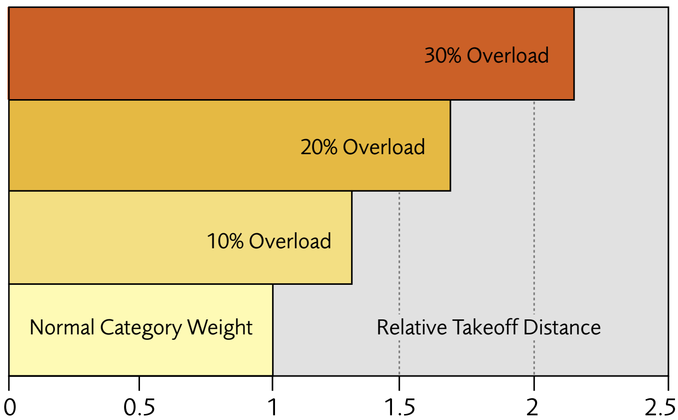
Although based on the FU24-950, the effects of overloading shown below will be similar for other types. The following figures assume a fixed set of conditions, such as density altitude, zero slope, a given surface and nil wind. While they do not necessarily reflect actual agricultural operating conditions, they do effectively illustrate the very significant degradation in performance that comes with increasing weight.

Note: Performance may be significantly worse than the values depicted in the accompanying charts at high density altitudes (ie, temperatures and pressures above and below ISA, especially at high elevations).

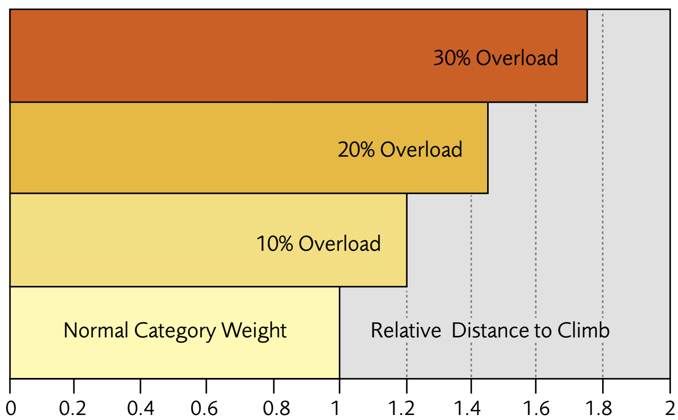
Increased Stall Speed – Stall speed is basically a function of the square root of the aircraft weight ratio when in a specified configuration. It increases as weight is increased, as can be seen from the following typical example:

Weight	Vs (kts)	Increase
Certificated MAUW	55	
10% Overload	58	+6%
20% Overload	60	+10%
30% Overload	63	+14%

Increased Takeoff Distance – The distance required for ground roll to liftoff and accelerate to best climb speed increases dramatically with overloading, as the first bar chart shows.



Reduced Angle/Rate of Climb – The angle and rate at which the aircraft is able to climb are significantly reduced at higher weights. This of course translates into a much greater distance to gain height.



Such large increases in climb distance can make obstacle avoidance in the takeoff flight path difficult, and they certainly limit options when manoeuvring in a confined space, such as a valley. Out-climbing the terrain at the higher weight just may not be an option unless the load is jettisoned.

Increased Turning Radius – The turning radius of an aircraft is a function of its airspeed and angle of bank. Minimum radius is achieved at maximum angle of bank at minimum airspeed. The only problem now is that the stall speed is higher and the design limit load is lower, due to the increased weight. The aircraft must, therefore, be manoeuvred less steeply to remain within the reduced design limit load, and at a higher airspeed to maintain a safe margin above the stall. If the stall margin is preserved and altitude maintained, the turn radius is directly proportional to the weight – so a 20 percent overload will result in a 20 percent greater radius.

For example, the increase in turning radius at 40 degrees angle of bank (assuming altitude is maintained) for an aircraft operating at a 20 percent overload might be another 130 feet or so. This might not sound a lot, but it could be the difference between getting out of a tight situation – or not.

Handling Characteristics – Spin characteristics and pitching moments may change with increasing weight. These will obviously vary considerably between aircraft types – some favourable and some extremely unfavourable. Operating within the manufacturer's Flight Manual weight and balance data gives us the confidence that the aircraft will display normal handling characteristics in this regard. The same can not be said about operating above MAUW.

Note: On some aircraft, the C of G range reduces as weight increases. The rate at which this reduction occurs for weights above MAUW is an unknown.

It is unlikely that the aircraft would have been flight tested for adverse handling above MAUW in a variety of C of G positions; spin recovery will not have been proven. Neither will pitching moments with the application or retraction of flap and/or load dumping. Quite simply, if you operate **above** MAUW you are putting **yourself** in test pilot territory.

Part 137 Overload

CAR rule 137.103 allows the pilot of an agricultural aircraft to exceed the MCTOW prescribed in the Flight Manual by, in some cases, up to 30 percent. This can be done provided that the procedures listed in Appendix B of the rule are complied with, and that the aircraft jettison system is capable of discharging not less than 80 percent of the maximum hopper load within five seconds. The only exception to this overload rule is where a risk to a third party in the takeoff flight path is identified. If a risk is identified, the takeoff weight must be reduced until the takeoff distance available is 1.2 times greater than the takeoff distance required – taking into account factors like density altitude, airstrip slope, headwind component, etc.

Background

Rule 137.103 was originally designed to allow aircraft with a Standard Certificate of Airworthiness to carry larger payloads during agricultural operations. It was accepted that aircraft certificated in this category had extra safety margins built in that were not necessarily applicable to agricultural operations. That is, they would not be carrying fare-paying passengers or be operating over areas where there was a significant risk to third parties. This was in line with the FAA thinking at the time and was reflected in the American Civil Aviation Manual (CAM 8).

The Part 137 rule adopted the structure of CAM 8, which was developed by the Americans to reduce the economic burden on

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agricultural operators and manufacturers. It was developed primarily for crop-dusting operations in the USA, where not only is the terrain flat and sparsely populated, but the weather conditions are generally more predictable. This is a completely different operating environment to the steep and rough airstrips of the New Zealand backcountry. Consequently, the permissible overload allowed by the Appendix B graph should be treated with caution.

Current Concerns

Some agricultural aircraft in New Zealand are being flown in an overloaded condition without reference to revised design limit load figures and performance data. Since they were never flight tested at these higher weights there is no manufacturer's Flight Manual data available for pilots to refer to, meaning that they are 'on their own' when it comes to dealing with any adverse performance and handling characteristics.

The other unknown is the lack of supporting engineering test data that establishes the effects of operating above MAUW on airframe fatigue. We simply don't know how much an airframe's safe life is reduced by, and in this day and age of the smaller agricultural owner/operator, fleet replacement does not tend to happen as often as it once did. Many airframes are likely to accumulate a large number of hours, bringing them closer to their fatigue life. Additionally, any change in airframe component life and maintenance schedules established as a result of the engineering test data should be made available to the operator's maintenance organisation via a Maintenance Manual Supplement. This has not yet happened in New Zealand, and agricultural aircraft are only being maintained to Part 91 standards, as allowed under a Restricted Certificate of Airworthiness.

The CAA and a number of prominent agricultural operators are concerned about this aspect of Part 137 and would like to see the overload allowance reviewed. They believe that this, along with a number of other initiatives, would greatly enhance safety and help to turn the current accident trend around. The CAA, in particular, is conscious of the financial impact that a possible change to the rules would have on operators (bearing in mind that it agreed to the introduction of the overload allowance to assist the industry in the first place). But the CAA strongly believes that reviewing the rules would be in the long-term commercial interests of the industry. Ultimately, this would mean passing the increased cost on to the client, but at least all operators would be doing so from a level playing field.

Safety Vs Profits

"If you think safety is expensive try having an accident".

The realities behind this phrase are very true. Having a major accident can wipe out many years of hard-earned profit and even put a company under. Often we tend to forget that the true financial costs of having an accident are not just those covered by insurance (direct costs such as the aircraft, spray equipment, property damage, etc), but include the indirect costs as well. These are things like lost productive time, increased insurance premiums, possible litigation from a third party, staff training, loss of business and damage to reputation. The indirect costs are generally double or triple the direct costs, but can be substantially more in some cases.

While the profit margins of operating with reduced loads may be less in the short term, we need to be very careful not to lose sight of the fact that it only takes one incident/accident as a result of overloading to destroy a company. When you look at it from this perspective, taking the more conservative approach when it comes to loading does make better long-term economic sense.

Summary

The cumulative effects of overloading and stress on the airframes are unknown, especially when the design limit load remains unchanged. There can be no question that overloading significantly reduces an aircraft's performance and alters its handling characteristics – all factors that reduce the safety margins in what is already a high-risk sector of the aviation industry.

The CAA is reviewing the criteria surrounding the application of the overload rule. The CAA rules set the minimum level of safety. Our advice, however, is to go one step better and set higher company operating standards with respect to what has been discussed in this article. We would like to reiterate that it makes good economic and safety sense to err on the side of caution when it comes to aircraft loading. We appreciate that the agricultural industry is a competitive one, but firmly believe that the long-term benefits of following this advice will far outweigh the short-term increase in operating costs. ■

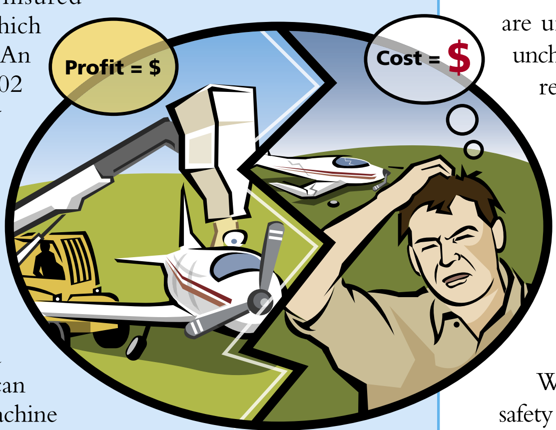
Accident Cost Example

Many people assume that if they suffer a total-loss accident, their insurance will replace their aircraft. Think again! The following is an example of what the owner has to pay.

You purchased a Bell Jetranger in 1992 for $650,000 and insured it for $750,000 (to be safe) at a rate of 6%. You wreck it in 2002 and **you** pay:

The 5% excess	37,500
The balance of your premium (up to)	45,000
You lose your 15% no-claim bonus	6,750
You can expect an increase of 3% when you re-insure	22,500
The old machine had been depreciated for 10 years at 31.3% so it had a book value of $15,222 and you have to pay tax at 33% on the depreciation recovered	209,476
You lose a minimum of two months work in the busy season so loss of profits	70,000
Your Costs	**391,266**

So, out of the $750,000 insured value you get $358,774, which will not buy a Jetranger. An equivalent machine in 2002 costs $1million. If you only had the one machine, your cash flow is shot to pieces, and you may have to repay a loan as well.



If you do not write off the aircraft in the accident, the costs are much higher, as the insurers will pro-rata all the lifed parts, and you can expect to be without the machine for many months.

This formula can be applied to any aircraft.

It takes no account of the cost in human terms.

Winter Anticyclone

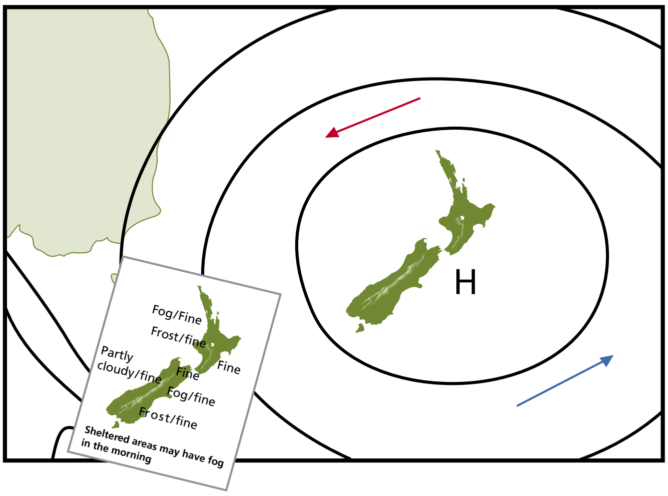
Photo courtesy of Mt Cook Ski Planes.

Flying in winter, over New Zealand's scenic countryside, can be a rewarding experience. Picture a clear crisp day, with unlimited visibility after an early morning frost – or the other extreme, cold miserable wet conditions, with a low cloud base and poor visibility. Interestingly, either condition can occur under the influence of a winter anticyclone.

New Zealand lies in the mid-latitude zone of westerly winds, in the path of an irregular succession of anticyclones which migrate eastwards. These are interrupted by troughs of low pressure, which extend northwards from low pressure depressions moving eastwards to the south of New Zealand. The centres of these anticyclones generally track across the North Island, with more northerly paths being followed in spring, and southerly paths during autumn and winter. Anticyclones generally bring settled weather, with light winds and clear skies, but they also bring frost, radiation fog, and cloud to some areas. Each anticyclone can produce different weather conditions, and will vary in strength, latitude and speed as they migrate eastwards.

Anticyclonic Conditions

High Pressure over New Zealand



When an anticyclone initially moves over the country, relatively clear skies will prevail. Some areas may, however, have stratocumulus cloud. This tends to be on the side of the country on which the large-scale wind flow is directed, with relatively clear skies on the lee side of the mountains. This flow is normally from the west, and usually results in stratocumulus cloud developing along the west coast, while eastern districts have clear skies. As the atmosphere stabilises, and the subsidence inversion (see definitions) lowers below mountain height, the wind flow tends to wrap around the terrain and cloud develops on the lee side. In Canterbury, this can happen after only one day.

Aerodrome Conditions

At night, frosts can be expected at aerodromes throughout inland and southern areas of the South Island, and in sheltered areas of the North Island, especially the central plateau. If the anticyclone remains situated over New Zealand for several days, air temperatures will become progressively colder, and frosts will become more severe in the South Island. Aircraft parked outside at night will receive a layer of frost on all exposed surfaces, which must be removed before flight. A layer of frost can form on aircraft that have been taken out of the hangar in the morning if the air temperature is still below zero degrees Celsius. This is common at inland aerodromes around Central Otago and Canterbury, where the air temperature can be as low as – 10º C in the early morning.

Frost can remain in shaded areas throughout the day. There may be sufficient solar energy to melt the frost, but water can remain on sealed runways when there is insufficient solar energy, or wind energy, to evaporate it. This may refreeze if there is another cold clear night, to form black ice. The thawing and refreezing process can make grass runways very soft and muddy.

Aircraft parked outside during a clear, cold night may receive a layer of frost on exposed surfaces.

Aerodromes situated near moisture sources, and located in confined topography on the lee side of the ranges, are more susceptible to radiation fog and stratus cloud. For example, Hamilton airport can be closed until late morning due to fog. Inland areas of Otago and Canterbury can have fog persisting for days at a time under

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very intense anticyclones (over 1030 hectopascals). Auckland and Dunedin may have fog, but this usually disperses by 10 am. At Christchurch, approximately 50 percent of fog events clear by sunrise, but low lying stratus cloud may persist for the day. Wellington does not usually have radiation fog during winter.

Radiation fog normally occurs during a clear night, or in the early morning after sunrise. The depth of the fog layer varies depending on the availability of moisture, but typically is around 100-200 feet. Radiation fog can thicken after sunrise.

Photo courtesy of Mt Cook Ski Planes.

Radiation Fog clearing at Mount Cook aerodrome.

Dispersal of radiation fog can be a slow process. It can take until late morning for the wind to increase sufficiently to encourage mixing of the drier air above the inversion with the fog below. After the fog has dispersed, a layer of low-lying stratus may remain. The dispersal of the stratus layer is dependent upon wind speed and the amount of energy available from solar radiation.

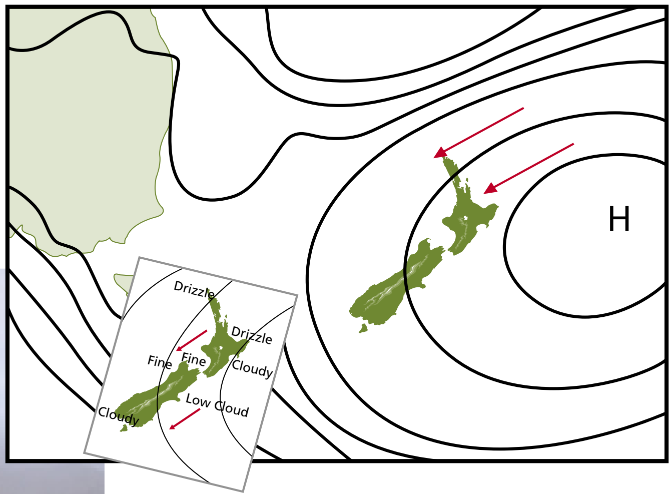
After sunset, runways can become slippery with the onset of frost. Strong inversion layers will begin to form which can, in some areas, result in smog and pollutants becoming trapped and reducing visibility. This is common at Christchurch airport.

In-Flight Conditions

Once fog clears, conditions from late morning until late afternoon will be ideal for flying. After a few days, broken stratocumulus cloud may form along coastal areas, with bases around 2000 feet amsl, with light to moderate turbulence. It may also thicken and spread inland, making VFR flight along coastal areas and the foothills more difficult. If the anticyclone is positioned only over the North Island, then clear skies may prevail north of a line from Nelson to Blenheim. Wanganui and Manawatu, however, may have extensive stratocumulus cloud and possible showers from a light westerly flow. To the south, a westerly flow will develop resulting in stratocumulus cloud forming along the west coast of the South Island. If this flow intensifies, then low cloud and precipitation may occur west of the Main Divide. On the east coast, clear skies will prevail from the fohn wind.

In both situations, sensible flight planning is required. Waiting for fog to clear or frost to melt may delay your flight until late morning. Stratocumulus and stratus cloud may mean a diversion to an alternative aerodrome. During winter, the days are short, and you may only have around four to five hours to achieve your planned flight.

High Pressure to the East of New Zealand



Aerodrome Conditions

When an anticyclone initially moves eastwards, it may cause strong northeasterly airflows over the country. Aerodromes in the far north, the Bay of Plenty and eastern regions of the South Island may have marginal VFR conditions, with low lying stratus and drizzle. Visibility can reduce to 2000 metres, and cloud heights can be 500 to 1000 feet amsl.

If the anticyclone becomes stationary to the east of the country, it may form a 'blocking high'. Lighter northeast flows may prevail, with low-lying stratus cloud, which may persist for days on the east of the South Island. The amount of cloud will, however, depend on the strength of the airflow. If the wind is light, cloud may be limited to coastal areas, with inland and western regions experiencing clear skies. Ironically, fog and low stratus will clear when a front approaches from the west, as this results in air blowing across the Southern Alps. This air descends on the eastern side and dries out. Any cloud it contains will evaporate.

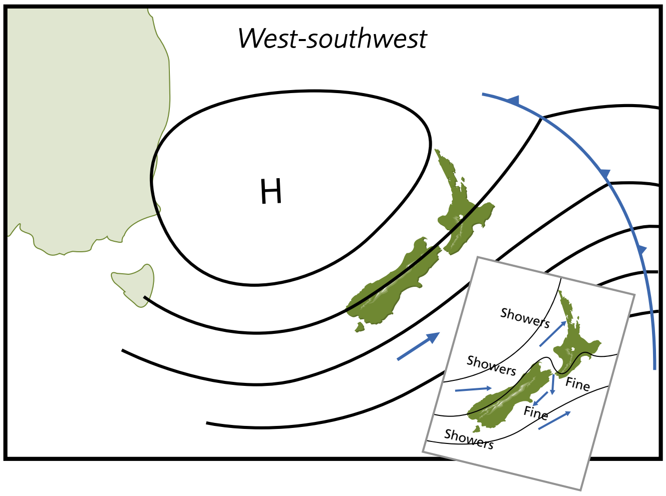
Aerodromes on the western sides of both islands, south of New Plymouth, may experience relatively clear skies. The central areas of Canterbury, Otago and Southland will also have clear skies, but fog may remain in the valleys. At night, frost will occur in sheltered areas.

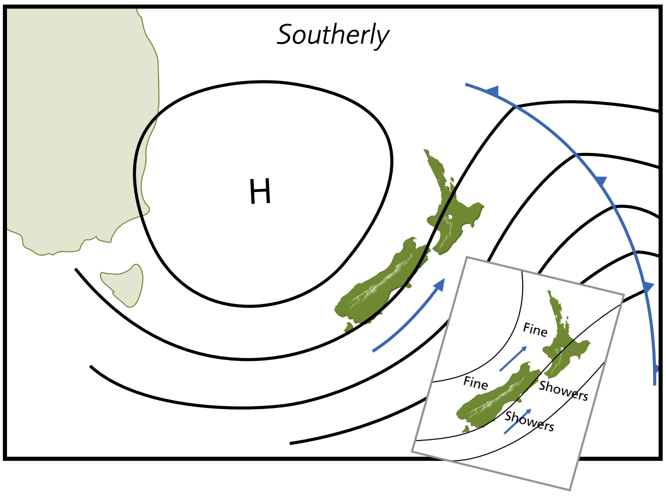
In-Flight Conditions

Aircraft flying VFR, north of a line from New Plymouth to Hastings, may encounter low-lying stratus and nimbostratus cloud. Along the eastern sides of both islands, VFR flight may not be possible with low stratus cloud or fog along the coast. South of New Plymouth to the Kapiti Coast, altostratus cloud may occur, which is not normally a problem for VFR flight. If the northeasterly flow is stronger than 20 knots, conditions may be turbulent in the lee of the mountain ranges.

High Pressure over the Tasman Sea

Cold fronts crossing New Zealand are generally followed by a southwesterly airstream. This is associated with a slow moving anticyclone over the Tasman Sea. The southwesterly airstream is unstable and small shifts in the wind direction can easily swap showers and fine weather between eastern and western districts of New Zealand.





Aerodrome Conditions

If the airflow is west-southwest, then aerodromes on the west, from Fiordland to Northland, will receive showery weather. This may be associated with snow showers down to sea-level. During heavy showers, the visibility may drop below 5 km. Aerodromes on the east, from Gisborne to Otago, will have mostly clear skies.

If the flow is southwest, showers may be confined to Southland, Manawatu, Taranaki and the far north, with fine weather elsewhere. This situation can easily change if the wind backs to a south-southwest flow, which will bring showers to the east from Southland to Gisborne. These areas may have cloud bases below 500 feet agl and visibility below 5 km. Aerodromes in western districts will have mostly clear skies.

As the high pressure system tracks eastward toward New Zealand, the southwest flow weakens in intensity. The air gradually becomes more stable, and therefore, more resistant to upward motion. This can force the southwest airflow to split into two streams that flow around the Southern Alps. This usually brings low stratus and drizzle to the eastern coasts of New Zealand as far north as Gisborne. The split airflow may also converge around the upper South Island and bring low stratus cloud through Cook Strait, and the lower North Island.

In-Flight Conditions

Flying VFR in a southwesterly airflow can be difficult. The weather is very changeable, and can vary greatly from one area to another. Turbulent conditions are typical when flying on the eastern sides of both islands. Along the western side of the South Island, VFR flight is possible away from showers. These conditions can quickly reverse if the flow backs to a southerly.

Depending on the rate of progress of the anticyclone, unstable conditions will remain for a few days until the centre of the anticyclone settles over the country. The showers and the cold southerly winds will then move to the east of New Zealand.

Summary

A winter anticyclone may bring ideal flying conditions to some areas but rarely to all of the country at the same time. Some regions will have frost and the formation of radiation fog at night. Other regions will have stratocumulus cloud. This tends to be on the side of the country to which the wind flow is directed.

For anticyclones positioned directly over New Zealand, the west coast of the South Island may be cloudy, while the eastern coasts remain clear.

If a 'blocking high' develops to the east of New Zealand, the northeasterly airflow may bring stratus and nimbostratus cloud to the far north of the North Island and eastern districts of the South Island. The amount of cloud will, however, depend on the strength of the airflow. If the wind is light, cloud may be limited to coastal areas, with inland and western regions experiencing clear skies.

If the anticyclone is to the west, a disturbed southwesterly airflow will bring changeable conditions over the country. Western districts will experience showers, and clearer skies will prevail on the east. This situation can, however, be reversed if the wind backs to the south. ■

Definitions

Inversion layer – air temperature increases with height, within a layer of air. This differs from the normal situation where the temperature decreases with height.

Subsidence inversion – an increase in temperature with height, within a layer of air, produced by the adiabatic warming of a layer of subsiding air under an anticyclone.

Fohn wind – refers to a warm, dry wind blowing on the leeward side of a mountain range. Commonly known as the nor'wester in New Zealand.

Radiation fog – a common type of fog, produced over a land area when radiation cooling reduces the air temperature to or below its dewpoint. Factors favouring the formation of radiation fog are a shallow surface layer of relatively moist air beneath a dry layer and clear skies, and light surface winds.

ELT Maintenance Correction

In our previous issue, *Vector* May/June 2004, page 13, we gave some erroneous advice regarding maintenance of ELTs. We referred to a "500-hour or six-monthly" inspection. This was wrong. Rule 91.615 *Emergency locator transmitter tests and inspections* requires only a check period of 12 months, the check to be carried out in accordance with Part 43 Appendix F. So long as it complies with rule 91.615, taking heed of the manufacturer's instructions is good advice.

Cellphones in Flight

The Incident

The Piper PA-31-350 Navajo Chieftain was on an air transport charter flight from Palmerston North to Christchurch with one pilot and nine passengers on board. At 1907 NZST, while on an instrument approach to Christchurch Aerodrome at night in instrument meteorological conditions (IMC), the aircraft descended below minimum altitude, in a position where reduced visibility prevented runway or approach lights from being seen. The aircraft collided with trees and terrain 1.2 nautical miles short of the runway. The pilot and seven passengers were killed and two passengers received serious injury. The aircraft was destroyed.

In its report, the Transport Accident Investigation Commission (TAIC) found that the accident probably resulted from the pilot becoming distracted from monitoring his altitude at a critical stage of the approach. The possibility of pilot incapacitation was considered unlikely, but could not be ruled out.

Cellphone Use on the Flight

Cellphones carried on the aircraft by passengers and the pilot were recovered by TAIC investigators. Investigation revealed that a number of calls to and from these cellphones were made during the flight. The only call that was made during the time of the Instrument Landing System (ILS) approach was from the pilot's cellphone to his home.

Telephones installed on aircraft are not considered PEDs. If a cellphone uses an antenna attached to the aircraft, it is considered part of the aircraft and is tested for interference with other systems.

One of the surviving passengers remembered seeing the pilot use his cellphone fairly late on the flight, listening to it by pushing one earphone from his ear.

The call made from the pilot's cellphone to his home was not answered but was connected instead to his voicemail. The pilot's partner listened to the first minute of it shortly afterwards and heard only the steady noise of aircraft engines. She deleted the recording without listening further. She reported that a similar previous call had resulted from an unintended speed dial selection while the pilot was flying. If the pilot's call was inadvertent, then it should not have posed a distraction. It could, however, have produced some electronic interference to the glideslope indication. If intentional, then this cellphone call would have caused him a high workload, and possibly overload and distraction.

The Rules

New Zealand Civil Aviation Rules, rule 91.7 (a) states:

"No person may operate, nor may any operator or pilot-in-command of an aircraft allow the operation of, any cell phone or other portable electronic device that is designed to transmit electromagnetic energy, on any aircraft while that aircraft is operating under IFR."

The operations of the company involved in the accident were commonly conducted under VFR, where electronic interference is not critical to the safety of flight. On VFR flights, cellphones and other portable electronic devices (PEDs) may be used provided the pilot-in-command agrees.

When a mix of VFR and IFR operations are undertaken, it is important that pilots discriminate between the two. Not only must passengers be briefed on the use of PEDs in flight, but also the use of cellphones by pilots must be appropriate and in accordance with Civil Aviation Rule 91.7 (a). The TAIC report stated that it may have become habitual for the pilot of the accident aircraft to permit cellphone use without discriminating between VFR and IFR.

Avionics and Cellphone Interference

The use of cellphones on board aircraft has been identified from numerous overseas occurrence reports, as a cause of random interference to the proper functioning of aircraft avionics, such as navigation equipment and autopilots (see also *Vector/CAA News* May/June 2001).

Research by the United Kingdom CAA has shown that signals from cellphones can reflect inside metallic surfaces in the aircraft. This can reinforce their signal, allowing them to interfere with aircraft instruments. Even in standby mode, cellphones can affect electronic instruments, as they periodically transmit to register and de-register with the cellular network and to maintain contact with a base station. As an aircraft increases its distance from a base station, the output power setting of the cellphone increases, which in turn increases the risk of interference with avionic equipment. Additionally, the closer a cellphone is to the aircraft avionic equipment or its associated wiring, the greater the potential for interference.

In October 2002, the United Kingdom CAA conducted a series of laboratory tests, which exposed general aviation avionic equipment to simulated cellphone transmissions. A VHF radio, a VOR/ILS receiver with horizontal situation indicator and secondary indicators, and a remote gyro compass system were used. At high signal levels, similar to those attainable from a cellphone 30 cm from the equipment or its wiring, anomalies were produced on all equipment readings except the glide slope indication. These tests confirmed onboard cell phones as an interference source, and they endorsed current UK legislation restricting their use on aircraft. (Reference CAA (UK) Paper 2003/4 Effects of Interference from Cellular Telephones on Aircraft Avionic Equipment.)

Summary

The risk of serious consequences resulting from interference caused by cellphones and other PEDs is possibly small, **but it is still very real**. It is vital that pilots protect the environment in which they work and subject their passengers to. They must ensure that cellphones are always switched off on IFR flights, and it is recommended that they also be turned off during critical stages of VFR flights.

The passenger briefing, therefore, is a good time to advise passengers to switch off all cellphones and to advise them on appropriate use of other PEDs. This information should also be available on passenger briefing cards. Reasons for not using cellphones should be given, because passengers will then be more likely to comply and they might also spread the word to others. ■

Two New Posters

Safety on the Apron

The apron is a busy place, and this poster depicts some of the more common hazards that personnel working there must be aware of and contend with.

Available in both A4 and A2 sizes, this poster should be displayed on doors leading airside, and in crew rooms, staff notice boards, etc.

NO Dangerous Goods on aircraft

This poster is available in A3 and A2 sizes and is intended to remind cargo handlers of the many substances that can be dangerous when carried on board aircraft.

Posters will be distributed to appropriate organisations. Further copies can be obtained by contacting your local Field Safety Adviser (see the advertisement in this issue for their contact details) or the Communications and Safety Education Unit.

Tel: **0–4–560 9400** Email: **publications@caa.govt.nz**

Aviation Safety Coordinator Training Courses

Attention all aviation organisations

Three Aviation Safety Coordinator (ASC) training courses are planned for September and October 2004. These two-day courses will be held in Rotorua 6 and 7 September, Palmerston North 13 and 14 September, and Queenstown 11 and 12 October (see details below).

An Aviation Safety Coordinator runs the safety programme in an organisation. Your organisation should have a properly administered and active safety programme.

If you are involved in commuter services, general aviation scenic operations, flight training, or sport aviation, this course is relevant for your organisation. You may have had an ASC trained in the past who is now due for a refresher, or personnel changes may mean a new person should be trained. As well as the course content, you will receive a comprehensive manual, which you could adapt to suit your operation.

There is no course fee. The cost of meals (except lunch), accommodation and transport is your responsibility.

Check the CAA web site www.caa.govt.nz, in early August for an enrolment form and further information. This can be found by selecting "Safety Information – Seminars and Courses". Alternatively you can receive an enrolment form by contacting Rose Wood, Tel: 0–4–560 9487, Fax: 0–4–569 2024, Email: woodr@caa.govt.nz.

ASC Course Venues

Rotorua – Mon 6 and Tue 7 September
Ventura Inn & Suites Rotorua, Cnr Fenton & Victoria Streets

Palmerston North – Mon 13 and Tue 14 September
Bentleys Motor Inn, Cnr Linton & Chaytor Streets

Queenstown – Mon 11 and Tue 12 October
Copthorne Hotel & Resort Queenstown Lakefront, Cnr Frankton & Adelaide Streets

Letters to the Editor

Readers are invited to write to the Editor, commenting on articles appearing in *Vector*, recommending topics of interest for discussion, or drawing attention to any matters in general relating to air safety.

V_1 Decision Speed

I note in the latest *Vector* [May/June 2004] your discussion on engine failures on takeoff.

In the closing section [of the article "Even Worse than the Real Thing"] on page 7 you have included some definitions – one of which is V_1. You define that as a Decision Speed. This is a common misconception and is in error. You are not alone in this misconception and I am the first to concede that, over the last four decades or so, there have been a number of refinements and clarifications to the definition, and these have been the source of some confusion. However, the latest definitions are now quite clear and unequivocal.

The fact is that, at V_1, the decision to stop or go has already been made. If the decision is to stop, then the brakes must already be on at V_1 to stop in the required distance in a balanced field.[*] To make the decision to stop at V_1 means that (depending on reaction time) the aircraft is already much faster than V_1 when the braking action commences, and of course in this case, a rejected takeoff will not be successful (again this applies to a balanced field).

I am including the Air New Zealand flight crew training manual reference material on the subject for your information. This material is largely drawn from the Boeing Takeoff Safety Symposium held in early 1991 and is now part of the Air New Zealand official training reference manual.

Riley Bell
Hibiscus Coast
May 2004

Vector Comment

Thank you for your letter on the definition of V_1. We submitted it to the CAA Airline Standards Unit for comment and they agree with you.

The definition of V_1 referred to by Riley Bell in the Air New Zealand flight crew training manual is as follows, and consists of two separate concepts:

"First, with respect to the 'No Go' criteria, V_1 is the maximum speed at which the rejected takeoff manoeuvre can be initiated and the airplane stopped within the remaining field length under the conditions and procedures defined in the FARs. It is the latest point in the takeoff roll where a stop can be initiated.

"Second, with respect to the 'Go' criteria, V_1 is also the earliest point from which an engine-out takeoff can be continued and the airplane attain a height of 35 feet at the end of the runway."

*The Federal Aviation Rules, FAR Part 25 specifies a critical engine-failure speed, V_1. Below this speed, the pilot should abort and bring the plane to a stop if an engine fails. If the engine fails after the aircraft has exceeded V_1, they should continue the takeoff using the remaining engines. The critical engine speed, therefore, defines the point on the runway at which the distance needed to stop is exactly the same as that required to reach takeoff speed.

Defect Occurrences Now on CAA Web

Readers who have access to the internet are advised that, in similar fashion to the now well-established "Accident Briefs", we can now offer published "Defects". (Select "Accidents & incidents – Defects")

The defects to be published are limited to those involving aircraft with an MCTOW of 9000 lb (4082 kg) or less. The data used is for all defect occurrences which have occurred since 1 January 2002.

CAA, however, reserves the right to withhold some reports from publication. For example, reports in which:

- There is insufficient information to make a coherent report.
- Confidentiality may be breached (when confidentiality is important).

The reason for withholding on the grounds of confidentiality is that, in addition to the CAA's obligations under the Privacy Act 1993, we are concerned that publishing may discourage reporting and investigation of defects. That would be counterproductive. On the other hand, large numbers of aviation persons – mostly LAMEs – have reported freely for many years now, and many of these reports have been published in *Vector* and its predecessors. Moreover, when we ceased publishing defects a few years back (because of resource prioritising), we were urged most strongly by the industry to re-start. We did so after a hiatus of a year or so.

Nevertheless, each defect is de-identified so that neither the reporter nor the operator is obvious.

The Defect Briefs system has the facility to filter and sort the entries:

Filtering can be by Manufacturer/Model, or by ATA Chapter, and part searches are possible.

For example, "172" will return any manufacturer or model name with "172" in it.

For ATA Chapter, leading characters are entered, eg, "6" will return entries between 6000 and 6999, and "64" will return 6400 to 6499.

Finally, the search results can be sorted in order of Date-time, or Aircraft Model, or ATA Code.

For maximum safety benefit – keep reporting. Every occurrence counts!

Beware of Winch-launched Gliders

This contributed item highlights the particular dangers for transiting aircraft at Drury airfield, but, as the writer points out, a similar situation could exist at other glider launch sites around the country.

After having a near-miss with a light aircraft earlier this year, while being winch-launched in a glider at Drury airfield in South Auckland, I would like to remind transiting pilots – especially those arriving from, or departing to the south from Ardmore aerodrome – about the dangers of overflying Drury airfield.

The safest option is to **avoid** overflying Drury airfield. This airfield is located 1.5 NM east of the Drury visual reporting point at the base of the Drury hills and is obvious, because it is the largest paddock in the area. Drury airfield, and its associated danger area, is clearly marked on the VNC.

A winch-launch involves a glider going from ground level up to 2000 feet in less than a minute. While the glider is being launched, the pilot has no forward view because of the very high nose attitude. Gliders can also be very difficult for other pilots to see because of their small frontal area. Then, there is the danger of colliding with the winch cable, which could end up wrapped around a wing. There has been a fatal accident in the United Kingdom where a winch cable was caught around an aircraft wing.

Winch-launching can occur on any day of the week. I think it is significant that my incident occurred on a Monday, when the gliding club doesn't usually operate.

A big thank you to the majority of transiting pilots who do avoid the area around Drury airfield. Pilots who don't, risk flying through a group of gliders while travelling at 100 plus knots – this will not win you any friends with the Auckland Gliding Club members.

Please be aware that many other gliding clubs around New Zealand also use winch launching. ■

Vector Comment

This near miss experience is a timely reminder to all pilots transiting this area, that they should avoid overflying the airfield. If you must overfly the field for any reason, then **don't fly below 2500 feet**. A sharp lookout is essential, and landing/anti-collision lights should be switched on. **Remember** – you must give way to gliders, and to tow-planes with gliders on tow.

We advise careful planning before arriving at or departing from Ardmore Aerodrome. Make sure that you follow the preferred VFR Arrival/Departure Routes as depicted in *AIP New Zealand Vol 4*. The recent GAP booklet, *In, Out and Around Auckland* will also assist.

Accident Notification

24-hour 7-day toll-free telephone

0508 ACCIDENT
(0508 222 433)

CA Act requires notification "as soon as practicable".

Aviation Safety Concerns

A monitored toll-free telephone system during normal office hours.
A voice mail message service outside office hours.

0508 4 SAFETY
(0508 472 338)

For all aviation-related safety concerns

Field Safety Advisers

Don Waters
(North Island, north of line, and including, New Plymouth-Taupo-East Cape)
Tel: 0–7–823 7471
Fax: 0–7–823 7481
Mobile: 027–485 2096
e-mail: watersd@caa.govt.nz

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OCCURRENCE BRIEFS

Lessons for Safer Aviation

The content of *Occurrence Briefs* comprises notified aircraft accidents, GA defect incidents, and sometimes selected foreign occurrences, which we believe will most benefit operators and engineers. Individual Accident Briefs, and GA Defect Incidents are now available on CAA's web site www.caa.govt.nz. Accident briefs on the web comprise those for accidents that have been investigated since 1 January 1996 and have been published in *Occurrence Briefs*, plus any that have been recently released on the web but not yet published. Defects on the web comprise most of those that have been investigated since 1 January 2002, including all that have been published in *Occurrence Briefs*.

Accidents

The pilot-in-command of an aircraft involved in an accident is required by the Civil Aviation Act to notify the Civil Aviation Authority "as soon as practicable", unless prevented by injury, in which case responsibility falls on the aircraft operator. The CAA has a dedicated telephone number 0508 ACCIDENT (0508 222 433) for this purpose. Follow-up details of accidents should normally be submitted on Form CAA 005 to the CAA Safety Investigation Unit.

Some accidents are investigated by the Transport Accident Investigation Commission, and it is the CAA's responsibility to notify TAIC of all accidents. The reports that follow are the results of either CAA or TAIC investigations. Full TAIC accident reports are available on the TAIC web site www.taic.org.nz.

ZK-EOE, NZ Aerospace FU24-950M, 24 Jul 02 at 14:50, 3 km SW Thames Ad. 1 POB, injuries 1 fatal, aircraft destroyed. Nature of flight, agricultural. Pilot CAA licence CPL (Aeroplane), age 27 yrs, flying hours 2016 total, 1522 on type, 21 in last 90 days.

The Walter Fletcher was completing a spraying run of a paddock when the right wing struck a protruding branch and part of the aileron was torn off. Further collisions occurred as the aircraft progressed along the tree line. The aircraft rolled and impacted the ground inverted. The pilot did not survive. Fatal accident report published on the CAA web site.

Main sources of information: CAA field investigation.

CAA Occurrence Ref 02/2248

ZK-CMC, Rans S-6ES Coyote II, 17 Jun 03 at 17:00, Loburn. 2 POB, injuries 2 fatal, damage substantial. Nature of flight, private other. Pilot CAA licence nil, age 22 yrs, flying hours 77 total, 39 on type, 20 in last 90 days.

The microlight aircraft was seen to enter a spin at low level from which it did not recover. Investigation revealed that the pilot may have decided to carry out an engine-off forced landing practice. He was taking prescription medication to treat depression. This medication and the depression, which were not declared, can cause cognitive and motor impairment. A full accident report is available on the CAA web site.

Main sources of information: CAA field investigation.

CAA Occurrence Ref 03/1768

ZK-EGW, NZ Aerospace FU24-950, 1 Nov 03 at 08:55, Kirikopone. 1 POB, injuries nil, damage minor. Nature of flight, agricultural. Pilot CAA licence CPL (Aeroplane), age 49 yrs, flying hours 10838 total, 5800 on type, 152 in last 90 days.

The pilot landed the aircraft with a tailwind well into the strip, the long grass surface of which was affected by dew. The pilot ran the aircraft off the side of the strip to avoid the loading truck, causing damage to the tailplane.

Main sources of information: Accident details submitted by pilot and operator.

CAA Occurrence Ref 03/3286

ZK-JLU, NZ Aerospace FU24-950, 11 Nov 03 at 15:00, Hinakura. 1 POB, injuries nil, damage substantial. Nature of flight, agricultural. Pilot CAA licence CPL (Aeroplane), age 39 yrs, flying hours 5472 total, 335 on type, 109 in last 90 days.

Just before touchdown the aircraft experienced a downdraught and struck the airstrip hard. It bounced approximately 60 metres before touching the ground again, when the nosewheel collapsed and folded back, and the aircraft slid a further 60 metres up the airstrip on its propeller.

Main sources of information: Accident details submitted by operator.

CAA Occurrence Ref 03/3205

ZK-GGD, Schleicher ASW 15, 5 Dec 03 at 14:00, Matamata. 1 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence nil, age not known, flying hours 450 total, 220 on type, 36 in last 90 days.

While participating in a glider competition flight, the pilot experienced reduced lift conditions, which required a landing away from the airfield. On final approach the pilot observed a subdividing fence obstructing the selected landing area. He retracted the airbrakes and avoided the fence, but this put the glider at a higher than required airspeed to stop in the remaining landing distance available. The pilot then dropped a wing to initiate a groundloop, which resulted in the separation of the landing skid and rudder.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 03/3540

ZK-HHX, Hughes 369D, 25 Jan 04 at 16:00, Ruahine Corner. 4 POB, injuries nil, damage minor. Nature of flight, transport passenger A to B. Pilot CAA licence PPL (Helicopter), age 25 yrs, flying hours not known.

It was reported that the helicopter landed in a clearing in the Ruahine Ranges to drop off hunters. While the aircraft was being positioned, the tail rotor made contact with some bushes.

Main sources of information: Accident details submitted by pilot and operator.

CAA Occurrence Ref 04/221

ZK-RCQ, Parsons/Reid GHR-T, 27 Jan 04 at 13:05, Stratford. 1 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence nil, age 50 yrs, flying hours 126 total, 16 on type, 13 in last 90 days.

The pilot reported that on takeoff from a paddock, the left wheel of the gyrocopter went into a depression, and the resulting damage caused the aircraft to fall onto its side and the main rotors to strike the ground.

Main sources of information: Accident details submitted by pilot and operator.

CAA Occurrence Ref 04/253

ZK-CSU, Cessna 172K, 4 Mar 04 at 15:45, Hinds. 1 POB, injuries nil, damage minor. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 63 yrs, flying hours 486 total, 165 on type, 11 in last 90 days.

After landing on a dairy lane (cattle race) the aircraft's right wing struck a windsock. This swung the aircraft through 90 degrees, and the left wing impacted a fence post, causing minor damage.

Main sources of information: Accident details submitted by pilot, RCC.

CAA Occurrence Ref 04/868

ZK-VID, Avid Flyer Aerobat, 13 Mar 04 at 10:15, Alexandra. 2 POB, injuries nil, damage not known. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 47 yrs, flying hours 478 total, 210 on type, 9 in last 90 days.

The microlight aircraft suffered a ground loop on takeoff. The pilot reported that he had little experience in taildragger aircraft on sealed runways. He will undertake further specific training.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 04/887

N6108W, Cessna P210N, 22 Mar 04 at 13:10, Rangiora. 2 POB, injuries nil, damage substantial. Nature of flight, training dual. Pilot CAA licence PPL (Aeroplane), age 66 yrs, flying hours 16850 total, 100 on type, 130 in last 90 days.

The aircraft was carrying out touch-and-go circuit training when the instructor decided to demonstrate a circuit to the student. Control was handed over to the instructor during the crosswind leg. At the handover, the student also raised the gear. The instructor did not realise this, and he also failed to check three greens on finals. The aircraft landed wheels-up. The propeller was substantially damaged, and the fuselage received minor skin damage.

Main sources of information: Accident details submitted by pilot plus further enquiries by CAA.

CAA Occurrence Ref 04/960

ZK-JJA, North American Harvard 2A*, 27 Mar 04 at 16:10, Whangarei. 1 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence ATPL (Aeroplane), age 57 yrs, flying hours 16012 total, 468 on type, 7 in last 90 days.

The Harvard groundlooped on landing, damaging the gear and wing tip. The aircraft was towed off the runway.

Main sources of information: Accident details submitted by pilot and operator.

CAA Occurrence Ref 04/1039

GA Defect Incidents

The reports and recommendations which follow are based on details submitted mainly by Licensed Aircraft Maintenance Engineers on behalf of operators, in accordance with Civil Aviation Rule, Part 12 *Accidents, Incidents, and Statistics*. They relate only to aircraft of maximum certificated takeoff weight of 9000 lb or less. These and more reports are available on the CAA web site www.caa.govt.nz. Details of defects should normally be submitted on Form CAA 005 to the CAA Safety Investigation Unit.

The CAA Occurrence Number at the end of each report should be quoted in any enquiries.

Key to abbreviations:

AD = Airworthiness Directive	**TIS** = time in service
NDT = non-destructive testing	**TSI** = time since installation
P/N = part number	**TSO** = time since overhaul
SB = Service Bulletin	**TTIS** = total time in service

Aerospatiale AS 350B
TL100AXE 9L MRXMSN Cowl Latch

During flight there was a noticeable yaw to the right, but there was no further effect. The flight proceeded to the predetermined landing point. On arrival the aircraft was inspected, and the righthand transmission cowling was found to be missing.

A main rotor transmission cowl latch failure was determined to have allowed the cowl to move into the airflow and depart the aircraft. A previous manufacturer's letter was issued in 1999 to highlight the failure of titanium hooks and recommended particular attention be given to these after each flight inspection. TTIS 142 hours.

ATA 5350 CAA Occurrence Ref 03/943

Aerospatiale AS 350B
SAFT Model 1606-1 J1264 Battery

It was reported that during flight an unusual smell occurred, with no warning lights indicating a problem. Upon landing, smoke was observed to be coming from the tail boom. Upon inspection the battery was found boiling. The temperature indicator was suspected to be not functioning properly, but it could not be faulted. A new battery was fitted, and there have been no reported problems since.

ATA 2400 CAA Occurrence Ref 04/505

Bell 206B
Pressure Hose

The pilot noticed a hot oil smell and was about to land at the loading site when the hydraulics failed, causing him difficulty in controlling the helicopter. Hydraulic pressure was momentarily regained, enabling the pilot to level out and perform a safe landing. Engineering investigation revealed a chafed braided hydraulic pressure hose from the pump to the filter housing. An incorrect size pipe clamp had been fitted, allowing movement and chafing of the pressure hose.

ATA 2910 CAA Occurrence Ref 03/1185

Britten-Norman BN2A-26
Throttle input arm P/N 12-B56

To commence a descent the pilot reduced the throttles to set a manifold pressure of about 12 inches. The left engine responded normally, but the right engine stayed at about 18 inches, even when the pilot applied carburettor heat, closed the right throttle, and set the propeller lever to full fine. Repeated throttle and pitch lever movements failed to control the engine. The pilot flew the approach using reduced power on the left engine and landed successfully. Investigation found that the carburettor throttle input arm had worn excessively. A new throttle arm was fitted and a new sleeve fitted to the arm. The carburettor was replaced as a precaution.

ATA 7610 CAA Occurrence Ref 03/2462

Cessna 172N
Cessna 172N Roller P/N 0523920

Pilot reported a loud noise in flight. Inspection found the righthand flap buckled in the middle. Further investigation found the inboard rear roller with a piece broken out, possibly due to fatigue or a material fault. The fractured edge had locked into the flap track, causing a jam. The buckling of the flap was due to extra loading from the activation of the flap motor. TSI 33.03 hours, TTIS 5056.95 hours.

ATA 2700 CAA Occurrence Ref 03/3459

Cessna 172P
Cessna front spar P/N 0532001-98/23

It was reported that both tailplane spar and an associated doubler were found to be cracked in the centre lightening hole at the 4 and 10 o'clock position (both cracks were approximately 2 inches long). Both items were replaced. TTIS 6885 hours.

ATA 5510 CAA Occurrence Ref 04/758

Cessna 172P
Slick LH magneto P/N 4371

The pilot reported the LH magneto not operating. It was found that the rotor drive shaft had been bent and was cracked enough to disengage the magneto drive gear from the idler gear. The engineer found evidence of a partial seizure between the magneto poles. The engine rear cover was removed, the gear train inspected and repaired, and a new magneto fitted. The overhaul organisation considered the cause of failure to be lack of the bearing lubrication recommended by the manufacturer at 500-hour intervals. TTIS 925 hours.

ATA 8500 CAA Occurrence Ref 03/3807

Cessna 182P
Cessna Dorsal fin base and ribs P/N 1231049-1

During an unscheduled removal of the vertical stabiliser assembly, severe corrosion was found in the dorsal area, forward of the fin front spar. All corroded parts were replaced. The new parts were treated and primed, and a corrosion preventative compound applied. TTIS 1700 hours.

ATA 5500 CAA Occurrence Ref 03/3637

Diamond DA20-C1
Slick-Unison Continental 4310/36066 magneto P/N 36066

The operator reported that during cruise flight engine oil pressure decreased into the red range. The aircraft diverted back to Ardmore for a precautionary landing. Engineering inspection found the lefthand magneto drive shaft had sheared and had deposited metal particles into the oil pump. A fleet inspection was carried out, and missing/cracked magneto gear teeth were found in four other aircraft. As a consequence an AD has been issued, DCA/CON/185. TTIS 335.2 hours.

ATA 7430 CAA Occurrence Ref 03/2192

Gippsland GA200C
Gippsland Aeronautics GA-200-C Shock absorber assy P/N 321004-1

The pilot heard a loud bang from the undercarriage during the takeoff roll. Investigation revealed the bungee assembly in the suspension had failed from the support lug breaking. The wire cable back-up cords also broke. These lugs are difficult to inspect for cracks, due to the bungee assembly being wrapped over the top. TTIS 200 hours.

ATA 3200 CAA Occurrence Ref 04/757

Piper PA-31
#3 Cylinder

The engine failed in flight. The failure was caused by 5 of the 8 base studs on number 3 cylinder coming loose and allowing sufficient play in the cylinder to fracture its fuel injector line. All 8 studs and the fuel injector line were replaced, and the other cylinder studs were checked for tightness.

ATA 8530 CAA Occurrence Ref 02/3268

Piper PA-34-220T
Gear Selector Knob

After takeoff, the pilot selected 'gear up'; at this point the gear position selector knob came off in the pilot's hand. The pilot wedged a key into the selector to select 'gear down' and landed the aircraft. The investigation revealed that the selector knob had apparently been bent to one side, and subsequent straightening had weakening the arm of the selector.

ATA 3230 CAA Occurrence Ref 03/2621

Robinson R22 Beta
Battery Lead

The radios and all of the aircraft's electrical instruments failed during flight. After making a precautionary landing, the pilot discovered that the lead between the solenoid and the battery had failed at the terminal. The failure appeared to have been caused by corrosion and fatigue. Battery leads are now replaced at each overhaul with a longer lead, which is positioned to reduce the chance of failure due to fatigue. As the investigation revealed that failure of this lead was not an isolated event, extra scrutiny is warranted, during maintenance, to verify the condition of these leads.

ATA 2400 CAA Occurrence Ref 03/1114


Get ready to
switch OFF
Leaving your phone ON can interfere with flight systems – even if you're not using it.
Switch your phone OFF when instructed by the ground crew or aircraft crew.
Please keep your phone with you, not in your luggage.
CAA
CIVIL AVIATION AUTHORITY OF NEW ZEALAND