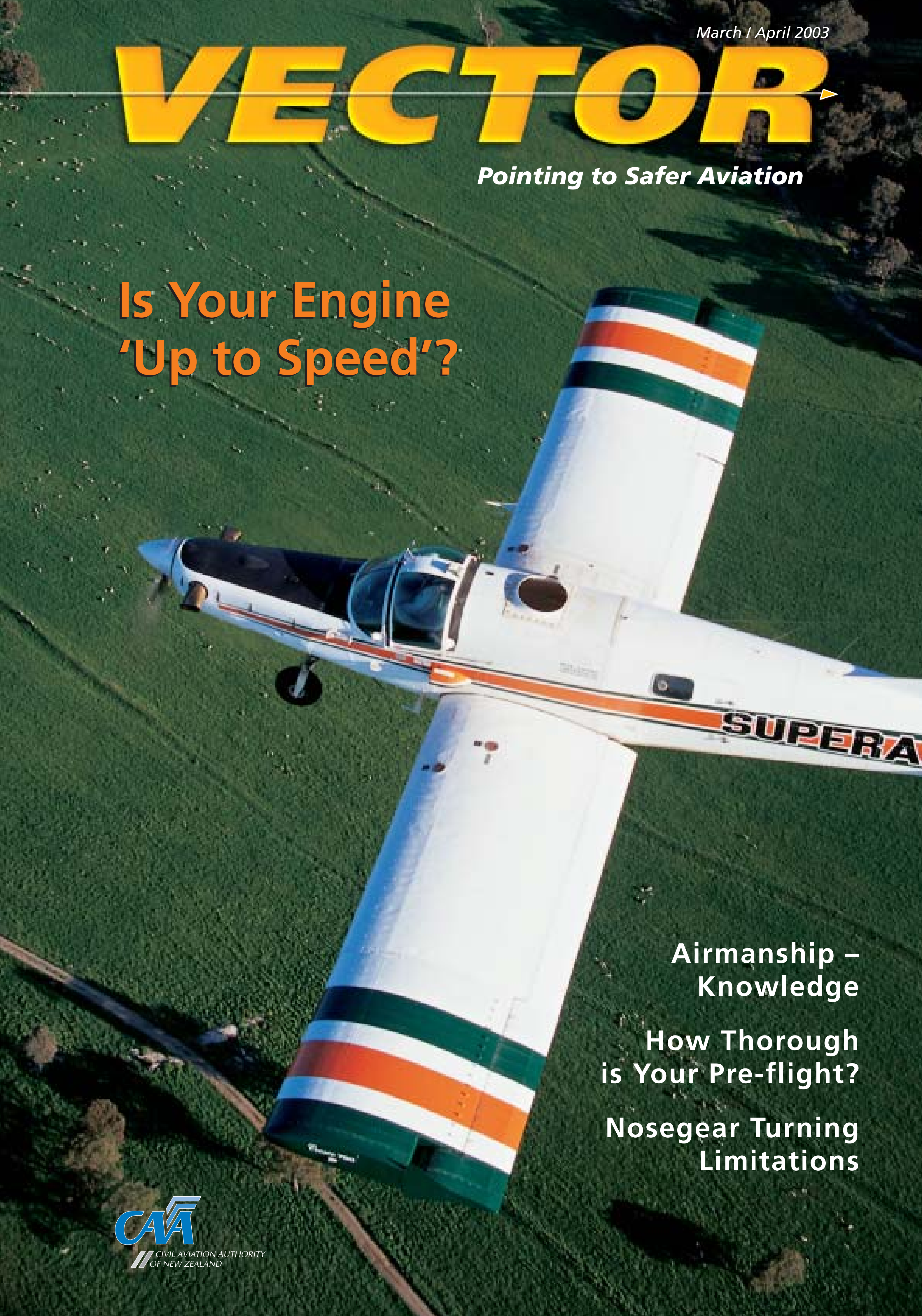
March / April 2003

VECTOR

Pointing to Safer Aviation



Is Your Engine 'Up to Speed'?

Airmanship – Knowledge

How Thorough is Your Pre-flight?

Nosegear Turning Limitations

CAA
CIVIL AVIATION AUTHORITY OF NEW ZEALAND

VECTOR

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How do you know that your aircraft engine is producing its rated power? Although primarily written to assist engineers when carrying out ground run and in-flight engine power checks, this article should help pilots to better understand their aircraft engine and alert them to the symptoms of poor engine performance.

This article continues the series on airmanship and considers the importance of having the knowledge to be able to determine the significance of information that you have detected.

The pilot of a Cessna 152 Aerobat recounts his experience of jammed controls while performing aerobatics.

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Cover Photo:
A Pacific Aerospace Cresco returns to reload while working near Armidale in Northern New South Wales, Australia. Operated by Superair Australia, this New Zealand manufactured aircraft is one of only a handful of Crescos flying in Australia. Photograph by Neville Dawson.

Is Your Engine 'Up to Speed'?

Photograph courtesy of *Flight Safety Australia*

A maintenance organisation, after carrying out the regular periodic inspection, is required by CAA rule 43.115 *Ground running checks – reciprocating engines* to carry out an engine ground run to determine satisfactory performance in accordance with the manufacturer's specifications. This requirement can be argued to be very subjective, as a number of parameters must be known to determine engine power. This article covers propeller function and rpm indicators and their importance when determining if an engine is producing its rated power.

The article is written for engineers, but pilots may gain a better understanding of their aircraft engines and the reasons for a static rpm check, which is one of the primary tools that a pilot has to assess engine performance.

Note: This article brings together available information coupled with the writer's practical experience and is intended as a guide only. The advice should not be used if at variance with either the engine or airframe manufacturer's maintenance instructions or any continuing airworthiness publications.

Preparation

Before conducting any ground run, the aircraft manufacturer's Flight Manual should be consulted for static rpm limitations for the engine concerned. It is also very handy to have a checklist form to record all the various parameters.

In the case of a fixed-pitch propeller aircraft, the Flight Manual will likely specify an upper and lower maximum static rpm limitation. This figure obtained on the ground run will be somewhat less than the engine's rated maximum rpm, as this rpm would normally only be achieved in a level-flight full-throttle situation.

In the case of a variable pitch constant speed (CSU) propeller, the Flight Manual will generally specify a maximum rated rpm. The governor should be set at this figure. For an American aircraft, this information can also be found in the FAA Type Certificate Data Sheet.

Ground Running – General

Choose nil or light wind conditions close to standard atmospheric conditions of pressure and temperature. Ensure that engine temperatures and pressures are well into the green range and that the propeller has been properly cycled. If there is a light wind, a static rpm check should be performed at 90 degrees to the wind in both directions, and the two readings averaged in order to nullify any wind velocity effect. Ground runs should **not** be conducted in strong winds, as facing 'in to wind' will give an artificially high static rpm, and crosswind running will result in excessive vibration, insufficient engine cooling, and the possibility of aircraft instability.

After a normal warm-up and engine checks, smoothly apply full throttle and observe the indicated static rpm. In the case of a turbo or supercharged engine, do not exceed the manufacturer's manifold pressure limits. Ensure that there is no rpm instrument parallax error by looking squarely at the tachometer. Record the rpm and carry out a normal run-down and shutdown procedure.

Note that for any maximum static run-ups or extended partial power ground runs, the engine should be fully cowled or have a cooling shroud installed. Also, at all times, ensure engine temperature and pressure limitations remain comfortably within limits.

Atmospheric Conditions

Atmospheric conditions will have an effect on power and static rpm indications.

A propeller absorbs a lot more horsepower at a given rpm in dense air. Engine power increases because of the increased charge density in the cylinder. However, the increased power output is more than opposed by the increased power absorbed by the propeller as a result of the denser air. The net result is that the observed rpm in denser air will normally be lower than that under ISA conditions.

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A Lycoming O-540 fitted with a test club propeller on the test stand.

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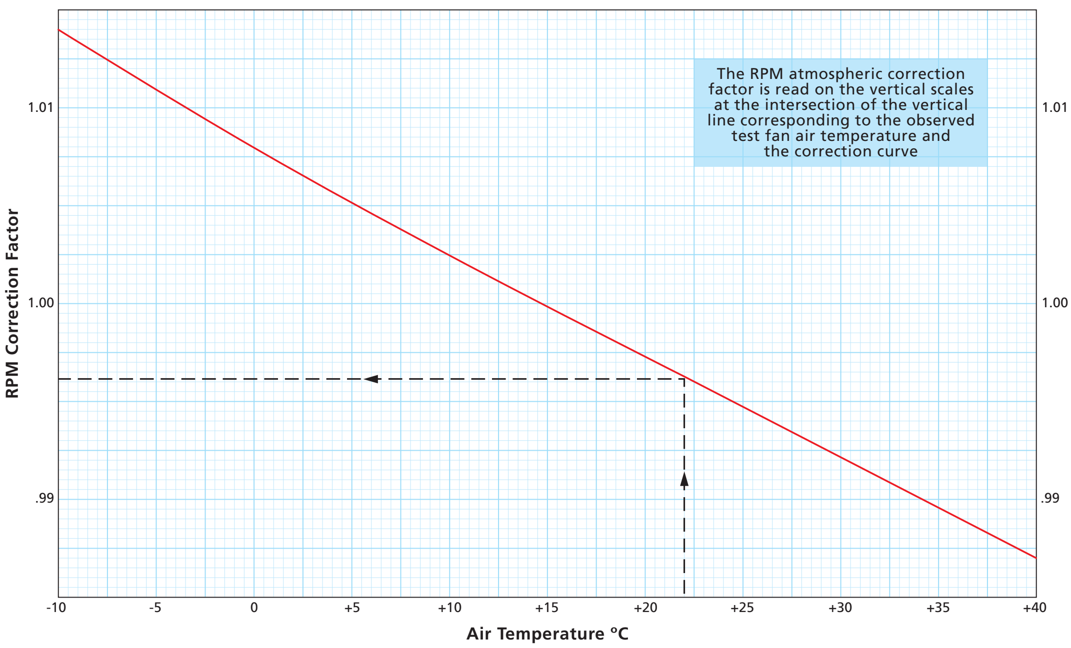
There is a correction chart available (commonly used by engine overhaul agencies when using a test club propeller) to relate the rpm achieved back to that which would be obtainable on a standard day. (See below.) This information is generally used by engine overhaul shops when they establish an engine's reference rpm. CAP562 *Civil Aircraft Airworthiness Information and Procedures*, Leaflet 7-5 has a good explanation of this and includes correction charts.

ENGINE TESTING WITH PROPELLER TEST FANS

Correction of observed engine RPM for observed temperature conditions to the RPM obtainable on a standard day



When testing normally-aspirated engines at full throttle, it can be assumed that barometric change affecting the engine power, and therefore the tendency to increase or decrease engine rpm, are counter-balanced by the variation in fan loading. It is therefore necessary to correct for air temperature only and this is normally done at the time of engine overhaul with the aid of the chart above.

Having obtained the figures, compare them with the manufacturer's Flight Manual parameters to determine if any further action is required.

If it is, the following procedures may be helpful as a guide.

Fixed-Pitch Propellers

If, after a ground run, the maximum static rpm is not within the Flight Manual limitations, one of the first items to check is the aircraft tachometer. This check can be carried out 'in situ' by using strobe equipment such as 'vu-thru tach' or dynamic balancing equipment.

It is the writer's experience that some light aircraft tachos have proven to read up to 100 rpm high or low. Such errors will have a significant effect on static rpm indication, aircraft performance and fuel burn. If the tacho is proven to be in error, it should be sent to a repair facility.

If the tacho is accurate, continue with the normal manufacturer's trouble-shooting procedures. Don't exclude the remote possibility of the propeller specifications being incorrect for the aircraft/engine combination.

Variable-Pitch Propellers

In the case of an aircraft fitted with a CSU propeller, it is a little more difficult to determine whether the engine is producing up to its rated power. The run-up procedure is the same as for fixed-pitch, but the maximum rpm obtained may be limited by the rated maximum rpm governor setting (rated rpm), or it may be limited by the propeller fine-pitch setting.

When the propeller fine-pitch setting is limiting the rpm before the governor-set max rpm is reached, there will be no rpm 'surge' when the throttle is quickly advanced from approximately five inches Hg below maximum to the maximum allowable limit.

Caution: It is important that personnel doing these checks are aware of any manufacturer's limitations and/or recommendations, as any engine surging is not desirable. Do not use a rate of throttle movement any greater than that involved in normal flight operations.

If, during the run-up, the rated rpm is reached and governing occurs some inches of manifold pressure before full throttle or maximum allowable manifold pressure is obtained, this generally indicates that the propeller fine-pitch setting (blade angle) and/or propeller diameter may be less than limits specified by the manufacturer.

Allowable Limits

The normal ex-factory setting has the propeller fine-pitch limiting the maximum static ground run rpm to 50 rpm to 100 rpm below the rated max rpm governor-set figure.

The McCauley C200 and C400 series owner/operator manual MPC-11, for example, notes that the propeller should prevent the engine rpm from going to the 'red line' and is a design characteristic of the propeller. The observed rpm, however, should be within 100 rpm of the rated rpm. In the case of the Hartzell Compact series propeller, the normal factory propeller fine-pitch setting is either takeoff rpm (rated rpm) or 50 rpm below takeoff rpm.

The above examples help explain why it is quite possible that many CSU propeller aircraft will not necessarily achieve their rated static rpm, despite the engine's power being up to manufacturer's specifications. The propeller Operator's Manual should be available and will generally contain a lot more information than is available in the Aircraft Maintenance Manual.

If the static rpm is outside the allowable limits, the tacho is the first thing that should be checked for accuracy (as for fixed-pitch).

Fine-pitch Adjustment

Adjustments to the fine-pitch setting may be required after a propeller change or because of specific aircraft variances. When a Supplemental Type Certificate (STC) involves a change of propeller, the STC data would normally quote the fine-pitch and coarse-pitch settings for that particular aircraft engine/propeller combination. Any adjustment should be **minimal**, and the result compared against factory and/or Type Certificate or STC data.

Governing RPM Check and Adjustment

When governing rpm is not reached in the static run-up (frequently the case), it is worth flying a circuit to determine the governor-set maximum rpm. By the time the aircraft has reached takeoff airspeed, the maximum rpm will be that controlled by the governor. Observe and record this rpm.

If the maximum rpm is seen to climb above the rated rpm during the takeoff, the propeller control should be smoothly pulled back to the rated rpm. You can either measure the distance the propeller control has been moved using an observer with a small ruler or, in the case of a quadrant type control, masking tape and ballpoint pen. (The latter method is a good way of getting rid of takeoff propeller sync problems in a twin-engine aircraft.) Land and replicate the setting and adjust the governor maximum stop to contact the arm. A re-rig of governor control may be required to obtain the correct pre-load.

Propeller – Blade Angle and Diameter Check

If the governor-rated rpm is correct from the flight check but the static ground run rpm is outside the maximum variation allowable by the propeller manufacturer, check the fine-pitch setting and propeller diameter figure from the aircraft propeller logbook against the Flight Manual and/or Type Certificate Data sheet. The most recent fine-pitch setting should have been recorded in the data page of the propeller logbook or the latest propeller overhaul entry.

If suspect, the fine-pitch blade angle and/or propeller diameter can be physically checked. The diameter check is easily carried out, but an 'in situ' check of blade angle is somewhat more difficult, and the propeller manufacturer's overhaul manual must be consulted to ensure the correct method is used. A protractor or inclinometer is required. The blade to be measured needs to be absolutely horizontal, and the crankshaft mounting flange angle must be measured as a datum point for blade angle reference.

Obtaining the propeller reference plane before measuring the blade angle.

The blade angle being measured at the manufacturer's reference station, which is normally a specified distance from the propeller hub centreline.

On some feathering propellers, the blades are sprung onto a latch position. These are not readily able to have their fine-pitch setting measured 'in situ'. A visit to a propeller overhaul shop may be required if the blade angle is suspected to be incorrect.

Fine-Pitch Stop – Functions and Cautions

Propeller fine-pitch settings should **not** be adjusted to set blade angle figures outside that of the aircraft Type Certificate (TC)/ Flight Manual in order to achieve maximum rated static rpm, unless approved by manufacturer's instruction.

Maintenance organisations should liaise with propeller overhaul facilities, as it is possible to mask an engine power deficiency by fine-pitch adjustment on some propeller models, eg, the Hartzell Compact series.

A cut-away of a McCauley C200-C400 threadless propeller showing the fine-pitch stop. Adjustment requires specialised tools and oil draining and is normally an overhaul shop task.

One of the reasons why the fine pitch limits the maximum static rpm below that of the governor setting, is to ensure that the aircraft will still be flyable in the case of a governor failure. A propeller fine pitch, which is set somewhat finer than the manufacturer recommends, can result in an engine severe over-speed in the event of a governor failure. Also, the same propeller would require an aircraft to be slowed down to a much lower airspeed on approach before the governor control could be set to rated rpm without a significant surge.

For smooth operating practice, which helps prevent counterweight detuning, it is desirable to have the propeller blade angle reach the fine-pitch setting during the gradual power and airspeed reduction process on approach, and at this time the governor control can be set to the maximum rpm without the rpm climbing. Having a fine-pitch setting finer than that of the manufacturer's recommendation also makes it difficult to keep a good partial-power approach, as even small power changes will result in significant rpm changes.

Post-Check Action

If, after having completed the above checks, a lack of power has been determined, the manufacturer's service information

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should be consulted. Generally, manufacturers have quite good trouble-shooting data and, when considered, this helps one to keep an 'open mind', as there are many reasons for poor engine performance. If difficulties are encountered, a phone call to your engine overhaul provider can be enlightening – they are usually very familiar with the many problems that can be encountered.

When the above checks determine that the engine's power is acceptable, the rated engineer can certify the CAA rule 43.115 engine ground run check as having been done and release the aircraft to service in the full knowledge that the engine is 'up to speed'.

Summary

It is important to determine that your aircraft engine is performing as it should. It is especially important to use all necessary inspection and test criteria when operating your engine in an 'on condition' programme.

The key points relating to ground-running power determination are:

- If the engine maximum static rpm is not within allowable limits, first ensure that the aircraft tachometer is indicating correctly. (Quite recently, in an aircraft that the owner considered to be slow in flight compared to others of the type, the tacho was found to be indicating nearly 100 rpm high. Since the tacho has been repaired, the aircraft's performance has improved markedly!)
- Be aware that some propeller manufacturers publish allowable maximum static rpm variation from that detailed in the TC/ Flight Manual as maximum rated rpm, this being a design feature of the particular propeller.
- Also be aware that on some propellers it is possible to mask low engine power by field adjustment of the propeller fine-pitch stop that results in blade angles finer than the aircraft TC or Flight Manual published limits. ■

Airmanship – Knowledge

Previous articles in this series introduced a model to describe airmanship. The model was described using the easy-to-remember 'Detect – Determine – Decide – Discipline – Do' mnemonic. This article considers the second of these factors, Determine.

Airmanship – The Importance of Knowledge

By **Determine**, what this model actually means is to determine the significance of things that your detection skills have identified. For example, you may have seen a change in the weather ahead of you. You may have noticed a change in engine performance. You might have heard a radio call from an aircraft joining at the same airfield. There are countless things that you can detect.

The next part of the process is to recognise the significance of these observations, before deciding what to do about them. In the majority of cases, we are able to determine the significance of what we observe because of previous experience and knowledge. You know that if the oil pressure drops to zero, the engine will soon stop. You know that flying in the mountains in strong winds will result in turbulence and downdraughts. You know that your aircraft burns fuel at a given rate at a certain power setting. Indeed there are thousands of things you need to know in order to fly your aircraft safely.

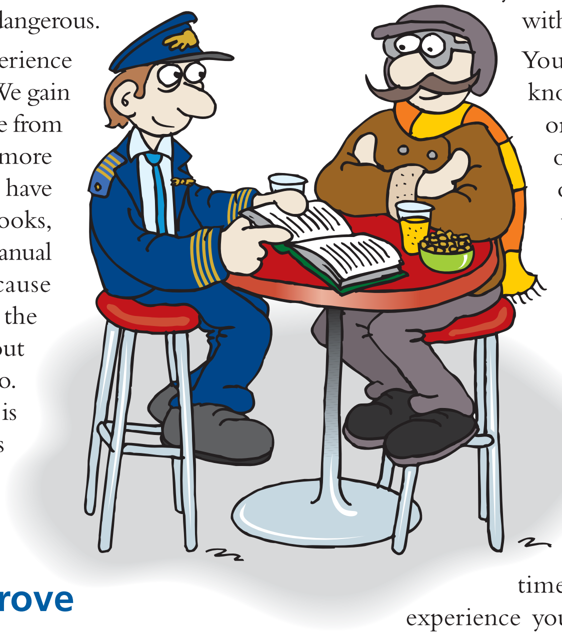
We can group the things you need to know about into some generic areas:

- **Yourself** – You need to know your own state of proficiency and performance. What can you safely do?
- **Others** – What will other pilots be doing that might affect you? What about air traffic controllers? How about the customers or passengers – what do they expect or need?
- **Your Aircraft** – You need to know everything about your aircraft required to safely operate it. What are the engine and airframe limitations? How do the systems work? How does the aircraft perform?
- **The Environment** – In an earlier article we talked about three environments: the physical one, the regulatory one, and the organisational one. The physical environment includes the geography of the area, the climate, obstacles, hazards, airspace and so on. The regulatory environment is the rule system that you operate under, which determines what you can and can not do while flying. The organisational environment is all about how your company or club conducts its business. These are all things that you need to know about.
- **Task and Risk** – What are you trying to do while flying, and what are the risks inherent to the job? Some are common to all flying – hitting the ground hard hurts in any aircraft! – but others are specific to the type of flying you are involved in.

How Do We Gain Knowledge?

There are two principal ways in which we gain knowledge, not just in aviation, but in all aspects of our life. These are from our own experiences, or from the experiences and thoughts of others.

Ever since you were a baby you were learning through experience – don't touch hot things because it hurts, anything coloured green probably tastes bad, and so on! That is the natural way we learn. It can also be very inefficient, because in order to learn about everything you would have to do everything yourself, in effect repeating the experiences and mistakes of others. Imagine having to learn how to fly without the benefit of an instructor, or any manuals. It would be a slow process, not to mention dangerous.



Learning from the previous experience of others is quicker and easier. We gain the benefit of others' experience from direct contact with them, or more normally by reading what they have recorded for us in manuals, books, rules, videos, CDs, etc. Flight Manual limits are written down because some brave test pilot has flown the aircraft to the limit, and found out what it is so we don't have to. Almost every rule in the book is based on someone else's previous experience of what happens if you don't obey that rule.

How You Can Improve Your Knowledge?

Congratulations – you are doing that right now, just by reading this article and this magazine. *Vector* is but one of a host of publications that contain information that will increase your knowledge of aviation. Read as much as you can about flying. You can do it by yourself, anywhere, anytime. This makes reading one of the most efficient ways of gaining knowledge. The benefits of reading can, however, be significantly enhanced by putting what you read into context. For example, rather than just reading the Flight Manual (when was the last time you did that?), read it while sitting in the aircraft. Actually look at the systems and controls while you read, and your retention of knowledge will greatly improve. Next time you read the AIP visualise how what you are reading might affect a notional flight, maybe even with a map in front of you.

Visualisation, or other such simulations, are a powerful learning tool, but at the end of the day there is no substitute for experience. The more you do things, and the more varied your experiences are, the greater your depth of knowledge. Flying by yourself can be fun, and you will be gaining knowledge and experience, but you are more likely to learn new things by flying with more experienced pilots or instructors.

You don't have to be flying to be gaining knowledge though. Sitting in the crew room, or in the bar after flying, can be a great way of picking up all sorts of useful knowledge or tips from experienced old hands. (Now you have an excuse when your partner complains about you always being at the club – you weren't socialising, you were expanding your aviation knowledge, and more far more cheaply than if flying!). Indeed, such socialising is one of the best ways of learning about the other people with whom you must deal in aviation.

People, including pilots, are actually learning and gaining knowledge all the time, whether they mean to or not. Every experience you have, and everything you see, hear and read, is adding to your knowledge base. The difference between the good pilot and the not so good is that the good one is **always** deliberately seeking to improve his or her knowledge base. They fly as much as they can, in as many different situations as are practical for their type of flying. They learn from the experiences of others, by watching them and talking to them, and by reading what they write. They enjoy flying with other pilots, particularly instructors, to see what they can learn. They are not afraid to ask if they don't know. They realise that no-one knows it all and there is always something else to learn. Are you that sort of pilot? ■

How Thorough is Your Pre-flight?

Readers are encouraged to share their aviation experiences in order to alert others to the potential pitfalls. We do not accept anonymous contributions. If you tell us who you are, we will not publish your name unless we have your permission.

The following account was submitted by Richard Brignall of Tauranga.

Photograph courtesy of Richard Brignall.

The Incident

On Friday the 3rd of January 2003 the weather over Tauranga airfield was perfect. Not a cloud in the sky and only a slight sea breeze. It was an excellent opportunity for that aerobatic flight that some of us find so hard to resist.

After completing a pre-flight of the outside of the Cessna 152 aircraft I was happy to find that everything was as it should be. I then carried out a final check of the cockpit and removed any items that may come loose during aerobatic manoeuvres. These included the fire extinguisher, axe, fuel drain, fuel dipstick, Flight Manual and any pens and pencils that I could find. After another quick glance around the cockpit, I was satisfied that everything had been removed and that it was safe to carry out the intended flight. I had 20 litres of fuel per tank on board. This allowed for 50 minutes flying time plus a 45-minute reserve.

After having a little joke with the duty controller about parachuting, I took off and started my climb to 3500 feet overhead the airfield. The view of the Coromandel Peninsula on the climb was amazing.

On finally reaching 3500 feet I carried out a HASELL check and allowed the engine temperature to settle. Another quick look around the cockpit showed everything was in order with no loose items to be seen.

I started out with a couple of loops and some stall turns and managed not to fall out of any of the manoeuvres. The feeling of freedom you get from aerobatics is great and I was really enjoying myself.

I did a loop with a roll off the top to the right utilising a slow roll to exit. It was quite a negative-G manoeuvre with the engine cutting out for a second or two when the aircraft was fully inverted. As the aircraft continued its roll through 360 degrees I started to neutralise the ailerons. Then there was a sudden resistance to the control column movement and the ailerons became jammed in a deflected position.

The aircraft continued into a second roll with a very low nose attitude. By the time I realised what was happening it was too late to arrest the roll with opposite rudder as the angle of bank would have been too great to maintain level flight and would have only resulted in the aircraft side-slipping and losing altitude. A recovery from that situation would not be successful.

As the roll continued and the aircraft inverted once again, I increased forward pressure on the control column in an attempt to correct the nose-down attitude and prevent further height loss.

As the aircraft came around to wings level again I applied full opposite rudder and to my relief I was able to arrest the roll at about 40 degrees right angle of bank. I was now able to maintain height. My altitude was now only 2200 feet.

I was very hesitant to move the control column further to the right to try and free whatever it was that had seized the controls. If I was unable to free the controls by moving the control column further to the right I might then be unable to return the control column back to its present position. If this happened, the rolling force would exceed the rudder force and the aircraft would then continue to roll and enter a spiral dive from which it would be impossible to recover.

I notified the control tower of my situation and also that any attempt to land the aircraft in this configuration would probably be unsuccessful as all I could do now was to fly around in circles to the right. I thought that it may be possible to enter a controlled descending righthand turn and, by adjusting my rate of descent using power, try to be lined up with one of the runways upon reaching ground level.

Unfortunately, the aircraft was not positioned correctly to allow this to be attempted. Also, it would have been far too risky as I would have had no real directional control and could not guarantee where I might end up.

I forced myself to take time to think, as I was sure there was a way to get out of this situation successfully. There is never any point in panicking as it achieves nothing.

I thought that if I was able to neutralise the ailerons I would be able to get the wings level with rudder. This would then allow me directional control with the rudder and the chance of a successful landing was quite reasonable.

I applied an increasing force to the control column but it was reluctant to move to the left. I was a bit concerned that the force I was applying might break the control column so I loosened my harness enough to allow me to reach the other control column if required.

I was getting a little concerned about the amount of time I had been in the air and how much fuel there was remaining. I had a look at the countdown timer on my watch and was pleased to see that I still had 30 minutes of flying time plus 45 minutes reserve. I was feeling some reassurance knowing that I still had one hour and 15 minutes of flying time in which to resolve the situation. It was with horror, however, that I suddenly realised I really only had half that time. Being grossly out of balance with a moderate amount of fuel on board meant that the right tank would probably un-port sooner rather than later leaving a large quantity of unusable fuel.

I kept trying to neutralise the ailerons but was still concerned about the amount of force being used. I thought that if the control column didn't break then maybe the chain system would. If that happened it would hopefully allow the ailerons to return to neutral and stay there due to the airflow passing over them. I would then have directional control with rudder and the situation would be resolved.

Eventually, after a lot of force, I was able to return the ailerons to neutral and level the wings using rudder. I then notified the control tower.

Now that I had the situation reasonably under control, I decided to try and free the controls completely. I could now make the aircraft climb so decided to gain a bit more height as altitude above you in such a situation is of no use at all.

I tried to free the controls but, again, was concerned about the amount of force being used. All of a sudden there was a loud **bang** and the control column suddenly became free-moving. At first I thought I had broken the control column or snapped the chain system, but soon realised that whatever had been caught in the control system had come free and I now had complete control of the aircraft.

I notified the control tower and was given a landing clearance. Knowing that there was something loose in the control system was still of concern so I used power only to control descent and rudder to control direction as I made my approach to the airfield. The sensation of the aircraft's wheels touching the ground was a huge relief and it wasn't until then that I considered the situation completely resolved.

The aircraft's whole control system was checked and it did not take long to find out what the cause of the problem had been. As it turns out, a stainless steel pen had been left somewhere in the aircraft. During the slow roll this pen had somehow become lodged in the chain system that actuates the ailerons, causing them to seize. Damage to the pen was matched exactly to the sprocket and chain on the righthand control column. After the pen had dislodged from the chain drive it had fallen down into the channel where the rudder and elevator cables run.

Lessons Learnt

There are lessons to be learnt here. The fact that you have taken the time to read this may save you from the same experience, and may even save your life. Perhaps my pre-flight could have been better as I did not see the pen in the aircraft. Perhaps if I had looked under the seats it may have been found and the situation could have been avoided.

It would be easy for me just to say that the pen was hidden and could not be found during the pre-flight, but if we don't look, we don't see. I made a mistake that could have cost me my life. I had two choices. I could have kept my mouth shut and saved myself the embarrassment (no one learns anything), or I could share the experience with others so they also can learn from my mistake. I chose the latter.

Remember, in aviation you learn from the mistakes of other pilots because you may not survive to learn from your own. I was one of the lucky ones.

It is really important that we, as pilots, talk about mistakes that we have made so that others may also learn from them. In this way our jobs and chosen recreation becomes safer. No matter what a pilot's hours or experience there is always something more to learn. The day we stop learning is the day to stop flying.

Just remember, when doing a pre-flight prior to aerobatic flight, to remove **all** loose items from not only the aircraft but also your pockets. Have a good look under the seats and in the seat pockets. Anything that is loose can seize the controls.

Metal pens should **never** be used in an aircraft. If a metal pen were to get caught in the controls, as in this case, its resistance to deform can cause the controls to seize completely. A plastic pen, however, is more likely to crush. Although it may cause some control resistance it would be less likely to cause the controls to seize completely. Another potential danger with metal pens is that they conduct electricity. If caught behind the dash during aerobatic flight they could lead to a cockpit fire.

Our training establishment has advised all its students and instructors that **no** metal pens are to be carried in the aircraft. If anyone drops **anything** in the aircraft it must be found and removed before the next flight.

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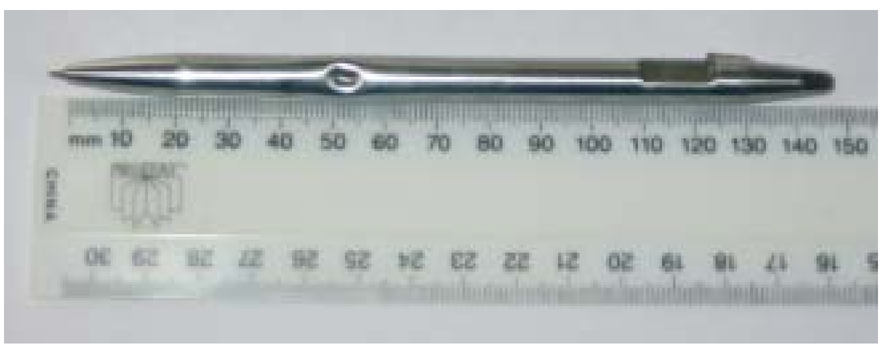
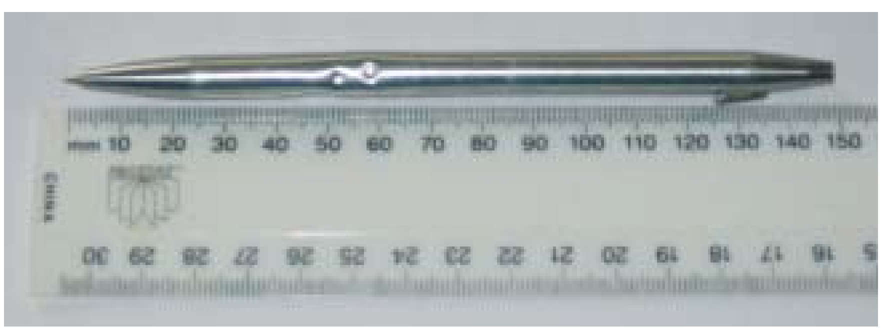


The damage caused by a sprocket tooth.



The damage caused by a chain link.

Photograph courtesy of Richard Brignall.

... continued from previuos page

I was talking to a pilot recently only a few days after there had been a fatal light aircraft accident. What this pilot said to me was quite sobering. After hearing of the accident, someone had said to him "From now on I will make sure I do a more thorough pre-flight check before I go flying". His reply to this person was "You shouldn't need to. You should always do a thorough pre-flight before you go flying"

Think of it this way – your pre-flight inspection is the last chance to find anything that may cause a serious incident or accident.

How thorough will your next pre-flight be?

Vector Comment

What a frightening experience to endure! You did extremely well to keep such a cool head and act so decisively considering the circumstances – it is difficult to know how we individually might react when confronted with such a situation.

Thank you for coming forward and sharing this experience with readers, it contains valuable lessons for all of us. You sum things up nicely when you say that it is important to talk about the mistakes that we have made so that others may learn from them. It is also very true that no matter what our experience level in aviation there is always something more to learn and that the day you stop learning is the day to stop flying.

Your account highlights the situation at many training organisations where aerobatic aircraft are also used for general training. This means that not all pilots using the aircraft are as careful or aware of the potential dangers of loose items in the cockpit as an aerobatic pilot whose pre-flight must therefore be doubly thorough. It also emphasises, as has been done at your organisation, the value of educating instructors and pilots generally so that all have a better awareness of the need for meticulous tidiness in an aerobatic aircraft. The next pilot's life could depend on it.

We note from your account that the Flight Manual was removed during the pre-flight to prevent it from becoming an in-flight safety hazard during aerobatics. While the intent of doing this is clearly safety orientated and is commendable, it should be noted that CAA Rule 91.111(2) *Documents to be carried* requires the aircraft Flight Manual be carried at all times. There is currently no exemption from this rule for aerobatic flight.

Pilots and operators of aerobatic aircraft should ensure that the Flight Manual is carried on all flights and that it is **firmly** secured inside the aircraft. If there is no provision to do so, then arrangements should be made with the aircraft's maintenance provider to appropriately modify the existing Flight Manual holder.

We also note that the axe and fire extinguisher were removed during the pre-flight. We strongly advise that these always be carried also. While Part 91 does not require this, it makes good safety sense to have them on board in the event of the unexpected. (We appreciate that when aerobatics are carried out directly over an attended aerodrome emergency services would be close at hand.) Again, it is vital to ensure that all emergency equipment is **securely** mounted. The advice of the aircraft's maintenance provider should be sought to be confident that this is achieved. ■

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.

Fokker Triplane Pilot's Scarf

Thank you for the latest copy of *Vector* and the interesting content. I'm a little concerned, however, at the cover photo of the Fokker Triplane in terms of the pilot's scarf and its closeness to the 'tail feathers'. I hate to imagine what would happen if the scarf became detached and fouled the elevators and/or rudder. I would be interested to know if any other readers have picked this up or am I a bit overly cautious?

Blair Wilmshurst
Opotiki
February 2003

Vector Comment

Thank you Blair for your concern. To answer your letter I am going to have to disclose one of my trade secrets.

I am not wearing the scarf and it is not attached to me personally, as the fluttering or tugging would be annoying or possibly distracting during a display. It is firmly attached to a permanent fixture in the cockpit and is simply flown for effect.

The length is carefully measured to be well clear of the control surfaces by an appropriate distance.

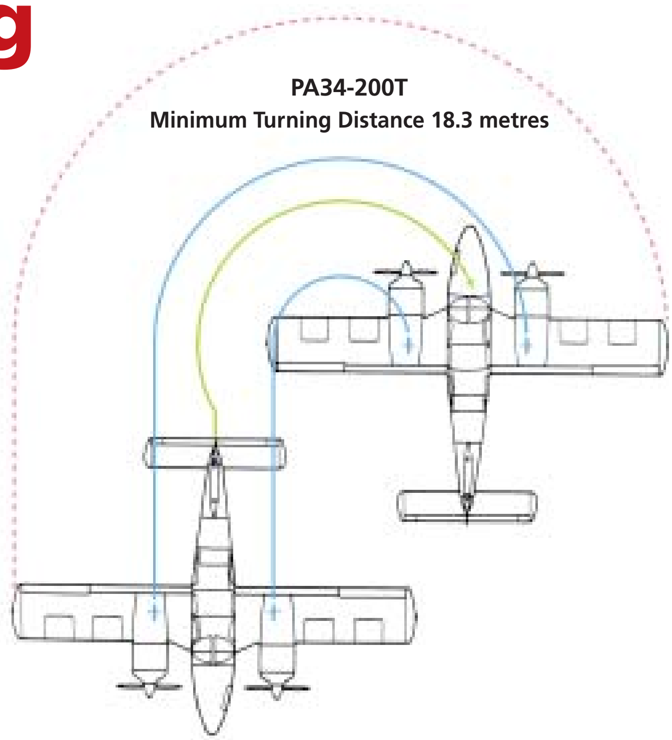
The scarf is light cotton material and the geometry of the horizontal stabiliser/elevator is not prone to jamming. The aircraft has an all-flying rudder with sealed hinges that is well clear of other surfaces and is very powerful both structurally and aerodynamically.

Historically, as a point of interest, in those early Royal Flying Corps days Squadron Commanders flew a five-foot streamer attached to the rudder and Flight Commanders two streamers from the wing struts for in-flight identification by their pilots. The Feldfliegercorps leaders needed no such devices because of their highly individualised aircraft colour schemes.

To date, you are the only person to make comment that I am aware of and I appreciate the sentiment behind it. ■

John Lanham
GM General Aviation
CAA

Nosegear Turning Limitations



The PA34-200T Seneca was on approach to land at Gisborne aerodrome when the nosegear failed to extend. After several unsuccessful attempts to extend the nosegear, the pilot diverted to Hastings aerodrome where a full wheels-up landing was completed. The occupants were not injured and the aircraft sustained minor damage.

In its accident report, the Transport Accident Investigation Commission (TAIC) concluded that while the reason for the malfunction could not be fully determined, the nosegear retraction system had in fact become misaligned over time, which probably contributed to it jamming after retraction.

As the nosegear retracted, the steering ball on the nose oleo had exited through the gap between the steering and track assembly channels. The ball had then travelled down the righthand outside of the channel and became lodged at the bottom of its travel. When undercarriage DOWN was selected, the available hydraulic pressure was insufficient to free the ball and extend the nosegear.

How the ball was able to exit through the gap on the right side of the channels was unclear. The misalignment of the retraction system was possibly due to a combination of the nosegear's turning limitations being exceeded during towing and the aircraft being turned too tightly while manoeuvring over rough ground.

The accident report recommended that Piper Seneca operators (pilots, ground staff and engineers) be reminded of the need to observe the aircraft Service Manual towing limitations (normally specified in the Handling and Servicing section of the manual) and to avoid performing tight turns while taxiing, especially when manoeuvring over a rough surface. The report also stressed the importance of carrying out a thorough pre-flight inspection of the nosegear retraction assembly for damage or indications of misalignment.

The nosegear turning limitations for the Piper Seneca are 27° left and right of the aircraft's fore-aft axis, which are usually denoted by two vertical lines (normally red) painted on the nosegear strut.

◄ *The vertical red turning angle limitation lines and stopper are clearly visible on this Cessna 402 nosegear leg.*

If these are not present, have worn off or have been painted over, it is suggested that they be reapplied by a LAME. The minimum turning distance for the Piper Seneca is 18.3 metres (see the accompanying diagram for details), but it is recommended that a larger turning radius be used where practicable. A letter has been sent by the CAA to all Piper Seneca operators reminding them of these limitations.

It should be borne in mind that the above advice is just as applicable to other types of retractable-gear aircraft that have towing/turning limitations.

Adherence to such limitations will certainly help minimise the chances of damaging the aircraft nosegear assembly and thus the possibility of landing gear extension problems. A thorough inspection of the retraction assembly to check for misalignment before every flight is equally important. ■

Instrument Approach Back-Up

Instrument approaches and possible false indications have become a topical issue of late. As well as the hazards created by ground equipment, the potential exists for pilots to be misled by faults in aircraft navigational equipment. This article relates one such incident and provides advice on how to check for incorrect instrument indications, thereby reducing the chances of falling victim to such a problem.

The Incident

The pilot of a light single-engine IFR aircraft was about to commence an ILS approach at Dunedin. On crossing the SWAMPY VOR, the ILS frequency was selected and identified. The CDI showed that the aircraft was established on the LLZ centreline, as was expected. All other instrument indications were normal. So far, so good.

On gaining visual reference, the pilot realised that, although the CDI bar indicated that the aircraft was on centreline, it was in fact drifting well left of the inbound track towards rising terrain. There was absolutely no instrument indication of any problem. The compass system was working correctly, glidepath and DME indications were correct, there was a good ident, and there was no NAV flag on the CDI to indicate a loss of incoming signal. The pilot continued the approach visually and noted that the CDI remained centred throughout the approach and subsequent landing.

The CDI had performed normally when used to track VOR signals.

The Problem

Subsequent maintenance investigation showed that there was a fault in the NAV receiver that meant that no signal was being sent to the CDI when ILS frequencies were selected. The CDI then **failed to the centre position**. Since the aircraft was receiving a good ILS LLZ signal, there was no NAV flag to indicate a problem. Discussion with a number of the operator's pilots indicated that many were unaware that it was possible for the instrument to give erroneous indications with no NAV flag visible.

The ILS is particularly problematic, in that there is no other direct indication of radial or track information as can be found for VOR or ADF equipment. Depending on how the LLZ is intercepted, it may well be that the aircraft is already on the inbound track when the ILS frequency is selected (as in this incident). The pilot would therefore expect to see the CDI somewhere near the middle of the deviation scale. This may reinforce the mindset that the approach is proceeding normally.

Some Safeguards

So how can the pilot guard against navigation equipment failures giving incorrect indications? The obvious answer is by having back-up equipment. If the aircraft is fitted with duplicate NAV or ADF receivers, select the approach navaid on both and crosscheck that they are giving similar indications. This does add to the workload during an approach, particularly for a single-pilot operation, but is a worthwhile precaution.

If you don't have the luxury of duplicate navaids, you may be able to use another type of navaid to check the primary approach aid. For example, you may be able to crosscheck a VOR approach against the position of an NDB at the same location. Note that co-location of VOR and NDB ground stations is not the norm, so some allowance may have to be made for the differing approach tracks that result. If the ground stations are too far apart, then they may not be particularly useful back-ups.

GPS can be used as a back-up, but once again extreme caution should be used to ensure that it has been programmed and selected to an appropriate waypoint. The GPS is likely to have stored waypoints for the VOR, NDB and other navaids, and also one for the airfield itself. Selection of the wrong waypoint could simply add to the confusion.

A number of modern VOR receivers have the facility to display the current radial in digital form in the controller display. This facility should always be used, if available, to crosscheck the radial versus the CDI or bearing pointer indications.

Before getting airborne on any instrument flight, check your navaids against any available airfield checkpoints. While in flight, and particularly during approaches, you should be applying 'common sense' checks. If your heading seems to be well off the sensible heading required, having allowed for drift, then you should be suspicious.

If you are flying in a radar-controlled environment ATC will be monitoring your approach, and they may be able to provide timely intervention if you are observed to be deviating from the normal approach path. Remember though that not all airfields have radar available, and that controllers might be busy with other aircraft, so it is probably best to treat ATC as the 'Big Brother' who may be able to assist you, but not always.

Conclusion

The aircraft mentioned in the above incident was fitted with single ADF, VOR/ILS, DME and GPS receivers – a fairly common GA IFR instrument fit. Aircraft navigation equipment failures can provide false indications without any overt warnings, a particular problem for aircraft with only one of each receiver type, and most acute for ILS or LLZ approaches.

The operator involved has mandated that, when flying any instrument approach in IMC, pilots are to use a suitable back-up. The pilots have been provided with training on how to program the GPS to that effect. This is a sensible precaution and one that other operators may like to copy. ■

Takeoff and Landing Performance Quiz

Around 50 percent of all New Zealand aircraft accidents occur during takeoff or landing, with approximately a further 10 percent occurring while on approach or in the circuit. Many such accidents happen when operating from airstrips that are short, sloping, have a poor surface, have a high density altitude, and that face out of wind. Such occurrences are performance-related accidents and many, if not all, could have been avoided if the pilots had been fully aware of the surrounding conditions and the performance limitations of their aircraft.

Recently, the CAA Safety Education and Publishing Unit ran a Takeoff and Landing Performance quiz at the Royal New Zealand Aero Club National Championships in Hamilton.

The winner (Jayne Bonser of Auckland) received $200 worth of fuel vouchers and the runner-up (Colin Greatrex of Auckland) $50 of fuel vouchers.

We have reproduced the quiz below for you to test your aircraft performance knowledge and to provide the Hamilton entrants with some feedback. The answers can be found on page 14.

For further reading on this topic the GAPs *Takeoff and Landing Performance* and *Helicopter Performance* are both available from your local flight training organisation, CAA Field Safety Adviser or the CAA Safety Education and Publishing Unit. Alternatively, they can be viewed under **Safety Information/ Publications/ GAPs** on the CAA web site (**www.caa.govt.nz**).

Takeoff and Landing Performance Questions

1. Approximately 50% of accidents in the under 2,721 kg aircraft weight category occur in the takeoff and landing phases of flight. Most of these accidents are not performance-related. **True | False**

2. Part 91 requires the pilot in command to have adequately determined the aircraft's performance before commencing a flight. **True | False**

3. List the three main methods of calculating aircraft performance:

4. The Group Rating System takes into account the ambient conditions of the day. **True | False**

5. A Group 5 aircraft cannot legally land on a Group 5 runway. **True | False**

6. The larger a runway's group number the longer the takeoff and landing distance available. **True | False**

7. All takeoff performance chart distance calculations assume the aircraft will achieve 1.2Vs by 50 feet agl. **True | False**

8. A landing performance chart does not take into account temperature and pressure altitude. **True | False**

9. If the wind direction is 45 degrees off the runway heading the headwind component is reduced by **20**, **30** or **40** percent**.** **20 | 30 | 40**

10. Aerodrome pressure altitude calculations are based on subtracting 30 feet for every hPa of observed atmospheric pressure less than 1013 hPa. **True | False**

11. Aerodrome density altitude is aerodrome elevation corrected for temperature. **True | False**

12. Density altitude should be increased by 120 feet for every 1°C of ambient air temperature above ISA for a given pressure altitude. **True | False**

13. High relative humidity does not have a significant effect on aircraft performance. **True | False**

14. A normally aspirated engine's maximum power output will decrease by approximately **5**, **10** or **15** percent when the aircraft is operating at a 6000-ft density altitude compared to sea level. **5 | 10 | 15**

15. A 20°C increase in OAT will reduce climb performance by around **5**, **10** or **20** percent. **5 | 10 | 20**

16. A 3000-ft increase in pressure altitude will reduce climb performance by around **5**, **10** or **20** percent. **5 | 10 | 20**

17. A 10% increase in aircraft weight above minimum operating weight will increase the takeoff roll by up to **5**, **10** or **20** percent. **5 | 10 | 20**

18. A 10% increase in weight will increase an aircraft's landing roll by up to **5**, **10** or **20** percent. **5 | 10 | 20**

19. Takeoff distance should be increased by **1**, **2** or **3** percent for every 1°C above the standard temperature for the aerodrome elevation. **1 | 2 | 3**

20. Landing distance should be increased by **1**, **2** or **3** percent for every extra 400 feet of aerodrome pressure altitude above sea level. **1 | 2 | 3**

21. Takeoff distance can be reduced by 1% per knot of headwind up to 20 knots. **True | False**

22. A 5-knot tailwind can increase landing distance by up to **10**, **20** or **25** percent. **10 | 20 | 25**

23. A 2% up-slope will increase takeoff distance by approximately **10**, **15** or **20** percent. **10 | 15 | 20**

24. The percentage slope of an airstrip can be calculated by dividing the height difference between the two ends by its length and then multiplying by 100. **True | False**

25. Dry short/medium length grass surface compared to a paved surface can increase takeoff distance by up to **10**, **15** or **20** percent. **10 | 15 | 20**

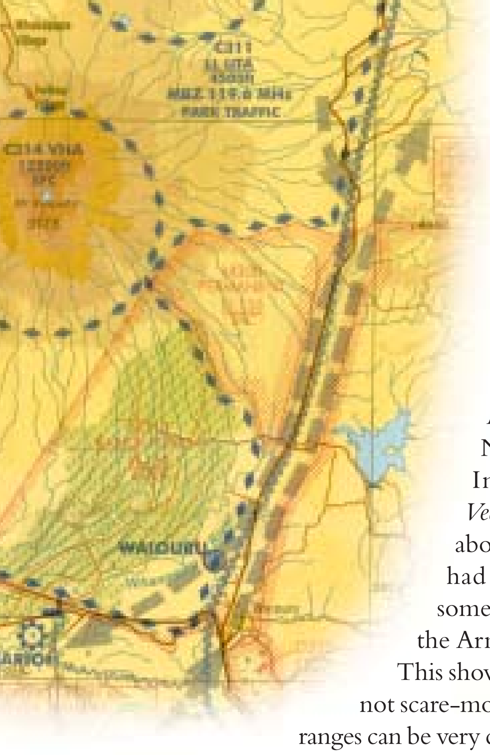
26. Short/medium length grass will result in a shorter landing roll than on a paved surface when short-field landing technique is used. **True | False**

27. Dirt, minor scratches and dents to the airframe and propeller will not significantly affect aircraft performance. **True | False**

28. Ground effect is only a performance consideration when landing. **True | False**

29. For air transport operations, the takeoff distance must not exceed 85% of the available runway using 50% of the reported headwind component. **True | False**

30. All takeoff and landing performance calculation methods are conservative and therefore do not require a contingency factor. **True | False**



Airspace Violations

In the November/December 2000 issue of *Vector* there was an article about the activities that go on in Waiouru Army training areas NZM300 and NZM301. In a subsequent issue of *Vector*, there was also a story about a helicopter pilot who had a close encounter with some pyrotechnic shells fired by the Army adjacent to these areas. This showed that the first article was not scare-mongering – Army live-firing ranges can be very dangerous places for aircraft! Despite these articles, violations of these and other military areas continue to be a problem.

Waiouru Area

Ohakea ATC has reported that they are continuing to observe on radar civil aircraft entering NZM300 and NZM301 (and NZM310 when active) on numerous occasions without a clearance. Sometimes ATC is able to identify these aircraft by their squawk codes, contact them, and steer them to safety. Often this is not possible, particularly when the aircraft is squawking 1200 and is not on a flight plan.

There does not appear to be any particular pattern to these incursions. Some pilots appear to be cutting the corners at the ends of the Waiouru corridor, some drift too far away from the main highway when flying through the corridor, some seem **totally** unaware of the areas at all (maybe flying point-to-point GPS tracks?), and others appear just plain lost! All are in potential danger from the extensive live firing that takes place around Waiouru. **Weapons training, including live firing, is a near daily event at Waiouru (including weekends).**

All pilots are strongly urged to ensure that they **do not** infringe these areas. Careful map study and preparation prior to the flight is required, as is constant monitoring of the aircraft's position when close to these areas – or any other special use or controlled airspace for that matter.

If you are at all unsure of your position around these areas, call Ohakea Control on 125.1 MHz. They will endeavour to provide information to help pilots who may find themselves 'spatially embarrassed'.

Ohakea Area

Ohakea controllers are also regularly called upon to provide assistance to aircraft in the Ohakea area, particularly around NZM303 – the restricted airspace surrounding Ohakea Air Force base, and NZM304 – the weapons range at Raumai.

Despite the disbanding of the RNZAF's Air Combat Force, Ohakea is still a busy place. A dozen Airtrainers, fourteen Iroquois helicopters, five King Airs and a similar number of Sioux helicopters all conduct intensive training in these areas. It will get even busier, with the recent announcement about the eventual closure of Whenuapai and the move of the RNZAF's heavy aircraft to Ohakea.

NZM304 is still extensively used for demolition training and for live firing by Iroquois heavy-calibre machine guns. Both of these could really ruin your day if you got in the wrong place at the wrong time. Even when NZM304 is not active, transiting aircraft should remain well seaward of the coast due to the proximity of the military coastal low-flying area (this extends from Himatangi Beach to the Whangaehu River mouth). It is regularly used by helicopters, CT4 trainers and for low-level Red Checkers formation aerobatics practice – all of which could easily conflict with a stray itinerant aircraft.

Given the proximity of Palmerston North, Wanganui, Feilding and Foxpine aerodromes, and the fact that the coast is a major north-south transit route, the traffic density in the area can be very high. The airspace can be potentially confusing to pilots unfamiliar with the area. The answer is thorough map study and preparation prior to the flight, and vigilance in monitoring your position during flight. Follow the instructions on the Ohakea VTC (after March the new Manawatu chart). If in doubt of your position or what you should be doing, call Ohakea on 125.1 MHz (or Palmerston Tower on 120.6 MHz if below 1500 feet and in the vicinity of Palmerston North aerodrome). ■

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Takeoff and Landing Performance Quiz Answers

1. False	7. True	15. 10%	23. 15%
2. True	8. True	16. 20%	24. True
3. Aircraft Performance Chart, Flight Manual Performance Data, Group Rating System	9. 30%	17. 20%	25. 15%
	10. False	18. 10%	26. False
	11. False	19. 1%	27. False
4. False	12. True	20. 1%	28. False
5. False	13. False	21. True	29. True
6. True	14. 15%	22. 25%	30. False

Licence/Logbook Back-Ups

Staff in the CAA Personnel Licensing and Central Medical Units frequently receive calls from pilots who have lost their pilot licences, medical certificates or pilot logbooks.

Lost Licences/Medical Certificates

It is possible to replace a lost Part 61 licence or medical certificate without too much difficulty. In the first instance, such losses should be reported to the Police. If they do not have the lost document, the document holder must send the CAA:

- A brief letter outlining the situation.
- A copy of the Police report.
- A signature on a blank white unlined piece of paper.
- A $50 replacement fee.

Lost Logbooks

A lost logbook is a more serious matter as the pilot concerned is faced with having to determine previous flight experience and reconstruct a replacement. Comprehensive records of individual flight experience are **not** contained in the CAA pilot files held for each Part 61 licence holder.

In many cases, pilots have gained additional 'non-prime' ratings (eg, aircraft type ratings, an agricultural rating, or an additional nav aid), the details of which are required to only be entered in their logbook. If these details have not been placed on their licence, the pilot is also faced with trying to prove that they have been gained.

With regard to recovering flight experience details, the best that CAA can do is to provide copies of issue flight test forms (PPL, CPL and so on) that identify a person's flight experience on the day the particular test concerned was undertaken. What cannot be determined by the CAA, are the details of any subsequent flight experience that may have been gained. Such detail has to be obtained from training or operational organisation flight records.

If such flight records are not available, all that may be used are known details obtained from issue flight test forms.

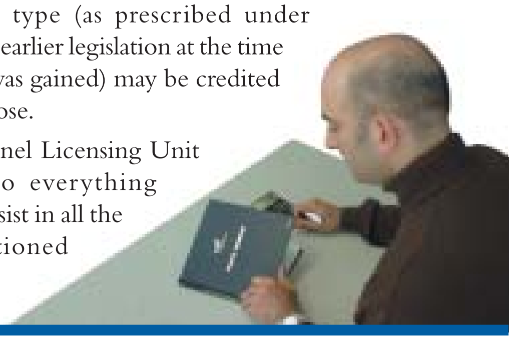
Although it costs $50.00 to amend a Part 61 licence by adding 'non-prime' ratings, it is money **well spent** should you happen to lose your logbook as CAA will now hold all the detail in their database. Accordingly, it is strongly recommended that pilots take up this option.

It is also strongly recommended that unless a pilot is flying with an organisation that holds experience details on record, that some form of duplicate record of flight experience be made.

Non-Part 61 Pilots

Pilots who have never held a Part 61 licence, and who may wish to return to flying, face additional problems. It is unlikely that CAA pilot files exist for persons who held licences issued under CASO 12 and earlier licensing systems. If you fall into this category, and have lost your licence and logbook, you will have to prove that you did in fact hold a licence. Proof may be obtained via statutory declaration from a former instructor or examiner. However, when it comes to starting a new logbook, where subsequent experience details are unobtainable, only the regulatory minimum flight experience requirements for that licence type (as prescribed under CASO 12 or earlier legislation at the time the licence was gained) may be credited for this purpose.

CAA Personnel Licensing Unit staff will do everything possible to assist in all the above-mentioned matters. ■



AIP Supplement Cut-off Dates

Do you have a significant event or airshow coming up soon? If so, you need to have the details published in an AIP *Supplement* instead of relying on a NOTAM. This information must be promulgated in a timely manner, and should be submitted to the CAA with adequate notice (within 90 days of the event). Please send the relevant details to the CAA (ATS Approvals Officer or AIS Coordinator) at least one week before the cut-off date(s) indicated below. Note: If your AIP *Supplement* requires an illustrated graphic you need to add another 5 working days to this date.

Supplement Cycle	*Supplement* Cut-off Date (with graphic)	*Supplement* Cut-off Date (text only)	*Supplement* Effective Date
03/06	10 Apr 03	17 Apr 03	12 Jun 03
03/07	8 May 03	15 May 03	10 Jul 03
03/08	5 Jun 03	12 Jun 03	7 Aug 03

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

OCCURRENCE BRIEFS

Lessons For Safer Aviation

The content of *Occurrence Briefs* comprises notified aircraft accidents, GA defect incidents (submitted by the aviation industry to the CAA), and selected foreign occurrences that we believe will most benefit engineers and operators. Statistical analyses of occurrences will normally be published in *CAA News*.

Individual Accident Reports (but not GA Defect Incidents) – as reported in *Occurrence Briefs* – are accessible on the Internet at CAA's web site **www.caa.govt.nz**. These include all those that have been published in *Occurrence Briefs*, and some that have been released but not yet published. (Note that *Occurrence Briefs* and the web site are limited only to those accidents that have occurred since 1 January 1996.)

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 which 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-RNA, Aviamilano Falco F8L Series 1, 6 Feb 99 at 16:10, Hauraki Gulf. 2 POB, injuries 2 fatal, damage destroyed. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 70 yrs, flying hours 10450 total, 2000 on type, 13 in last 90 days.

The pilot and passenger were on a scenic flight from Ardmore Aerodrome. Their intention was to over-fly the departing 'Around Alone' race yachts, particularly the Italian entrant. Upon arrival overhead the yacht southwest of Little Barrier Island, the aircraft made several low passes. On the last pass it was seen to enter a turn, then suddenly roll and descend in a steep nose-down attitude into the sea.

A full accident report is available on the CAA web site.

Main sources of information: CAA field investigation.

CAA Occurrence Ref 99/227

ZK-JCU, Airborne Windsports Edge 582, 1 Apr 01 at 16:35, nr Havelock North. 2 POB, injuries 2 fatal, damage destroyed. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 32 yrs, flying hours 186 total, 47 on type, 19 in last 90 days.

The microlight was on its last joyride flight of the day. It was observed to enter a spiral dive, during which the wing failed and control of the aircraft was lost. It subsequently impacted the terrain.

A comprehensive CAA accident investigation report is available on the CAA web site.

Main sources of information: CAA field investigation.

CAA Occurrence Ref 01/1047

ZK-LTT, Pacific Aerospace Cresco 08-600, 6 Jun 01 at 13:30, Wairoa. 1 POB, injuries nil, damage substantial. Nature of flight, agricultural. Pilot CAA licence CPL (Aeroplane), age 46 yrs, flying hours 8000 total, 180 on type, 169 in last 90 days.

While the aircraft was engaged in an aerial topdressing operation, the low-pressure fuel light illuminated, followed shortly thereafter by a flameout. The pilot attempted a re-light, but due to the limited height available, the aircraft was secured for a precautionary landing. The landing was made on a soft, uphill slope. The pilot stated that the low fuel quantity might have contributed to the flameout.

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

CAA Occurrence Ref 01/1966

ZK-GSD, PZL-Swidnik PW-5 "Smyk", 13 Oct 01 at 15:13, Taupo. 1 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence nil, age unknown, flying hours unknown.

The glider was on a long final to land when another glider descended onto it. The tail of the top glider shattered the lower glider's canopy. Both landed safely. Each pilot reported not having seen the other.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 01/3520

ZK-RCE, L A Compton Cyclone, 5 Dec 01 at 17:20, Whakatane. 1 POB, injuries nil, damage destroyed. Nature of flight, private other. Pilot CAA licence nil, age unknown, flying hours 50 total, 5 on type, 5 in last 90 days.

The gyrocopter was at about 300 feet agl when its rudder detached. An uncontrollable yaw developed as the gyrocopter entered autorotation. The pilot managed to land the gyrocopter level while still yawing, but the left undercarriage leg collapsed, causing it to roll over and the rotor to impact the ground.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 01/4021

ZK-KRM, Cessna 180H, 10 Jan 02 at 14:00, Slipper Is. 4 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence ATPL (Aeroplane), age 39 yrs, flying hours 10000 total, 500 on type, 210 in last 90 days.

While landing on the 'one way' northerly cross-strip, the aircraft veered to the right during the landing roll. The pilot used full left rudder and brake but was unable to prevent a ground-loop. The aircraft came to rest with its left wing and nose down on the righthand side of the airstrip. The pilot believed that damp ground might have resulted in ineffective braking.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 02/35

ZK-GVW, Schleicher ASW 20, 22 Jan 02 at 15:00, Omarama. 1 POB, injuries 1 fatal, damage destroyed. Nature of flight, private other. Pilot CAA licence nil, age 53 yrs, flying hours 485 total, 60 on type, 16 in last 90 days.

The glider was launched from Omarama Airfield at approximately 14:00 hours. The flight progressed in an anti-clockwise direction in the vicinity of the Omarama valley in the company of three other gliders. Altitude was gained by ridge soaring and thermal flying.

Just prior to the accident, ZK-GVW was gaining altitude by flying lefthand circuits close to a ridge to utilise the available lift. While turning left toward the scree slope the glider was seen, by one of the other glider pilots soaring at a higher altitude, to do what appeared to be a wing-over to the left followed by a vertical dive towards the ground.

With the grey scree slope blending into the grey overcast conditions, it is likely that the pilot became disoriented due to lack of visual cues and was unable to accurately judge the glider's bank angle and proximity to the slope. It is possible that the pilot misjudged the glider's radius of turn towards the slope. This may have occurred for a number of reasons, including distraction, misidentifying the size of an object on the slope, or looking away from the slope for too long. If the pilot assessed the radius of turn to be too large to complete the manoeuvre, his response would most likely have been to increase the bank angle and G loading. This may have resulted in an incipient spin to the left, which is consistent with the manoeuvre described by the other glider pilots.

A full accident report is available on the CAA web site.

Main sources of information: CAA field investigation.

CAA Occurrence Ref 02/99

ZK-SFC, Piper PA-34-200T, 25 Jan 02 at 14:30, Bridge Pa Ad. 4 POB, injuries nil, damage minor. Nature of flight, air ambulance. Pilot CAA licence CPL (Aeroplane), age 21 yrs, flying hours 1136 total, 515 on type, 115 in last 90 days.

On Friday, 25 January 2002, at about 1430, Piper PA34-200T Seneca ZK-SFC was on approach to land at Gisborne Aerodrome when the nose undercarriage failed to extend. After several unsuccessful attempts to extend the nose undercarriage, the pilot diverted to Hastings Aerodrome where a full wheels-up landing was completed. The two crew members and one passenger on board were uninjured and the aircraft sustained minor damage.

The reason for the undercarriage malfunction was not fully determined. However, the nose undercarriage retraction system had become misaligned over time, possibly because of a combination of the nose leg exceeding its limitations during aircraft towing and the aircraft being turned too tightly while manoeuvring over rough ground. The misalignment of the nose undercarriage probably contributed to it jamming after retraction.

The safety issues identified were the need for operators and maintainers to be aware of aircraft taxiing and towing limitations, and the requirement for regular, thorough inspections of the nose undercarriage assembly.

Main sources of information: Abstract from TAIC Investigation Report 02-002.

CAA Occurrence Ref 02/152

ZK-BPI, Piper PA-18A-150, 10 Feb 02 at 12:00, Putaruru. 1 POB, injuries nil, damage minor. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 19 yrs, flying hours 79 total, 5 on type, 13 in last 90 days.

The pilot lost control of the aircraft during a crosswind takeoff from an airstrip, subsequently ground-looping it before running through two fences.

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

CAA Occurrence Ref 02/306

ZK-DAO, Cessna 177B, 13 Feb 02 at 08:15, Makarora Ad. 3 POB, injuries nil, damage minor. Nature of flight, transport passenger A to A. Pilot CAA licence CPL (Aeroplane), age 41 yrs, flying hours unknown.

During takeoff, the aircraft drifted slightly to the left picking up a stick on the edge of the airstrip as it did so. The stick then bounced into one of the elevators, causing minor damage.

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

CAA Occurrence Ref 02/465

ZK-HXD, Robinson R22 Beta, 15 Feb 02 at 09:30, Opotiki Ad. 1 POB, injuries nil, damage minor. Nature of flight, training solo. Pilot CAA licence CPL (Helicopter), age 44 yrs, flying hours 3280 total, 1100 on type, 87 in last 90 days.

The pilot was carrying out a practice 180-degree autorotation on runway 27 at Opotiki aerodrome. A slight tailwind was encountered, resulting in a heavy touchdown.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 02/464

ZK-EGO, NZ Aerospace FU24-950, 19 Apr 02 at 10:13, 7 NM SSE Masterton. 1 POB, injuries 1 fatal, damage destroyed. Nature of flight, agricultural. Pilot CAA licence ATPL (Aeroplane), age 37 yrs, flying hours 10165 total, 152 on type, 100 in last 90 days.

The aircraft was engaged in spreading superphosphate on a hill-country property near Masterton. On the second flight after a mid-morning break, the tail fin assembly separated from the aircraft, which then climbed, and turned left slightly before colliding with a ridgeline.

The aircraft was destroyed by the impact and ensuing fire. A full accident report is available on the CAA web site.

Main sources of information: CAA field investigation.

CAA Occurrence Ref 02/1167

ZK-AWP, Douglas DC3C-S1C3G, 19 Jun 02 at 13:05, Glentanner. 3 POB, injuries nil, damage substantial. Nature of flight, ferry/positioning. Pilot CAA licence ATPL (Aeroplane), age 56 yrs, flying hours 3542 total, 1720 on type, 104 in last 90 days.

The crew taxied the aircraft up and down the runway a number of times to clear some of the 35 centimetres of snow on the runway before attempting to takeoff. In the early stages of the takeoff run, the aircraft veered off the runway to the left and travelled quite some distance before coming to rest. The left main gear collapsed, and the left propeller struck the ground in the process.

Temporary repairs were carried out at the aerodrome, which enabled the aircraft to be flown to Palmerston North for extensive repairs.

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

CAA Occurrence Ref 02/1877

ZK-RMW, Gippsland GA200C, 29 Jun 02 at 09:50, Waituna West. 1 POB, injuries 1 minor, damage minor. Nature of flight, agricultural. Pilot CAA licence CPL (Aeroplane), age 48 yrs, flying hours 16554 total, 1754 on type, 320 in last 90 days.

The aircraft was involved in topdressing operations when it failed to become airborne during the takeoff run. A load jettison was initiated along with the application of full flap, but the aircraft failed to clear a fence. Damage was confined to the hopper door and the cockpit floor.

Weather conditions were calm and overcast at the beginning of the day's operations but subsequently deteriorated during the day to light showers, with a sudden increase in the tailwind component at the time of the accident.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 02/2082

ZK-APO, Auster J1B, 30 Jun 02 at 14:00, Lindis Pass. 2 POB, injuries 2 fatal, damage destroyed. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 76 yrs, flying hours 750 total, 666 on type, 15 in last 90 days.

The aircraft was on a flight from Hokitika to Alexandra and was last seen at Hokitika about 14:00 local time on Sunday 30 June. It was reported as missing two days later and was subsequently found to have crashed north of Alexandra.

Poor planning with respect to weather and fuel endurance were significant factors in this accident.

A full accident report is available on the CAA web site.

Main sources of information: CAA field invesigation.

CAA Occurrence Ref 02/2023

ZK-HDB, Robinson R22 Beta, 10 Jul 02 at 14:40, Mt White Station. 2 POB, injuries nil, damage destroyed. Nature of flight, ferry/positioning. Pilot CAA licence CPL (Helicopter), age 33 yrs, flying hours 5700 total, 5600 on type, 150 in last 90 days.

The helicopter was in a low hover over sloping ground. The passenger vacated the aircraft and, while standing on the ground, reached back in to retrieve a strop from under his seat. As the seat was being raised, it came into contact with the cyclic control and pushed it to the right. The pilot was unable to counteract the control movement, and the helicopter rolled to the right. The tail rotor struck the ground, resulting in uncontrollable right yaw. Although the pilot closed the throttle, he was unable to retrieve the situation and the helicopter was destroyed when it hit the ground.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 02/2098

ZK-CHV, Europa XS, 30 Jul 02 at 11:00, Waihi Beach Ad. 2 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 57 yrs, flying hours 274 total, 21 on type, 22 in last 90 days.

The pilot found the flight controls to be jammed after the aircraft became airborne. It started to roll to the left, but the pilot managed to land the aircraft safely in an adjoining field.

Investigation revealed that a stone was jammed under the aileron control inside the cockpit. A wall and gaiter will be added to this area to prevent a repeat of this type of occurrence.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 02/2304

ZK-END, North American Harvard 3*, 23 Aug 02 at 11:25, Tauranga. 1 POB, injuries nil, damage minor. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 53 yrs, flying hours 522 total, 27 on type, 14 in last 90 days.

The aircraft was on base leg to land when the engine stopped suddenly. The pilot immediately turned the aircraft towards the airfield, but landed short of the runway threshold. The aircraft then bounced over a drain and came to rest on the airfield. Damage was sustained to the wing leading edge and the rudder.

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

CAA Occurrence Ref 02/2518

ZK-HVI, Hughes 369HS, 5 Oct 02 at 17:00, Spoon River. 2 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence CPL (Helicopter), age 57 yrs, flying hours 15100 total, 10000 on type, 20 in last 90 days.

The pilot reported that on takeoff from the Spoon River bed, his foot slipped off the left yaw pedal. The helicopter yawed to the right and the pilot lowered collective to arrest the yaw. The helicopter touched the ground before control was regained, and it rolled over when the left skid failed.

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

CAA Occurrence Ref 02/2924

ZK-RAC, Vancraft Rotor Lightning, 9 Oct 02 at 09:30, Feilding. 1 POB, injuries nil, damage minor. Nature of flight, private other. Pilot CAA licence nil, age unknown, flying hours 1100 total, 700 on type, 16 in last 90 days.

The gyrocopter's propeller gearbox failed in flight. The pilot carried out a forced landing, but one wheel entered a ditch causing the main blades to strike the ground and the gyrocopter to roll onto its right side.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 02/2954

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 5700 kg or less. Details of defects should normally be submitted on Form CAA 005D 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

Cessna 180J – Short-circuit causes battery fire

The pilot noticed smoke in the cabin while on approach to land at his home airstrip. After landing, he found that the battery was on fire, so extinguished it.

The righthand engine cowl flap cable had chafed through the main battery cable, shorting the battery and causing the fire. Damage was sustained to the battery box, baggage shelf, ELT, and the antenna cables to the VOR and COM sets. The elevator, rudder and trim control cables were heat-damaged and required replacement. A new parcel tray was fitted and the lower fuselage skin also replaced.

The LAME who inspected the aircraft found that the cowl flap and electrical cables were correctly fastened in their respective locations. Considerable wear was noted in the cowl flap hinge. The cowl flap cable had previously been refitted higher than normal on the firewall, so that the cowl flap would shut flush with the lower cowl. The combination of the worn hinge and inner conduit of the cowl flap cable rubbing continuously caused the insulation on the battery cable to wear through.

It is recommended that cowl flap hinges and cowl flap attaching hardware is replaced at regular intervals to prevent a reoccurrence of such an incident.

ATA 2400 CAA Occurrence Ref 01/4377

Cessna A185F – Alternator pulley detaches

The alternator failed in flight because the pulley and fan assembly detached.

Investigation showed that the alternator pulley and cooling fan retaining nut had come off the commutator shaft, resulting in the pulley not driving, the shaft being damaged, and the internal bearings seizing. This was attributed to a spring washer behind the retaining nut not being installed by the manufacturer. A new alternator was fitted after a spring washer was placed behind the pulley nut.

Engineers are advised to check alternator cooling fan and pulley retaining nuts for correct locking prior to fitting.

ATA 2420 CAA Occurrence Ref 02/1364

Cessna 402B – McCauley propeller blade root seal cracks

During a scheduled inspection, red dye was noted on the ground beneath the righthand propeller.

Further inspection revealed that red dye was leaking from around the No 2 blade root dust sealant. When the propeller was removed dye was found to have mixed with the engine oil.

The propeller was sent to an overhaul facility, who advised that the blade ferrule was leaking. The engine oil leakage into the hub was considered to be due to wear of the inside diameter of the repair bush.

It is recommended for McCauley propellers detailed in AD DCA/McCauley/144A that the red dye section outlined in the AD is complied with at overhaul. Not only does the dye show up cracks in the hub, but also it detects other defects – as was evident with this occurrence.

ATA 6110 CAA Occurrence Ref 02/3177

DH 82A Tiger Moth – Flying/landing wire attachment points corroded

When new flying wires were being fitted, the flying and landing wire attachment plates were found to be badly corroded. The corroded plates were replaced or repaired. When the plates were removed, it was also found that a number of the retaining bolts were corroded. The corrosion of these bolts was hard to detect, as they were covered by a paint finish.

It is recommended that engineers carry out very detailed inspections of these attachment fittings and retaining bolts during periodic inspections.

ATA 5700 CAA Occurrence Ref 02/74

DH 82A Tiger Moth – Flying/landing wires corroded

During an inspection of the flying and landing wires, it was found that eight were corroded and pitted, making them unserviceable. The wires were covered with PVC tubing that had discoloured, making a thorough inspection impossible.

It has been recommended that an AD be issued requiring that all protective coatings be removed from flying and landing wires for aircraft of this type.

ATA 5700 CAA Occurrence Ref 01/3682

Piper PA-28-161 – Main landing gear bolt fails, P/N AN4-11A

The pilot reported that an undercarriage bolt had sheared and was missing from the left main landing gear leg.

Inspection revealed that the lower outboard main attachment bolt, just above the threaded portion, had failed. The cause of failure could not be determined, but the aircraft had been used in a flight-training role prior to the incident during which time other bolts had broken.

To assist in preventing a recurrence of the event the engineering organisation is replacing all of this flight training operator's main landing gear attachment bolts every 12 months.

ATA 3200 CAA Occurrence Ref 02/1267