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VECTOR

Pointing to Safer Aviation

CAA
CIVIL AVIATION AUTHORITY OF NEW ZEALAND

VECTOR

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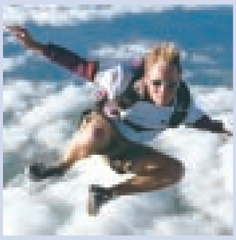

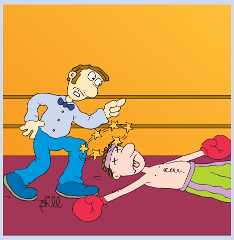

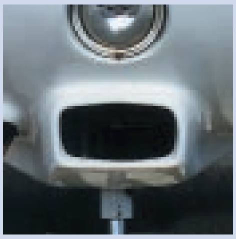

Cover Photograph
Kermit Ryan of Skydive Waikato free-falling near Rotorua.
Photograph kindly supplied by Peter Ryan of Skydive Waikato.

Letters to the Editor

Unnecessary Danger

After reading your "Unnecessary Danger " article I was very discouraged about the law makers in New Zealand. I have been flying for twenty years, and in all flights I flight-plan direct – as I have been taught to do by my instructor who is well respected within the aviation community. It will be a sad day for New Zealand when a pilot is charged as a criminal because they had to ditch after an engine failure not having gone out of their way to take the shortest route over water or rough ground.

If you say that you have to be able to land safely if the engine fails, then 90 percent of the possible flight paths around New Zealand would leave many pilots very worried. Your examples are all very well, but what say the cloud base is at 4000 feet for your crossing, or you plan a trip from Taupo to Wanganui which takes you over some very unpleasant terrain – are you expected to fly via the coast and thus double the distance?

What is a pilot to do, continue to flight-plan direct and run the risk of being labelled a criminal if their engine quits, or forget why we use an aircraft in the first place and make a series of dog legs that extend the length of the trip considerably?

Ross Price
Auckland
October 1998

I have just received the latest issue of *Vector* and read, with interest, the article on "Unnecessary Danger".

While there are some valid points raised, the paragraph entitled "Duty of Care" brought an ominous tone to the article.

Surely it is both dangerous and irresponsible to suggest that a pilot, who having suffered an abnormal, statistically improbable and probably unprecedented mechanical failure, is open to prosecution because of a decision made, based on completely normal circumstances (ie. that the engine would continue to function).

There are some pilots who might take evasive action (eg, destroying or withholding evidence) upon finding themselves in such circumstances, if they believed that prosecution was imminent – this clearly goes against the promotion of safe aviation.

The on-going situation of CVRs (and I refer to the Ansett crash) is evidence of the behaviour that can be attributed to this kind of issue.

The quoting of Section 156 of the Crimes Act is sheer scaremongering, and is totally outside the context of fair and reasonable judgement.

With aviation facing an increasing number of legal challenges, and possibly restrictive local body legislation (including the over-ready involvement of Police in aviation-related instances), surely the best middle-ground for the CAA is to complete the task with which you are charged – the promotion of safety.

Why even open up the ground for any non-pilot prosecutor to say "you were given the warning, here is the *Vector* article, so now let's proceed with the prosecution"?

Taken to extreme, any landing that resulted in damage to object or person as a result of mechanical failure could result in prosecution. How long will it be before this is the case if articles like this promoted such concepts?

Looking at the route you have illustrated in the article, surely there is more danger associated with the possibility of a mid-air collision in over-flying two airports and entering into a military training area at a typical VFR cruising altitude?

One wonders if it is a latent desire of the CAA that all flights be conducted in the IFR environment?

While clearly you have an opinion on the use of GPS, we note that you have not even suggested that pilots request controlled VFR or the use of non-standard altitudes.

As VFR pilots, we pay Airways charges and controllers will either grant or modify a request.

Thus on the route shown, Paraparaumu to New Plymouth, requesting non-standard 8000 feet controlled VFR direct to New Plymouth prior to takeoff covers:

- **Terrain considerations** – both water and land eg. Mt Egmont.
- **Traffic considerations** – both around Ohakea and en route due to the controlled nature of the flight.
- **Weather** – provides the ability to see bad weather approaching more easily.
- **Communications** – simplified and as directed.
- **Navigation** – better beacon and radar coverage to supplement the use of GPS.

This does not overrule, or challenge, the validity of any of the common-sense issues you have raised, but rather highlights a "legally helpful" aspect in preference to the "big brother, confrontational" aspect you have chosen to employ.

Dale Rawlings
Auckland
October 1998

Vector Comment

Thank you to both correspondents for their letters on this topic.

We would like to emphasis that the purpose of the article was not to focus entirely on the legal ramifications of having an engine failure over inhospitable terrain that results in injury or death, but rather was intended to promote discussion on safer flight-planning alternatives.

The majority of alternative routes (it does not take long to learn what they are) provide a much greater safety margin, and do not in fact add much to the total flight time – as the example given in the article demonstrated.

We were not suggesting that a flight should be planned so that it avoids every piece of rough terrain or body of water, but rather that safer alternative options must be considered, when available.

The section of the article entitled "Duty of Care" was intended to alert pilots to the fact that the concept of "duty of care" is becoming more prevalent within the New Zealand legal system, and that aviation is not exempt from the legal process in this regard. Its intention was to stress that a pilot **may** face legal action after an accident, if it can be shown that **no reasonable care** was taken in planning and conducting the flight with respect to inhospitable terrain. ■

Parachute Jump Pilot Notes

Photograph courtesy of Peter Ryan.

This article will be of particular interest to qualified jump pilots and parachutists, but some of the information may also be useful for pilots of other aircraft operating near Parachute Drop Zones, particularly those based on an aerodrome. The article has been adapted from notes compiled by Peter Ryan, Chief Jump Pilot for Skydive Waikato, and retired airline captain Jim Woodhams. Peter has considerable experience in parachute jumping operations, more than 7000 flying hours and around 5500 parachute jump flights.

Aircraft Types

The selection of an aircraft for parachuting operations is a specialised task that must take into account a number of factors. These include the engine, airframe, interior, exterior, general aircraft condition, and the safety of the jumpers on board.

Often, the general opinion of aircraft operators that are approached to hire their aircraft for parachute jumping operations is that it will end up with a wrecked interior and cracked cylinders as a result of descents conducted at high airspeeds with the throttle closed. While this may be true in isolated cases, the majority of jump pilots are very skilled at minimising aircraft 'wear and tear' and engine cooling stress during the descent. Most parachuting organisations endeavour to utilise pilots who are not only proficient and safety orientated, but who also have a keen interest in, and a complete understanding of, the sport.

The following types are commonly used as jump aircraft in New Zealand:

Aircraft with Front Exits

Aircraft with righthand front door exits are the Cessna 172, 180, 182, and 185, which are desirable for the new jump pilot for the following reasons:

- The pilot has full view of the jumpers on exit.
- The aircraft centre of gravity (C of G) will remain within limits and will therefore retain stable characteristics at the exit speed.
- A front exit provides better access to the jumpmaster to give wind-line instructions and power-off commands. It also enables the pilot to assist the jumpmaster with a problem student or any emergency should it arise.
- It allows the anchor point for the static line to be checked and confirmation that the karabiner has been locked. It also provides early warning of the pilot-chute popping out – or of a premature canopy deployment.

For information on the require-ments for a parachute drop rating, refer to CAR, Part 61 *Pilot Licences and Ratings*, Subpart N and its associated Advisory Circular AC61-1.14.

"As the jumpers exit… some aerodynamic buffeting will be experienced. This must not be confused with the stall."

Aircraft with Rear Exits

Aircraft with rear-door exits are the Piper 32, Cessna 205, 206, 207, and 402. In addition to the pilot having limited visibility of jumpers exiting the aircraft, rear-door aircraft can be prone to substantial rearward C of G movements. Note that jumper exits from rear-door aircraft can involve up to four people hanging outside the aircraft, with two more in the doorway, thereby creating a large aft C of G moment.

Preparation

The following points need to be considered before a parachute jump flight takes place:

- The location of the parachute target within the drop zone needs to be checked.
- The door retaining hook on high-wing front-exit aircraft should be removed. This has been known to foul on canopy containers and deploy the parachutes. Also ensure that the wind deflector is securely attached to the aircraft.
- Make sure that a knife is carried on board, to cut a static line or a fouled canopy if necessary.
- Ensure the security of the anchor point and that the karabiner meets the required safety regulations.
- Because of the repetitive nature of parachute jumping operations, and the fact that the jump pilot can be exposed to extremes of temperature and pressure for considerable periods, it is essential that appropriate clothing is worn for the conditions. Having access to food and liquid helps too. Preventing low blood sugar levels and dehydration is important for pilot performance and decision making.

Aircraft Loading

The aircraft's engine should be shut down before loading begins, to avoid the possibility of a parachutist walking into a turning propeller.

As loading begins, check the static fine-pins for correct installation and that an extra stow of the static line is secured to the parachute container by a rubber band.

Load the heaviest jumper in the front of the aircraft. Care should be taken that static lines are stowed neatly behind the jumper's pack to avoid entanglement.

Ensure that all static lines are attached and that the karabiner is locked. Where possible, check that the auto-opener is turned on – the jumpmaster should also confirm this.

If any irregularity with the equipment is noticed, it must not be touched, and it should be reported to the jumpmaster or an instructor.

C of G Considerations

The C of G position is a factor that must be considered at all times when loading an aircraft with jumpers – particularly if it has rear exits. Unlike normal aircraft operations where the C of G remains fairly constant, parachute jumping generally involves large changes in C of G. The jump pilot must accept responsibility for loading the aircraft **at all times** which may involve disrupting a planned jump. Remember that disrupting a jump is **a small price to pay** to ensure the safety of the operation.

Tailwheel Aircraft

The C of G can be critical when loading a tailwheel aircraft. Having an aft C of G can often make takeoff and landing in crosswind conditions hazardous due to a large aft moment. Great care is required if a crosswind landing is necessary with the jumpers still on board. Aircraft stability and climb performance must also be taken into account when loading takes place.

Nosewheel Aircraft

Nosewheel aircraft generally do not have the same controllability problems on takeoff and landing as tailwheel aircraft do, but aircraft stability and climb performance can be drastically reduced if the aircraft is incorrectly loaded.

Free-Fall Jumpers

Free-fall jumpers need to have exit positions which enable them to build their formations in the correct sequence. These positions are worked out on the ground and a 'dirt dive' rehearsed. Caution should be exercised when loading begins as most jumpers have little, or no, knowledge of aircraft loading requirements. Heavier jumpers often want to be loaded in the rear of the aircraft which can compound any C of G problems.

The Climb and Jump Run

Normal climb speeds and power settings should be used. It is also recommended that turns be restricted to Rate 1 to minimise the apprehension a jumper (particularly a student) might feel when sitting by the open exit.

Drifter Run

Commence the drifter run by flying down the wind-line at 2000 feet, directly over the ground target. Directions down the wind-line will be given by the jumpmaster using a combination of voice communications and hand signals. Signals used will be "left, right, steady, and power off" at which point the drifter will be dispatched. The climb should be continued to the drop altitude such that the drifter is always kept in sight of the jumpmaster. The point at which the drifter lands will give the wind-line that establishes the exit point for jumpers upwind of the target.

The Jump Run

At the commencement of the jump run, check that the target is still in position. If it has been rolled up, or instructions are received from base radio to abort, then the jump must not proceed. Obtain the required air traffic control clearance and notify aerodrome traffic on the local frequency that the drop zone is active. Jump-run calls should be made at five, three, and one minute intervals prior to the drop.

Try to make the jump run of three to four minutes duration to allow the jumpmaster to guide the aircraft accurately to the exit point. Coarse rudder corrections should be made to provide flat turns. The duration of the jump run should also be sufficient for the engine temperatures to stabilise. Thermal shock should be minimised by slowly reducing the power and airspeed together.

Check the wheel brakes are on, but **do not** use the park brake. At the 10-second call by the jumpmaster, slowly reduce power and airspeed together and close the cowl flaps if applicable. Reduce power to between 1500 and 2000 rpm and airspeed to a minimum of 10 knots above the stall. Keep the wings level as the jumpers commence exiting the aircraft, remembering that the drag and yawing moment will increase. Check again for traffic, below you and on the airfield. Due to the possibility of damaging the aircraft after the jumper has exited, do not increase engine power until the free-bag – or static line – is brought back into the aircraft.

Engine Handling

Maintain normal climb power settings with constant reference to the cylinder head and oil temperatures. Cowl flaps should be utilised as required. The mixture control should be left in the FULL RICH position for as long as possible to cool the engine, but above 5000 feet can be leaned slightly in order to maintain maximum climb power.

As the jump run progresses, slowly reduce power and airspeed together, being careful not to reduce the rpm below the recommended minimum so that large decreases in cylinder head temperatures are avoided. At exit, increase power to the cruise setting and lean the mixture appropriately.

The cowl flaps should be closed for the descent, the mixture correctly leaned, and the maximum recommended rpm used (airspeed must be maintained within the green range) to retain engine heat. The descent should then be continued into an area clear of other traffic and a circuit made that avoids a long glide approach.

Exiting the Aircraft

The exit configuration is the phase of flight that may cause the most anxiety to the new jump pilot. It will be the first time that they have flown an aircraft with people hanging outside.

Continued over...

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Exit Speed

This will vary from 55 to 80 knots depending on the type of operation. For student parachutists, keep the airspeed low to make it easier for them to climb out of the aircraft. This will also increase the student's ability to hear the commands of the jumpmaster. As the jumper climbs out, there will be considerable drag on that side of the aircraft – which requires positive control inputs to maintain the desired heading. If the strut- hanging method is used, the increase in drag will cause adverse yaw towards that strut and mean that large aileron and rudder inputs are required to maintain heading and balance.

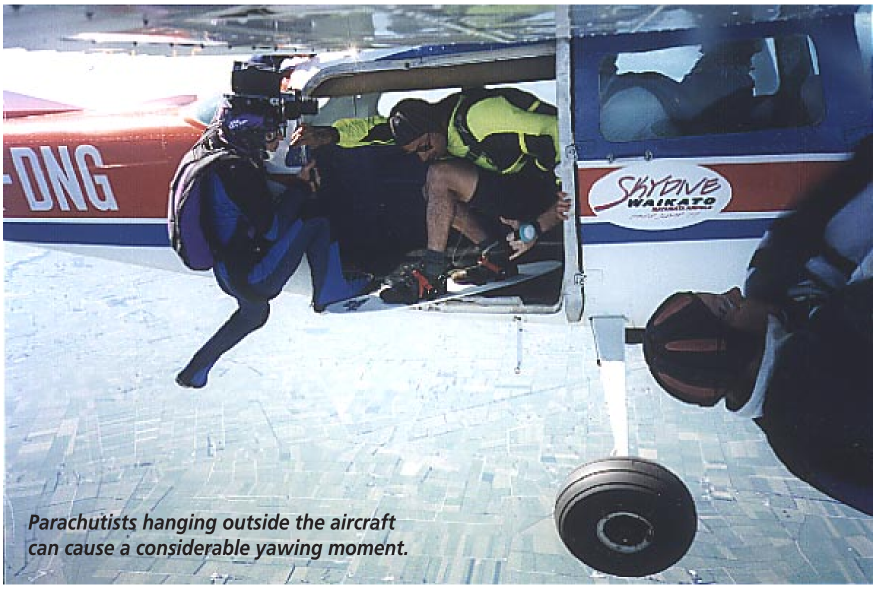
Free-Fall Jumpers

The airspeed for a free-fall exit will be slightly higher than that for student jumpers. As the jumpers stack the exit into the airflow, some aerodynamic buffeting will be experienced. This must not be confused with the stall. Buffeting will be more pronounced with aircraft that have a rear-door exit, due to jumpers being closer to the tailplane and disturbing the airflow over it. The jump pilot must ensure that a constant attitude is maintained until the jumpers complete their exit, as there will be some involuntary pitching of the aircraft due to elevator blanking as the jumpers exit.

Extreme care should be exercised when jumpers are 'stacking' on an aircraft that has a rear exit – as the C of G can go well beyond the aft limits of the aircraft. If the aircraft goes beyond the basic stall and enters an involuntary spin, the jumpers on the outside will be thrown off. This does not create a major problem in its self, **but** the jumpers left inside will most likely be pinned to the rear bulkhead giving an extreme aft C of G causing the spin to 'flatten out'. This may result in a situation where recovery from the spin is not possible.

Handling In-flight Problems

Knowing how to identify, and respond to, any one of a large number of potentially hazardous situations is extremely important as a jump pilot.



Parachutists hanging outside the aircraft can cause a considerable yawing moment.

Photograph courtesy of Peter Ryan.

Student Hesitation

Some student parachutists may be reluctant to jump and therefore hang on longer, or in fact refuse to jump altogether. This is most likely with strut type aircraft. If this is the case then:

- Keep the airspeed low.
- Make a gentle turn towards the student and attempt to hold the same spot for the exit. The jumpmaster will give the necessary guidance to ensure that the appropriate position is maintained.

If an attempt is to be made to bring the student back in to the cabin, extreme caution must be exercised because of the danger of canopy deployment. This practice should be discouraged.

Premature Parachute Deployment

This occurrence is difficult to detect in aircraft with the rear-door exits. There is little that can be done to prevent this putting the pilot-chute over the tailplane. If this does happen, it is recommended that you take the following action:

- Decide if the aircraft is still flyable.
- Try to maintain control until all jumpers are clear.
- If it is necessary for you to bail out, an early decision is imperative.

Premature parachute deployment in aircraft with front exits gives more chance of the situation being saved as the jumpers are in full view and you may see the deployment commence. It is recommended that full right rudder and left aileron be applied at the same time. This will induce a rapid left-hand sideslip that will normally cause the pilot-chute to miss the tailplane.

Premature parachute deployment can be caused by a number of equipment failures such as the closing-loop on the container breaking, the pilot-chute escaping, the static-line fouling, the jumpmaster kneeling on the static line, or even the airflow over the static line deploying the canopy. In respect of the latter, it is essential that the closing-loop be subjected to frequent, and thorough, checks for slackness and wear. It should be replaced if necessary. The 'Bunny Tail' deployment system is particularly prone to becoming dislodged through movement of the jumpers within the aircraft, and it is strongly recommended that jumpers carry out a pre-exit 'buddy check' on all types of deployment systems prior to the jump run.

Jumpers in Tow

Most light aircraft under 200 hp would have difficulty in maintaining altitude with a jumper in tow. The jump pilot should select maximum power and avoid making turns, if possible, until the jumpmaster has taken the necessary action to remedy the situation. All jumpmasters carry a karabiner to enable them to travel down the static line to reach the pupil. The writer has yet to actually see this happen, and has serious doubts as to the outcome of such a manoeuvre being successful. In view of the possibility of losing the aircraft and its occupants under these circumstances, it is recommended that the static line be cut by the jumpmaster.

Night Operations

The dropping of jumpers at night requires some modifications to the techniques that have been mentioned so far, due to the fact that the jumpers are not visible to the pilot. Jumpers also have to carry an array light (a small chemically activated light) to verify altimeter readings. These light sources can create an additional hazard by causing the loss of the jump pilot's external reference during the climb. The writer can vouch that this is a very dangerous situation, and that jumpers should be asked to devise a temporary cover for their array lights to minimise the problem.

Fuel

Sufficient fuel and oil should be carried to reach a suitable alternate aerodrome. On one occasion, when returning from a high altitude night drop, the writer had only six lanterns visible along one side of the runway while on approach and was not carrying sufficient fuel to divert to a suitable alternate aerodrome. On this occasion, a successful landing was achieved without incident.

Landing Back

A base radio is also required for night operations. If the aerodrome does not have an ATC service, then a landing must not be made back at the aerodrome until all jumpers have been accounted for. If a jumper should be injured on the runway, for example, this information must be passed to the pilot who will hold clear until the situation is rectified and the runway cleared. In extreme cases, this could be 45 minutes or more – another good reason for always carrying sufficient fuel.

> *"In view of the possibility of losing the aircraft…it is recommended that the static line be cut by the jumpmaster."*

The descent should always be made outside the circuit area, and well clear of upwind side of the target, to avoid a possible collision with a jumper who may have opened high.

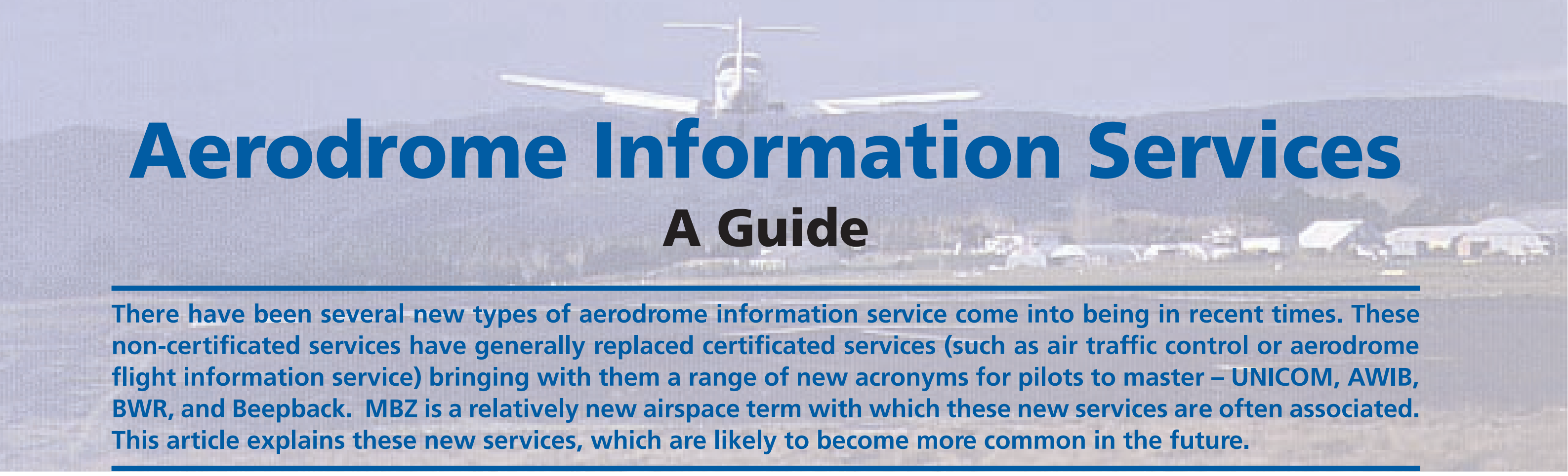
Summary

Parachute dropping is a very specialised operation with no room for error. Whether you are a jump pilot, instructor, jumpmaster, or a parachutist, the operating procedures that have been outlined in this article should be followed – they will reduce the chances of getting something wrong.

This article has hopefully provided an insight to the problems that the parachute jump pilot faces to pilots of other aircraft that are operating in, or near to, an active parachute drop zone. Promoting a better understanding of the other parties' needs by sharing information will always be important in improving aviation safety within the general aviation environment. ■

Look before you leap!

Kermit Ryan and Sol Vallis free-falling near Mount Maunganui. Photograph kindly supplied by Peter Ryan of Skydive Waikato.



Aerodrome Information Services

A Guide

There have been several new types of aerodrome information service come into being in recent times. These non-certificated services have generally replaced certificated services (such as air traffic control or aerodrome flight information service) bringing with them a range of new acronyms for pilots to master – UNICOM, AWIB, BWR, and Beepback. MBZ is a relatively new airspace term with which these new services are often associated. This article explains these new services, which are likely to become more common in the future.

UNICOM

What is a UNICOM?

A UNICOM is an aeronautical service to aerodrome traffic which is designed to fill the gap between an aerodrome flight information service (AFIS) and no aerodrome service at all. The name is derived from the American term "Universal Communications". While UNICOM is a relatively new term for most New Zealand pilots, there has, in fact, been a UNICOM type service operating at Mount Cook Aerodrome (Mount Cook Radio) for some years.

With the withdrawal of the AFIS from Taupo and air traffic control (ATC) from Ardmore, UNICOM stations have recently been installed at both of these aerodromes. It must be emphasised that a UNICOM service **is not** an air traffic service, meaning that pilots must accept more responsibility for their actions than when operating in a controlled aero-drome circuit environment for example.

How is a UNICOM different?

The table below indicates the main differences between a UNICOM, AFIS, and ATC. As indicated, a UNICOM operation is not certificated under the Civil Aviation Rules, although other services associated with the UNICOM can be. Ardmore and Taupo, for example, provide full meteorological information that is certificated under CAR, Part 174 *Aviation Meteorological Service Organisations*.

A UNICOM **can not** provide traffic information derived from the observations of the UNICOM operator, nor are they required to maintain a visual, or radio, watch on aerodrome operations. They can, however, relay pilot position reports, or make a general broadcast to all aircraft. Broadcasts are likely to include information about inbound IFR traffic for example.

Pilots operating in the UNICOM environment must ensure they maintain traffic awareness and a listening watch at all times. Remember that rule 91.223 *Operating on and in the vicinity of an aerodrome* requires pilots to conform with, or avoid, the traffic pattern formed at an uncontrolled aerodrome. You must not conflict with other aircraft that are already established in the circuit traffic pattern. Runway-in-use changes need to be carefully coordinated too, so as to avoid a possible conflict of circuit directions.

What oversight of UNICOM operations does the CAA have?

The 1990 Civil Aviation Act allows the CAA to conduct safety audits of any aviation related service. The CAA will propose that only those operations that meet the means of compliance published in a proposed Advisory Circular on UNICOM facilities (under CAR, Part 139 *Aerodromes Certification, Operation and Use*) should be able to use the radio callsign "UNICOM".

What else can UNICOM provide?

Depending upon what the aerodrome operator requires, UNICOM stations may provide information on aircraft parking, call a taxi for you, or even just direct you where to pay your aerodrome landing charges.

Who can be a UNICOM operator?

Although UNICOM operators are not certificated under CAR, Part 65 *Air Traffic Service Personnel Licences*, some will have come from a pilot or an air traffic services background. Those that do not have an aviation background are expected to complete more extensive training.

UNICOM	AFIS	ATC
Non-certificated (CAR Part 172).	Certificated under CAR Part 172.	
Operates as required – hours of service may be published.	Operates published hours.	
Advises the preferred runway-in-use.	Designates the runway-in-use.	
UNICOM operators are not certificated (CAR Part 65).	Flight service operators certificated (CAR Part 65).	Air traffic controllers certificated (CAR Part 65).
May relay specific position reports.	Provides traffic information.	Provides aerodrome control service, traffic information, and traffic avoidance advice.
Provides information relating to the physical characteristics of the aerodrome, and hazards to navigation in the vicinity of the aerodrome.		
May alert aerodrome emergency services. No formal alerting service is provided.	Provides an alerting service and an emergency aerodrome service.	
May provide basic weather reports if not Part CAR 174 certificated.	Provides meteorological information and briefing information if CAR Part 174 certificated.	

Aerodrome Weather Information Broadcasts (AWIB)

AWIB stations are normally recording facilities that broadcast weather and aerodrome information on a specified frequency that is published in the VFG. AWIB is a term peculiar to New Zealand. An AWIB is not part of an air traffic service and therefore does not have to be certificated under CAR, Part 171 *Aeronautical Telecommunication Service Organisations – Certification*. Because AWIBs are not certificated, there is no assurance that the information they provide is reliable. AWIB information can **not** automatically be taken as gospel. It would be prudent to avoid relying on it solely; and where possible it should be cross-referenced with other information.

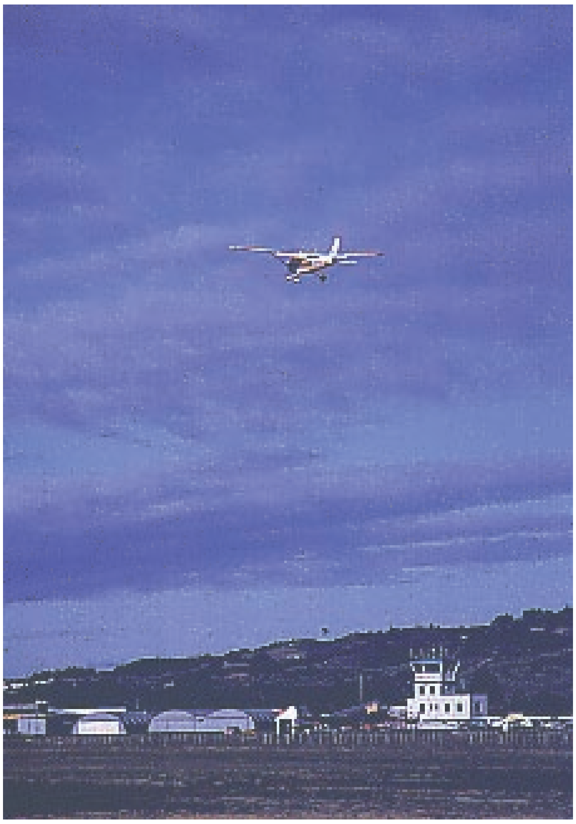
Air traffic service units use a similar facility called an Automatic Terminal Information Service (ATIS). This is certificated under CAR, Part 171, and its information can be taken as gospel.

Basic Weather Reports (BWR)

BWRs are verbal reports that are made on the actual weather conditions in the vicinity of a particular aerodrome or place. CAR, Part 174 *Aviation Meteorological Service Organisations – Certification* sets out the requirements for people providing such reports. When BWRs are provided by a UNICOM or Air Traffic Services operator (by RTF voice) they can be accorded a level of confidence. This is because these operators comply with the respective meteorological or air traffic service rules. On the other hand, BWRs provided outside this framework should not be treated with the same level of confidence.

Beepback

Beepback units originally came from Australia, but they are now used in New Zealand at some UNICOM stations. The purpose of the Beepback unit is to provide confirmation to pilots that they are on the correct aerodrome frequency, and that their aircraft radio is operating correctly. The Beepback unit can be set to the aerodrome frequency to respond to an aircraft transmission when there have been no other broadcasts within a specified time period (normally five minutes). It provides confirmation of being on that frequency. If, for example, there have being no transmissions on Ardmore 118.1 for the last five minutes, then the Beepback will respond with "Ardmore 118.1" immediately after a transmission is made. Once a transmission has occurred within the specified period, the Beepback will respond to a transmission of three seconds or more with just a single "beep".



Mandatory Broadcast Zones (MBZ)

Why are MBZs designated at some UNICOM aerodromes?

MBZs are normally established to improve safety levels at busy uncontrolled aerodromes or high traffic density regions. This includes some UNICOM aerodromes that have a large number of traffic movements. Australia too designates MBZs in a similar way.

What do I need to do to operate within an MBZ?

Your aircraft needs to have a serviceable radio on which you can report your position, altitude, intentions at entry, exit (this means prior to taking off from an aerodrome located within an MBZ), and at specified minimum periods while operating within the MBZ. Ardmore has a minimum reporting period of five minutes for example, while Taupo has a period of 10 minutes. Obviously, if you are flying around the circuit at these aerodromes the normal circuit radio calls will fulfil the MBZ reporting requirements.

In addition, aircraft that carry anti-collision or landing lights must have these switched on while operating within an MBZ.

What happens if I have radio failure in an MBZ?

If you are operating within, or are about to enter, an MBZ and experience a radio failure, you must **carefully consider** what the safest course of action might be. If you are unable to continue your flight safely to an alternative aerodrome that is located **outside** an MBZ (eg, insufficient fuel, inclement weather), then you may consider the situation as an emergency and land **as soon as practicable**. Joining the aerodrome circuit to land must then be done with **extreme caution** – particularly if there are a number of other aircraft already within the MBZ.

If there is no reason why you can not continue to an alternative unattended aerodrome that is outside an MBZ, then you must do so. Section 13A *Duties of pilot-in-command and operator during emergencies* of the 1990 Civil Aviation Act does not allow the operational requirements of an MBZ to be breached unless the emergency involves danger to life or property. It also requires that there be "… no other reasonable means of alleviating, avoiding, or assisting with the emergency…" and that "The degree of danger involved in complying with the prescribed requirement is clearly greater than the degree of danger involved in deviating from it."

Any breach of the Act or Rules resulting from an emergency situation (such as entering an MBZ without a radio) must be reported under Section 13A of the Civil Aviation Act to the CAA, as soon as practicable.

Am I allowed to fly NORDO within an MBZ?

No, unless another party, such as a UNICOM or another aircraft, is able to

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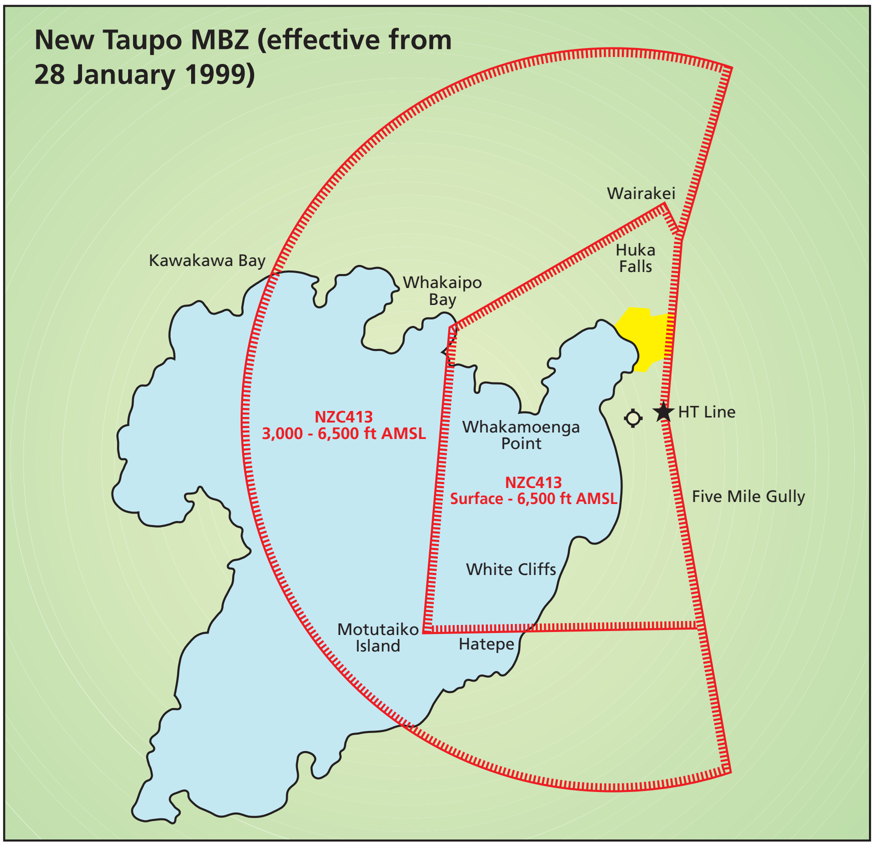
"broadcast on behalf" of your flight. This may occur in circumstances such as; parachute dropping where the jump aircraft broadcasts on behalf of the parachutists, or for formation flight where one aircraft is able to broadcast the formation's position and intentions.

Ardmore and Taupo Aerodromes

Pilots should note that there are specific operating procedures for the busy UNICOM aerodromes at Ardmore and Taupo. The procedures are detailed in the Aeronautical Information Publication, specifically in the *Instrument Flight Guide* and the *Visual Flight Guide*. It is strongly recommended that pilots familiarise themselves with the necessary operating procedures, and any applicable NOTAMs, before departing for these aerodromes.

Note that the Taupo MBZ is currently being amended and that the new changes will be effective from 28 January 1999 (see accompanying map for details). We suggest that if you are planning a flight near Taupo Aerodrome, that you obtain the most up-to-date information possible.

The CAA is also reviewing Ardmore airspace, which may result in amendments at the next chart cycle (15 July 1999), subject to industry consultation.



Summary

With the ongoing assessment of regional aerodrome air traffic service requirements by aerodrome operators, it is likely that we will see more UNICOMs and MBZs established around the country. It is therefore going to become increasingly important that you understand how they operate, what information they provide, and what they require of you as the pilot-in-command. ■

BFR Due?

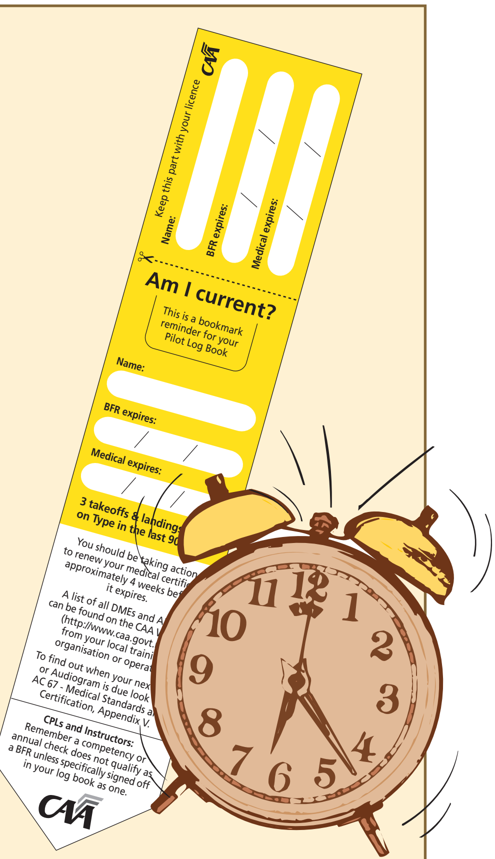
Several flight training organisations have recently reported that some pilots are forgetting when their BFRs are due and are expecting their training organisation to remind them.

It is important to remember that your local training organisation is not legally obliged to inform you of when your next BFR is due. It is, in fact, the responsibility of the pilot licence holder to check this and to arrange a renewal – preferably before the BFR expires.

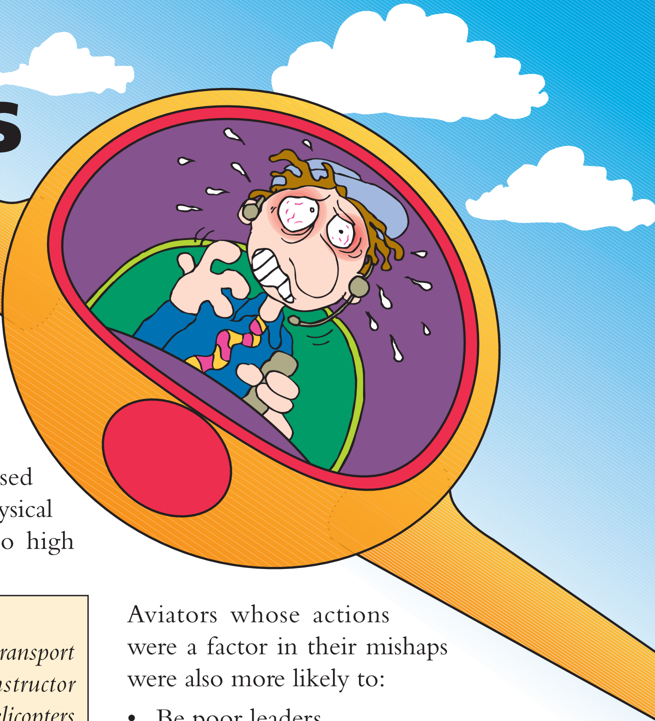
We suggest that you arrange a BFR renewal date that takes into account things such as the availability of a suitable aircraft and instructor, cancellations to bookings because of bad weather, and the need for additional training to reach the required BFR standard. Failing to have your BFR done on time will mean that you must revert to student pilot status (and consequently will be unable to carry passengers).

We suggest that you make use of the CAA's yellow pilot logbook markers. They are an excellent device for recording when your next BFR is due. They should be inserted at the logbook page that is currently in use – that way you should notice it each time you make a logbook entry. Note that the top portion of the logbook marker allows you to record your medical and BFR expiry dates together; keep this part separately with your pilot licence.

Next time you do a BFR, ask the instructor doing the renewal to provide you with a logbook marker. It can be filled out on the spot after you have successfully completed the BFR. Logbook markers can also be obtained from your local training organisation or aviation doctor. ■



Managing Stress



This article by Joel S. Harris of FlightSafety International appeared in Flight Safety Foundation ***Helicopter Safety****, Vol 21 No 1, Jan-Feb 1995. Although directed at helicopter pilots, the topic is equally applicable to all pilots – and not only pilots.*

Stress is a normal part of life, and up to a point can be beneficial in critical situations. But pilots must take care that daily stress plus ordinary cockpit stress do not combine to threaten safety at times of severe flying difficulty.

Many helicopter pilots thrive on the stress and challenge inherent in aviation. Nevertheless, individual differences exist in stress-coping ability, and the cumulative effect of the stresses of daily life combined with those of the cockpit may result in overload. Degraded performance levels, unnecessary risk taking and interpersonal problems may result. It is in the best interests of both pilots and employers to work toward developing ways to eliminate, moderate and cope with stress.

Failure to manage stress often leads to eroded judgment, decreased performance, inattention, loss of vigilance and preoccupation. A pilot suffering from stress tends to forget or skip procedural steps, accept lower performance standards and exhibit a tendency toward spatial disorientation and misperceptions. These misperceptions may result in misreading maps, charts and checklists, misjudgment of distance and altitude and loss of time perception.

Signs of high levels of stress in individuals include:

- Headaches,
- Insomnia,
- Upset stomach or digestive changes,
- Emotional fatigue,
- Nervous habits such as nail biting,
- Irritability with friends and relatives,
- Pessimism,
- A sense of being victimised or unappreciated,
- Inappropriate laughter or aggressive behaviour,
- Distraction or difficulty in thinking,
- Tense and aching muscles,
- Decreased coordination,
- Frequent yawning, and
- Slowed or slurred speech.

The term "burnout" is often used to describe a combination of physical and psychological responses to high levels of chronic stress.

> ***About the Author***
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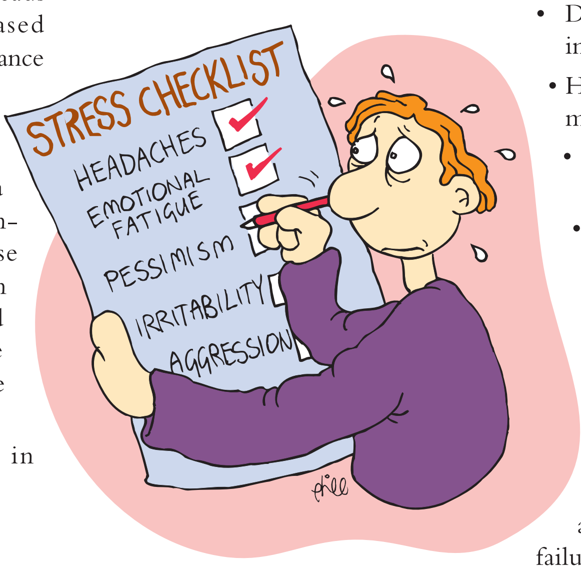

Personal Traits Can Make Coping With Stress Harder

Personal problems or dysfunctional behaviours interfere with coping strategies that can be adopted to reduce the effects of stress. In a study of more than 700 naval aviators who had been involved in major aircraft mishaps over a four-year period, it was discovered that those aviators who exhibited the symptoms of inadequate stress coping were more likely to contribute to an aircraft mishap.[1]

Aviators whose actions were a factor in their mishaps were also more likely to:

- Be poor leaders,
- Be less mature and less stable,
- Lack an adequate sense of their own limitations,
- Lack professionalism and the ability to assess trouble-some situations,
- Have financial problems,
- Have trouble with relationships,
- Have trouble with superiors and peers,
- Drink to excess or to have recently increased their alcohol intake,
- Have recently become engaged to be married,
- Be making a major career decision, and
- Have undergone a recent personality change.

The study found that many of these factors were associated with individuals who had little or no introspective ability. When confronted with a stressor such as the failure to achieve a goal, the aviators turned frustrations outward and projected the cause of their failure onto others. Symptoms of the inability to cope were manifested as "acting out" behaviour, which often contributed to trouble in interpersonal relationships and to aviation mishaps.

Stress Has Physical Symptoms

According to the *American Heritage Dictionary,* stress is "a mentally or emotionally disruptive or upsetting condition occurring in response to adverse external influences, and is capable of affecting physical health, usually characterised by increased heart rate, a

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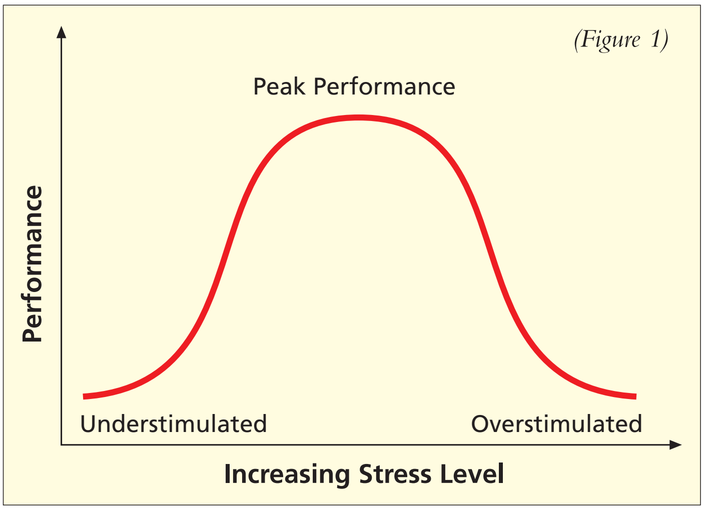
rise in blood pressure, muscular tension, irritability and depression."[2] A person in a physically or mentally demanding situation is said to be under stress.

But stress is a normal part of life, encountered at home, on the job and during recreational activities. The effect of stress on performance can be graphed as a classic bell curve (Figure 1). Moderate stress is a stimulus that enhances energy, awareness and perhaps motivation to succeed, and tends to positively affect performance. Nevertheless, as stress levels increase, eventually performance begins to decrease. When this point is reached varies from individual to individual. The ability to cope with stress also changes during the course of a person's life.

Performance vs Stress Level



(Figure 1)

The U.S. Department of Transportation's *Airman's Information Manual (AIM)* in a section headed "Fitness for Flight," declares that "stress from the pressures of everyday living can impair pilot performance, often in very subtle ways. Difficulties, particularly at work, can occupy thought processes enough to markedly decrease alertness. Distraction can so interfere with judgment that unwarranted risks are taken, such as flying into deteriorating weather conditions to keep on schedule."

The *AIM* also notes: "Most pilots do not leave stress 'on the ground.' … Certain emotionally upsetting events, including a serious argument, death of a family member, separation or divorce, loss of job and financial catastrophe, can render a pilot unable to fly an aircraft safely. The emotions of anger, depression and anxiety from such events not only decrease alertness but also may lead to taking risks that border on self-destruction."[3]

In a U.S. National Transportation Safety Board (NTSB) safety study of emergency medical service (EMS) helicopter operations, the NTSB included among its findings the observation that "… commercial EMS helicopter pilots work in a high-stress environment with rotating shifts; this predisposes them to acute and chronic fatigue. … Pilots are often under self-imposed and externally imposed pressure to complete EMS missions. These pressures can negatively influence pilot judgment."[4]

The NTSB's distinction between *acute* and *chronic* fatigue applies to stress in general. Acute stress arises from emergency conditions or particularly intense adverse circumstances. Chronic stress is the cumulative build-up of tension or depression resulting from a multiplicity of stressors in a person's daily life, such as those mentioned in the *AIM*.

When a particularly difficult flying situation – acute stress – is faced by a pilot who is also under chronic stress from personal situations and normal cockpit duties that are often demanding, the potential exists for a stress overload with dangerous consequences (Figure 2).

"…while returning to the airport the B-707 lost power in all four engines and crashed…"

We cannot know what chronic stress, if any, affected the actions of a twin-turbine Sikorsky S-76 pilot involved in an accident near Angleton, Texas, U.S. But we can be sure that acute stress was present. Experienced helicopter pilots know that a case of inadvertent flight into instrument meteorological conditions (IMC) is inherently stressful. And when it occurs without a qualified copilot and without instrument approach plates, the acute stress is compounded.

The Sikorsky S-76 was on a night instrument landing system (ILS) approach to the Brazoria County Airport (LBX), Texas, when it crashed about one mile from the outer marker. The helicopter was destroyed and the two crew members were killed.

The aircraft had departed the company heliport on a night maintenance test flight to perform an in-flight check of the main rotor system following replacement of a blade dampener. The pilot in command was a fully qualified airline transport pilot (ATP) with more than 6,400 hours total time, and 1,200 hours in the S-76. The left seat was occupied by a maintenance technician.

The weather was reported to be 400 feet (122 metres) overcast and three miles (4.8 kilometres) visibility, with fog and haze. After receiving a full weather briefing, the pilot departed, and shortly after takeoff, contacted base operations on company frequency, reporting that he had inadvertently encountered IMC. Because he had no instrument approach plates on board the aircraft, he asked the radio operator, a fully qualified S-76 captain, to relay information to him from the approach plate for the ILS Runway 17 at LBX. As the radio operator briefed the approach, the pilot replied "check" after each item.

- "Heading one seven four," the radio operator said.
- "Check," the pilot said.
- "ILS frequency one zero nine point one."
- "Check."
- "ADF [automatic direction finder] two three six."
- "Check."

After receiving the information, the pilot contacted Houston approach control and requested the ILS approach. Vectors were provided to him and he was cleared for the approach. The pilot made three separate attempts to establish the aircraft on the approach; the last attempt was a "no-gyro" approach. During the attempts, simultaneous radio contact was maintained with approach control and company operations. Air traffic control (ATC) radar later revealed that the aircraft's ground speed varied from 28 knots to 106 knots.

Just prior to the accident, the pilot said on the company frequency, "… I've got an attitude problem." After a three second delay he added, "… I am going to crash."

The radio operator replied, "… pull power, cruise power, pull power. Wings level, needle ball and airspeed, altitude.

Get a climb going."

There was no reply.

The wreckage was found approximately one mile (1.6 kilometres) northwest of the outer marker. There was evidence that the main rotor blades had struck the tail boom and the radome, and then the blades had separated in flight.

The NTSB determined that the probable causes of the accident were:

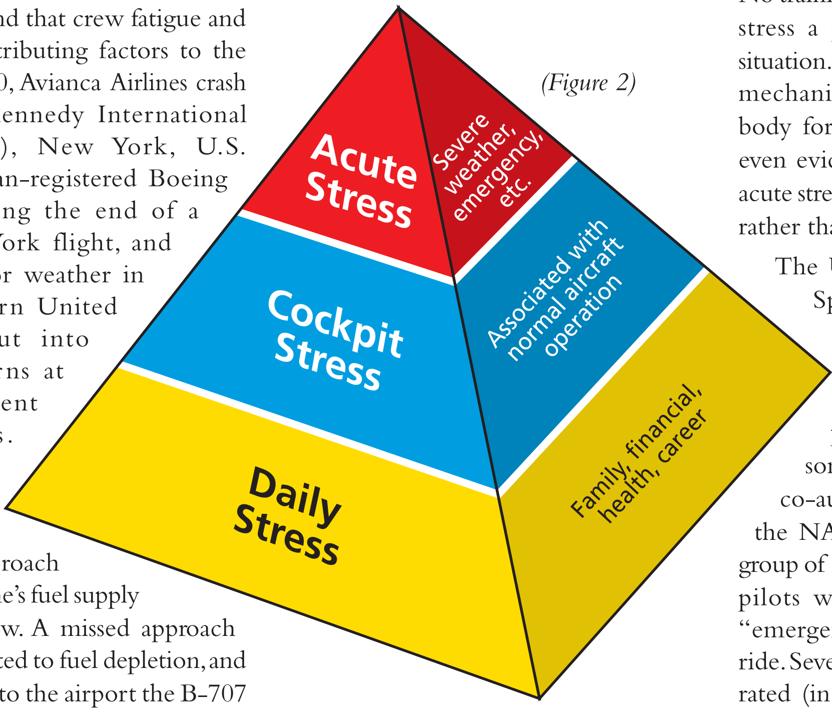
- The captain's inadvertent entry into IMC,
- Failure to maintain proper control of the aircraft,
- Spatial disorientation, and
- Exceeding the design stress limits of the aircraft.[5]

The NTSB found that crew fatigue and stress were contributing factors to the January 25, 1990, Avianca Airlines crash near John F. Kennedy International Airport (JFK), New York, U.S. [The Colombian-registered Boeing 707 was nearing the end of a Bogota-New York flight, and because of poor weather in the northeastern United States was put into holding patterns at three different intersections. By the time the flight crew received clearance to approach JFK, the aeroplane's fuel supply was critically low. A missed approach further contributed to fuel depletion, and while returning to the airport the B-707 lost power in all four engines and crashed at Cove Neck, Long Island, New York. Seventy-three of the 158 persons aboard died.]

The NTSB found that during an attempt to execute the ILS approach, the captain did not fly the approach in a stabilised manner, which led to a serious deviation below the glideslope. The crew executed a missed approach while at 200 feet (61 metres) above ground level (AGL) but still 0.8 miles (1.3 kilometres) short of the missed-approach point. The aircraft's fuel supply was exhausted while the aircraft was being vectored for a second approach. The NTSB determined that crew stress (possibly chronic, but certainly acute) was one of the factors that led to the unsuccessful completion of the first approach, and thus contributed to the accident.[6]

Stress Produces Autonomous Mode Behaviour (AMB)

Acute stress produces a high state of psychological and physiological arousal. This state of arousal is known as autonomous mode behaviour (AMB). AMB may be brought on by the abrupt onset of an in-flight emergency and is often detrimental to pilot task performance. Some symptoms of AMB are sweaty palms and increased heart rate, increased breathing and increased blood pressure. Another effect of AMB is that a pilot will tend to focus on one problem, while ignoring more critical information. This is commonly known as "tunnel vision." Situational awareness is severely diminished. Studies have shown that AMB is a contributing cause of some pilot-error aircraft accidents.[7]



(Figure 2)

Pilots know that high stress (resulting in AMB) has a negative influence on task performance and decision making. Thus, many pilots exert conscious effort to maintain a calm and relaxed outward demeanour as a means of coping during periods of high stress. Nevertheless, outward calm may only mask states of high physiological and psychological arousal.

The S-76 pilot evidenced no alarm when he found himself in IMC, and his responses to the radio controller were only the repeated "Check." In a statement to the NTSB the company radio operator reported that "at no time did [the pilot] seem anxious, excited, concerned seriously, as if he had a real problem. In fact, the statement of '… I am going to crash' sounded the same as his 'check' answers."

After the Avianca accident near JFK, ATC controllers who had been handling the flight said that the crew never communicated the severity of the aircraft's fuel state either through proper terminology, ie. "mayday" or "emergency", or through tone of voice. Instead, the first officer, when faced with impending fuel exhaustion, sounded calm and matter-of-fact.

Autogenic Feedback Training Can Counter Stress

No training can, or should, eliminate the stress a pilot feels in an emergency situation. Up to a point, stress is a valuable mechanism for energising mind and body for fast, decisive action. There is even evidence that training can reduce acute stress to a level where it is a stimulus rather than an additional safety threat.

The U.S. National Aeronautics and Space Administration (NASA) has sponsored research into pilot stress and AMB's negative impact on performance, which has yielded some interesting data. In a study co-authored by Patricia Cowings of the NASA Ames Research Center, a group of 17 active-duty U.S. Coast Guard pilots were subjected to an intense "emergency flying conditions" check ride. Seven of the pilots were fixed-wing rated (in the Lockheed Hercules HC-130) and 10 were rotary-wing rated (in the Aerospatiale HH-65).[7]

"The ability to cope with stress also changes during the course of a person's life."

To assess the individual pilot's performance during high levels of stress, compound in-flight emergencies were simulated. During the HH-65 emergency-flight scenario, for example, the pilot was asked to simulate a hoist operation lifting an injured boat crew member aboard the aircraft.

While in a 50-foot (15-metre) hover, the pilot was given a servo-jam warning followed by a secondary hydraulic failure indication resulting in locked tail-rotor

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pedals. On returning to base in the "impaired" aircraft, the pilot was given a simulated No. 1 engine stall while on short final to the heli-pad.

Instructor pilots served as observers and graded each pilot's performance in:

- Knowledge of aircraft and procedures,
- Technical proficiency,
- Control smoothness,
- Crew coordination,
- Internal and external communications,
- Motivation,
- Command ability,
- Vigilance, and
- Situational awareness.

Following the checkride, approximately half of the pilots (eight of 17) were subjected to twelve 45-minute sessions of autogenic feedback training (AFT). The other nine pilots received no AFT.

AFT combines biofeedback with autogenic training, and is designed to increase a pilot's ability to control their body's responses – heart and respiratory rates, perspiration, blood pressure and muscle tension – to stress. Autogenic training provides specific instructions on ways to control these responses. During a typical training session subjects are instructed in, and practice, such methods.

The training includes visual and auditory feedback indications of the body's responses. A case study of the effectiveness of AFT revealed that after six hours of training, one subject could voluntarily increase and decrease his heart rate by an average of 25 beats per minute.

At the conclusion of the training, all 17 pilots flew the simulated emergency scenario checkride again at approximately the same time of day and with the same check pilots as in the initial flight. The check pilots did not know which pilots had received AFT and which had not.

Comparison of the results of the final checkride revealed that AFT pilots showed significant improvements in every performance category, while pilots who did not receive the training showed no improvement. The success of this study should lead to further research and possibly the incorporation of AFT into some pilot training.

Chronic Stress Rooted in Day-to-day Activities

Chronic stress among helicopter pilots is found both in the line of duty and in daily life. Stress in the cockpit may be caused by difficult schedules, maintenance problems, personality conflicts, adverse weather, extended duty days, night operations, and boredom.

Helicopter pilots operating at low altitudes, where traffic is dense and the weather situation is unavoidable (and making multiple takeoffs and landings per hour), may be under particularly high stress.

Keith McCuthen, chief pilot of Indianapolis Helicopters, also sees stress as a generational symptom of the helicopter pilot population. Many U.S. commercial helicopter pilots began flying during the Vietnam era in the 1960s and early 1970s. "I see some of these pilots suffering from the effects of stress caused by frustration and worry over career and retirement," McCuthen said. "The room for advancement for pilots within a company is often very narrow. Pilots begin to wonder if this is really what they want to do for the rest of their lives. As we get older, we also begin to consider the possibility of retirement and all its ramifications. These can be sources of stress and may affect a pilot's job performance, if he becomes preoccupied by them."[8]

Chronic Stress Can Be Managed

Some stressors in daily life and in the cockpit can be reduced or can be eliminated. Stressors that an individual can control include excess travel time to and from the airport (by moving closer to work), harmful personal habits, ongoing interpersonal conflicts, and unsafe flying conditions.

One important stress reduction strategy is setting aside regularly scheduled free time for relaxation. Other strategies include learning to communicate better, thus helping to reduce interpersonal conflict, and maintaining a positive mental attitude. Gaining proper perspective on problems is not always easy. Many pilots believe that they are responsible for, and need to be in control of, every situation. This creates an unrealistic burden on the pilot and those around them. Gaining a realistic perspective can help eliminate this problem.

Although many things can be done to eliminate or to reduce the effects of stress and to relieve the discomfort it causes, some stress is inevitable. Accepting situations that cannot be changed is one form of coping. Good diet, adequate rest and exercise are also methods of coping with stress. Researchers at Stanford University, Palo Alto, California, U.S., studied more than 350 middle-aged men and women and found that those who engaged in regular exercise experienced a 30 percent reduction in levels of stress, anxiety and depression.[9] According to the International Society of Sport Psychology, the benefits of physical activity include relief of tension, depression and anxiety and the development of positive coping strategies.[10]

Laughter is a proven stress-coping mechanism. Laughter lowers blood pressure and lowers heart rate, and reduces production of the hormone cortisol, which is associated with stress.[11] Keeping a balance between work, family and recreation minimises the effects of stress.

Still, it is sometimes wise to seek professional help in dealing with personal stress. Stress in the cockpit can be managed by thorough planning before flight, avoiding stressful decisions by following regulations and company standard operating procedures (SOPs), taking a few deep breaths during stressful situations, keeping a disciplined focus on task performance to the exclusion of other worries, sharing the workload with other crew members, using all available resources including ATC and company operations, and recognising and taking action to avoid stress and overload. ■

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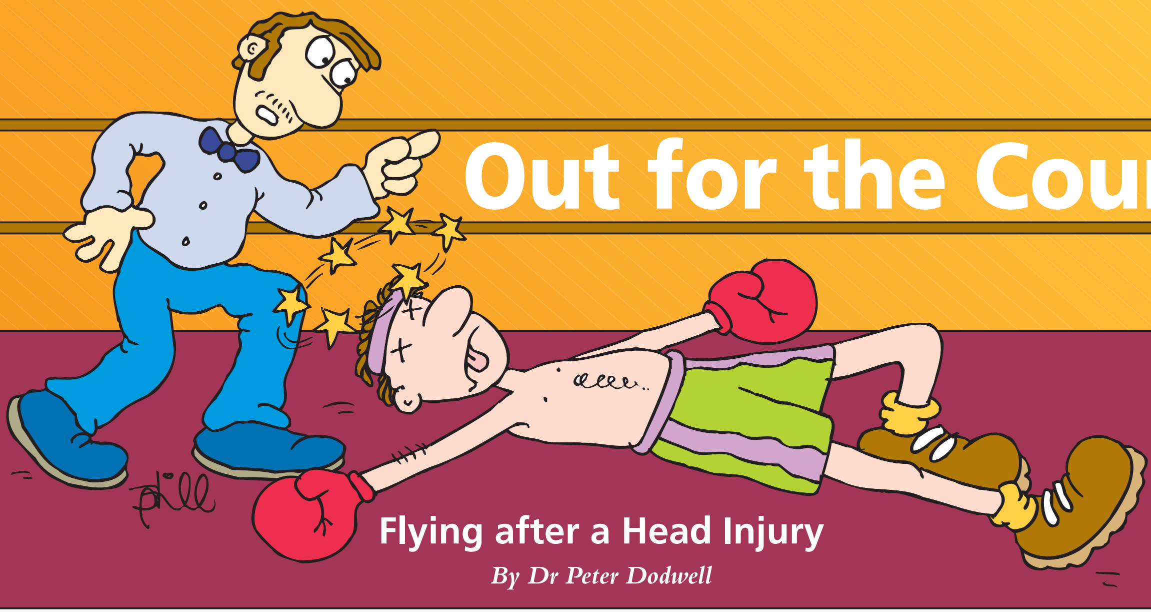
Out for the Count



Flying after a Head Injury

By Dr Peter Dodwell

Some years ago in New Zealand, a pilot suffered a seizure during a charter flight with five passengers on board. Fortunately, a PPL passenger was able to fly the aircraft for 40 minutes while the pilot recovered. The passenger later handed back control to the pilot, who managed to land. Since there is often a state of confusion immediately after recovering consciousness from a seizure, it is remarkable that a safe landing resulted. Investigation revealed that the pilot had suffered a head injury in a car accident six months previously.

Reporting a Head Injury

Readers may feel confident that they would always be sensible and avoid flying if they were experiencing problems after a head injury. But don't be so sure. Fitness after head injury is a tricky area of decision-making. The example given above was not a case of foolhardiness after a car accident, but instead was a genuine mistake – the pilot had been cleared to resume flying as the injury had been assessed as mild.

From time to time, the CAA Medical Unit learns of a pilot who has resumed flying not long after a head injury. This suggests that guidance is needed on this aspect of fitness to fly. What follows is not intended to make you experts in assessing a head injury, but does show the sorts of factors that need to be considered.

Newspapers often tend to highlight extreme cases – people with penetrating, or open, wounds to their head who are hospitalised for months and recover gradually. The patient's decision to ask an aviation doctor about their return to flying is therefore not usually a difficult one, and it is not surprising that it is often many years before they can fly again.

It is in the grey area of less severe head injuries that misunderstandings most often arise. So where, and how, do you draw the line with head injury, and what applies to those wanting to combine the pursuits of flying and contact sports such as boxing for example? Read on.

The Normal Brain

Pilots know how important a normally functioning brain is to their skills. The problem of fatigue is often debated. We have heard about "zero alcohol-levels" in terms of drinking and flying and about the effects of tranquillisers, sleeping pills, antihistamines, and other drugs which can slow thinking and reactions.

Yet a myth in Western society, fed by decades of exposure to heroes in movies and on the sports field, is that a person knocked unconscious can rise minutes later and function normally. In sports, this is often encouraged (although in sports such as boxing there are indeed rules for returning to the ring after a knockout). This cult of "the hero" has almost become the norm of Western society, and is very difficult to counter. So what are the realities of receiving a head injury?

Effects of Head Injury

The brain is a very soft organ, with about the consistency and strength of a jelly. Its support and protection comes almost entirely from being enclosed in the cavity of the skull.

When the head is suddenly struck, or comes abruptly to a stop, the contents of the skull slap around inside. Brain activity demands an extensive blood supply, so it is intimately entangled with a maze of blood vessels. These blood vessels can tear (with internal bleeding resulting), and soft brain tissue can also be damaged by an impact. Over the next few hours, or days, bleeding can cause further damage to nerve tissue by either splitting it or compressing it within the unyielding skull cavity.

This description is the "worst case", of course, and at the other end of the scale it is possible to have a mild head injury where the brain does not suffer any internal tearing or bleeding. But without special scans and x-rays, how can you tell the difference?

In terms of the patient's reaction, there are several problems associated with receiving a head injury:

- Immediately after the blow to the head is received there is a disruption of consciousness. This may range from just being dazed briefly to being completely unconscious – other temporary effects may also be suffered.

What happens over the next months, or years, inside the head of a person who has received a moderate to severe head injury is a bit of a mystery, and involves two other types of problem.

- They may suffer a disability or impairment as a result of brain damage. The undamaged brain tissue may be able to take over some of the functions of the lost tissue, but there are limits to this.
- There may be seizures. The initial damage can result in scar tissue slowly forming within the brain. But scar tissue can be a problem. It seems to sometimes disrupt the normal electrical activity of that part of the brain. This is presumed to be why epileptic seizures can develop in later years – these can develop even in someone who seems otherwise to have recovered.

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About the Author

Dr Dodwell is a specialist in occupational and aviation medicine based in Wellington, and was formerly Principal Medical Officer for the CAA

Disabilities and Impairment

In severe cases disabilities may prove permanent, despite some improvement over time. These may include paralysis of the limbs, difficulties with speech, or problems in thinking. There may also be permanent changes in personality. The remainder of this article does not dwell on these fairly clear-cut cases, which are unlikely to be assessed as fit to hold a medical, but instead looks at the less obvious cases.

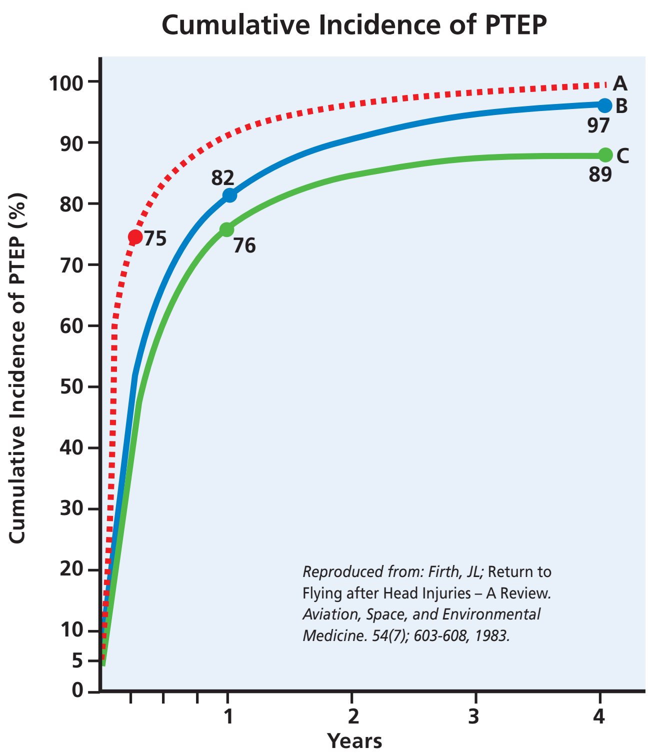
Even in cases with a closed head injury, and perhaps with no clear evidence of brain injury on a scan, there can remain subtle signs of disrupted brain function for some time afterwards. The person can feel confused, easily tire, suffer headaches, suffer depression, and have difficulty concentrating on some tasks. This is the post-concussional syndrome – often called "concussion".

CAA Medical Criteria

For those with less demanding types of work and a less severe post-concussional problem, a short period off work may be acceptable. But aviation (especially commercial aviation) is very demanding, and it is not possible to take a break from its demands once you are "up there".

The CAA often has to insist on a prolonged break from flying, and a careful evaluation of the recovery. This sort of evaluation (involving neurologists and psychologists) is time consuming, and the results are often difficult to relate directly to questions of flying skill. Computer-based tests with greater relevance to aviation (such as an American system called CogScreen) are currently under trial. Meanwhile, simulator and flight tests remain important – provided the flight examiner is clear what sort of problems to anticipate.

It is the uncertainties of post-concussional syndrome, especially in their subtle form, which make the CAA wary of allowing boxers in particular to fly. An aviation medical applicant was recently advised by his aviation medical assessor (AMA) to make a choice between learning to fly, or continuing as a boxer. The AMA felt that he was unable to certify the applicant fit unless the conflict was resolved. The CAA agreed, since the aims of being a boxer and being a pilot seem to be mutually exclusive.



The CAA has recently revised its "green form"– it is now called the *Notification of Medical Clearance* form. This form can be found on CAA's web site (www.caa.govt.nz) under the heading **Personnel Licensing – Medical Certificate – Medical Certificate Information – Keeping Current**. Head injuries can be found in the list of "Risky Conditions" on page two of the form. The list purpose is to remind pilots when they should consult an AMA before returning to flying. The AMA will then decide whether to refer to CAA for a special assessment.

Post-Traumatic Epilepsy (PTEP)

The risk of epilepsy is an important factor in the recovery process. Because the PTEP risk can persist long after a person feels completely back to normal, it can be the cause of great debate. There are a number of complex issues involved.

The CAA has set a limit of 1% per annum on the risk associated with suddenly becoming incapacitated from events such as cardiac collapse while flying in a multi-crew situation (see "What do you Mean, Doc?" in *Vector* 1998, Issue 1, for further information). This particular risk starts off as being very low in a young pilot, and gradually increases until, at age 60, the average reaches 1%.

In contrast to this, the normal risk of a pilot developing epilepsy, of any sort, does not alter very much with age, and is very low. For example, the International Airline Transport Association for airline pilots puts the average risk of developing epilepsy at 0.01% per annum. So, although a 1% incapacitation risk factor sounds low, if it was applied to the risk of developing epilepsy it would be 100 times higher than is presently being achieved.

Collapse from epilepsy is different from cardiac collapse because of the threat it poses to flight safety. When a person has a seizure it can be difficult to get them away from the controls, and there is a high likelihood that the spasms and involuntary movements caused by the seizure will interfere with the aircraft's controls. Dual controls do not resolve these problems (unless the incapacitated pilot's controls can be disengaged, such as in some wide-body airliners).

The CAA prefers to err on the side of caution when it comes to PTEP, and it is not convinced that multi-crew flying offers much of an advantage over solo flying. The 1% limit set for cardiac collapse is based on the assumption that one accident would occur for every 400 collapses in a multi-crew situation. For epileptic seizure this ratio may be nearer to 1 in 40 – thus the reason why the CAA is more likely to want the PTEP risk to be **below 0.1% per annum** before a pilot is permitted to return to flying.

How can we predict the risk of PTEP associated with a particular pilot after a head injury event? It is generally easy to identify those pilots who present a high level of risk and should therefore have their medical certificates revoked. The likelihood of PTEP is highest with a penetrating injury, or with those where significant brain injury can be demonstrated by scans done shortly after the injury. Another indicator is how prolonged the period of post-traumatic amnesia (loss of memory) was.

Despite the potential difficulty of the decision, in severe cases the question of a return to flying does not arise for some months because the patient is likely to have received other accident injuries that prevent them from holding a medical certificate. Thus there is plenty of time for specialists to look at all the evidence.

But with more moderate injuries, it is common for the injured person to have no apparent disabilities. These borderline cases present a dilemma. The majority of them will never develop epilepsy, and after a prolonged period of grounding may angrily say "I told you I was fine". But within this "grey area" group it is impossible to distinguish those who will have a seizure from those who will not. There is no reliable test for predicting PTEP before it strikes. Without such a test, CAA often has to make a decision based on average risks (erring on the side of caution).

It is difficult to explain to a pilot who feels completely well that the likelihood of PTEP is worth considering. Looking at how this risk progresses over time may help. The accompanying graph shows how the onset of new cases of PTEP tends to climb rapidly at first (from 75 to 90 percent of first seizures present within the first year) and then progressively levels off. In other words, this study shows that, if you are in a high-risk or moderate-risk group following a head injury, the chances are high that you will have your first seizure within the first year. Depending on the severity of the original injury, your risk of developing PTEP in subsequent years may remain unacceptable, but may gradually reach acceptable levels over several years. Or, in the most mild cases, it may reach acceptable levels within the first year.

Picking a clear point where normality will be reached is not an exact science. A certain amount of value-judgement may be appropriate in some cases. The final decision is affected by the class of licence involved and any safeguards which can be put in place. The CAA considers these types of situations case-by-case. A specialist neurologist is asked to look at the facts of the case and estimate the likelihood of PTEP at significant points in time. This may be within two weeks of the injury, or one year later. An estimate may also be made of when the risk is likely to reach less than 0.1%.

Head Injury Checklist

This checklist will help you plan what to do when a head injury has involved unconsciousness, confusion, or amnesia.

- Read the green *Notification of Medical Clearance* form.
- Do not resume flying until you have a written clearance from a CAA appointed medical assessor. It is not sufficient to be reassured by a doctor not appointed by the CAA.
- One of the most difficult situations is when detailed records are not available of the early effects of your injury. If the accident is far from home, someone must ensure that you are examined by experts and that records are available for the CAA to use later. A brain scan taken at this time can be very useful.
- Be prepared for referral to the CAA for special assessment.

Summary

Perhaps after reading this article you may see why participation in contact sports where head injuries can occur, such as boxing and rugby, can present problems when it comes to retaining an aviation medical certificate. Sports that carry a high risk of head injury are a personal choice, but if you have a career in flying (which would be affected badly by a sporting injury), then you need to consider your options carefully.

If you are a recreational pilot you may feel that the risk of receiving a serious sport's injury is small, but please don't blame the AMA if your injuries occasionally require a period of grounding. We just want to ensure that you remain safe. Be careful out there! ■

Consider Thy Neighbour

Minimum Height Limitations

Extracts from rule 91.311(a) *Minimum heights for VFR flights* (Civil Aviation Rules, Part 91 *General Operating and Flight Rules*) state that you must not operate your aircraft VFR:

"… at a height less than that required to execute an emergency landing, without hazard to persons or property on the surface, in the event of an engine failure …"; or

"… over any congested area … at a height of less than 1000 feet above the highest obstacle…"; or "… over any other area, at a height of less than 500 feet above the surface.";

unless you are conducting a takeoff or landing, a hover in ground effect in a helicopter, a baulked landing or discontinued approach, or operating an aircraft within a low flying area (LFA)* in accordance with rule 91.131.

There are many reasons for these minima. First and foremost is safety. Operating your aircraft so that you maintain a reasonable height above the ground will give you a chance to react in the event of an engine failure – or any other malfunction. In the case of a partial, or full, power loss (especially in a single-engine aircraft) there will be only limited time to recognise the situation, do the trouble checks, attempt an engine restart, and prepare for a forced landing if you are unable to rectify the situation. These height minima are intended to give you time and gliding range – remember that you can always set greater personal minimums to further reduce the risks. After all, one of the most useless things in aviation is altitude above you!

Another reason for these height minima is for the avoidance of obstacles. Buildings should be obvious, trees and terrain too,

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but there are many aerials and wires down there that do not mix well with aircraft. The recent Wirestrike Avoidance Seminars held in Auckland, Palmerston North, and Christchurch emphasised this point.

A further reason for having height mimima is **noise**. Aircraft are noisy, and the sound of an aircraft engine is not always music to the ears of others. Generally, an aircraft flying overhead at the legal height will not raise too many concerns – although there can be complaints when a ground observer thinks that it is "too low", is creating a danger, or is a disturbance. An aircraft operating over or near the same spot at minimum height can soon be perceived as a noisy nuisance. Aircraft noise may not just be noticed by humans though; it can also have an effect on livestock and pets. Remember also that some people may genuinely be scared of a low-flying aircraft.

LFAs

It is no surprise that these issues are even more sensitive in LFAs – especially those where there has been considerable land-use change over the years. Sensitivity to the needs of landowners who are under, or adjacent to, an LFA is critical. With the rights to use an LFA come responsibilities. We therefore have to be careful that we do not let the ill-considered actions of a few individuals jeopardise the future of any particular LFA.

Requirements

Rule 91.311 allows you to operate below 500 feet for the purpose of training within a designated LFA – provided that you have been briefed on the appropriate operating procedures by the LFA using agency and authorised by an instructor.

For an LFA to exist, the prospective using agency (usually a flight training organisation) must apply to the CAA with documented evidence that the landowner(s) below the LFA do not object to low-level training operations taking place there. If the CAA accepts that application, then the designated using agency (or agencies) is (are) required to ensure that training activities are carried out in such a way that they do not create any undue nuisance, or present a hazard to persons or property situated within, or adjacent to, the LFA. Note that using agency contact details can be found in the Air Navigation Register on the CAA web site and also in the RAC section of the AIP *Planning Manual*.

Operating Considerations

Many designated LFAs are located over farmland that the owners have agreed to make available for flight training purposes. Much of this land will have stock grazing on it, which can easily be disturbed (especially during lambing or calving), and therefore care is required when operating an aircraft in close proximity.

The same level of care and consideration should be applied when manoeuvring near houses and structures that are located within the LFA or adjacent to its boundaries. This is particularly important when climbing away following a simulated engine failure after takeoff (dual exercise only unless you are an instructor), forced landing without power, precautionary landing, turns that require high power settings, and when climbing to vacate the LFA. If possible, try to operate the aircraft in a portion of the LFA that keeps you away from stock and buildings when practising these exercises. Set up your exercise so that the resulting overshoot is directed away from any stock or buildings – this might also provide better forced-landing options in the event of a real engine stoppage.

When entering the LFA do not descend below 500 feet agl before reaching its boundaries, and take care not to fly over the tops of buildings during that descent. Similarly, when vacating the LFA, manoeuvre to a position that will allow you to climb to at least 500 feet agl (we suggest 1000 feet agl) before reaching its boundary. This will help minimise the noise levels to property owners adjacent to the LFA.

Personal Minimums

Remember that the Civil Aviation Rules provide the minimum operating parameters for the use of LFAs. Many flight training organisations have developed their own operating procedures and guidelines, designed with the landowner's needs in mind. Landowner cooperation and consent is essential to the continuance of many LFAs. If you are still concerned that your low-flying activities might be likely to disturb someone, then set your own personal limits to minimise the disturbance. Remember it is not just operating heights that you need to consider, but methods of entry and exit, and how operations within the LFA are carried out.

Review

As a result of some specific incidents, the CAA will shortly be conducting a review of LFAs. These events have simply brought forward the five-yearly requirement under the Civil Aviation Rules. It is strongly suggested that all designated LFA using agencies begin reviewing the status of their landowner or lessee consents, and that all relevant LFA operating procedures and briefing requirements be formalised so that these details may be promulgated for pilot use.

Summary

The use of LFAs for training is a privilege. To keep this privilege, it is important that all LFA operating requirements are observed. Thought must be put into LFA entry and exit procedures, and how training exercise are conducted within that LFA. It takes only one annoyed landowner to complain about aircraft misusing an LFA, and its designation could be put up for review. This could quickly become a problem for your training organisation; alternative sites may be difficult to come by and be some distance away. LFAs will always be an invaluable training resource, and it would be a pity if some of them are disestablished because of misuse by a small number of pilots.

The message is simple – if you abuse it, you may lose it. ■

** Note that the term LFA will shortly change to LFZ (low flying zone) so that it is consistent with terminology used for other pieces of airspace that touch the surface of the earth.*

Carburettor Icing?

Dave Leeming, CFI of Canterbury Aviation, wrote to us to share this sobering experience with Vector readers.

The Experience

Recently, while instructing a student in a low flying area (LFA), our Cherokee 140 suffered a sudden, and complete, engine failure during an overshoot from a precautionary landing.

We had been operating for approximately 20 minutes in fine weather with a temperature of 13 degrees Celsius and a dew point of nine degrees Celsius. The only significant weather at the time was an approaching squall line from the south.

Carburettor heat had been applied in the downwind prior to the descent and was left on until short final. The same technique had been used in previous approaches, and no icing had been detected. However, five to ten seconds after the application of full power, flap having been retracted to 25 degrees, the engine "coughed once" and then stopped.

A successful forced landing quickly followed. Unfortunately there was insufficient time to complete the trouble checks, so I am not certain that carburettor icing was the cause of the failure. The engine was subsequently found to have no other defects which might have caused the failure.

Currently, we apply carburettor heat prior to reducing power and use 'engine warms' to maintain heat in the induction system when simulating a precautionary landing. Carburettor heat is then removed before the overshoot from the approach is commenced. Is this a satisfactory technique, or can it be improved?

We also use carburettor heat just prior to the takeoff roll to check for, and clear, any ice that may have developed while taxiing. Any comments or thoughts on this subject would be appreciated.

Vector's Advice

Our thanks go to Dave for sharing this experience with readers. It certainly makes us think about what we can do to minimise the risks of developing carburettor icing when operating at low level in the bad visibility configuration.

Although there is not conclusive evidence to pinpoint carburettor icing as the cause of this engine failure, it is nevertheless a good catalyst to make us review the engine handling techniques associated with the bad visibility configuration.

Carburettor Icing Symptoms

Carburettor icing is usually characterised by decreasing engine rpm (or manifold pressure) and rough running. While rough running is an obvious symptom, a decrease in engine rpm may be more subtle and can be mistakenly attributed to factors like throttle fiction nut position, turbulence, or variations in airspeed.

> *"…five to ten seconds after the application of full power…the engine 'coughed once' and then stopped."*

The application of carburettor heat, however, normally provides a clearer indication of carburettor icing. If ice is present, then the selection of hot air will normally result in a brief rpm drop followed by a noticeable rpm increase as the ice is cleared (this may be accompanied by rough running as the engine ingests pieces of ice). If no ice is present, the application of carburettor heat will result in a rpm drop only.

Engine Handling Techniques – Airborne

Most low-level flight training involves the use of low engine power settings (approximately 2000 to 2200 rpm or low manifold pressure settings) that are just in the normal green range. This generally results in lower-than-normal engine temperatures when operating in the bad visibility configuration for prolonged periods of time. The application of carburettor heat therefore becomes less effective in preventing the formation of ice. Maintaining low power settings also means that the throttle butterfly position causes more of a venturi effect, which further lowers the carburettor temperature towards the carburettor icing range.

Because of these two factors, we would like to reinforce that the following techniques **must** be used when operating in the bad visibility configuration:

- The frequency and duration of carburettor heat application should be increased relative to the normal SADIE checks. A good rule-of-thumb is to apply full heat at least once every five minutes for 20 to 30 seconds – or at any other time that carburettor icing is suspected. Note that **full** carburettor heat should be applied, as partial heat applications can actually promote induction icing. Make full use of a carburettor temperature gauge if it is fitted – it will provide a good indication of whether atmospheric conditions are conducive to carburettor icing and therefore how frequently heat should be applied.
- Carburettor heat should always be selected well before the reduction of power in the downwind position when conducting a precautionary landing or paddock inspection. This will utilise the heat that is still being produced by the exhaust manifolds and should clear any ice that may have already formed. Full heat should be retained until just before the overshoot is commenced. Some pilots advocate using full heat until overshoot power is applied to make sure that ice does not accumulate in the very last stages of the approach. This method is considered acceptable for most aircraft types, **provided that** some system of checking that the carburettor heat has been returned to COLD following the overshoot is employed. Note that this technique will result in a slight power loss and may cause rough running in some aircraft engines. It should **not** be used if large power losses, and very rough running, are experienced after the overshoot is commenced.
- Care should be taken not to advance the throttle too quickly when applying the overshoot power, as the extra fuel that is suddenly introduced may make the mixture too rich and could cause the engine to falter, or even stop.

We suggest that all the engine handling techniques mentioned be employed when conducting training exercises in the bad visibility configuration, regardless

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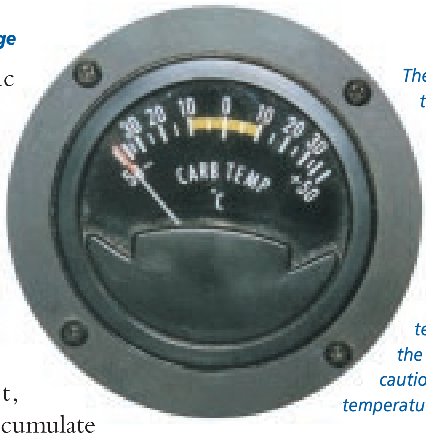
of whether atmospheric conditions are conducive to carburettor icing or not. These techniques will better prepare you for the real thing should it happen.



The carburettor temperature gauge should be scanned frequently when in the bad visibility configuration. Full heat should be applied as required to keep the carburettor temperature out of the yellow range (the cautionary carburettor temperature range).

Pre-Takeoff Engine Handling

As Dave points out, carburettor ice can also accumulate while taxiing. This is something that we need to be aware of, as it can markedly reduce takeoff performance and might even result in engine failure. We suggest that, when it is suspected that conditions are conducive to carburettor icing, carburettor heat be applied for approximately 20 to 30 seconds before the takeoff roll is commenced. The application of carburettor heat should be accompanied by increasing the engine rpm to help clear any ice build-up or spark-plug fouling due to prolonged periods of idling. Remember to avoid applying carburettor heat in areas where the engine induction system is likely to ingest foreign material, as the hot air selection will not be filtered.

The application of pre-takeoff carburettor heat is especially important if long taxi or holding times are anticipated – such as can be experienced at Auckland, Wellington, and Christchurch. Include confirming that the carburettor heat is in the COLD position in your line-up checks so that a takeoff with the carburettor heat on is avoided.

Summary

Developing carburettor icing at low level will leave you almost no time to carry out the forced-landing checks and little time to select a forced-landing site. It is therefore important that the above engine handling techniques are adhered to when operating in the bad visibility configuration. Being able to identify the symptoms of carburettor icing, and to respond quickly, when operating in the bad visibility configuration is critical. When it comes to carburettor icing at low level, prevention is always the best strategy. ■

Fuel Primers

The following is adapted from a UK safety publication (GASIL 1/1997) and recounts a pilotís experience of a fuel primer becoming unlocked during flight.

The pilot had found the aircraft difficult to start, and consequently had to use the fuel primer.

Ten minutes after takeoff, the engine spluttered and the rpm dropped back to around 1500. The pilot applied the carburettor heat, tried each magneto position, turned the electric fuel pump on, and adjusted the mixture. None of these actions restored proper power to the engine, and it quit. A witness reported that fluid from the aircraft fell onto his car's windscreen and evaporated.

During the forced landing, the aircraft struck the roof of a two-storey building and was destroyed. The pilot received minor injuries, while the two passengers were seriously injured. Investigators noted soot and carbon-like deposits on the spark plugs and carburettor venturi. They noted that an open fuel primer allowed excess fuel into the cylinders, and that activating the electric boost pump would have only exacerbated the situation by introducing even more fuel, thus further flooding the engine.

Accident investigators concluded that the probable cause of the accident was "a total loss of engine power due to the pilot's inadequate pre-flight actions, the engine primer not being secured and the fuel boost pump being activated, resulting in excessive fuel flow to the engine".

Confirm that the fuel primer has been pushed right back into its key-way and rotated through 90 degrees to ensure that it does not work its way loose.

Vector comment

The above accident clearly demonstrates the importance of thorough pre-takeoff checks (DVAs). A loose fuel primer can make an engine run incredibly roughly – if not stop altogether. Checking that the fuel primer is locked is as vital as ensuring that you have the magnetos selected to BOTH or that the mixture is FULL RICH. It is important that such checks are actually physically carried out – rather than done by visual observation and an assumption that each control has been correctly set. If confronted with rough running in-flight, then checking the fuel primer, as part of the FMIIP pre-forced landing checks, is an absolute must – fuel primers can work their way loose in flight.

A *Vector* editor recalls a troublesome engine some years ago during aero club forced-landing competitions. The culprit was the fuel primer. This was not initially identified, as the competitor concerned had "checked" the primer as part of their forced landing checks – but presumably with each successive competitor having checked the primer, each with a small twist, it finally reached the unlocked position and created a realistic situation! ■

Cold Water Survival

Understanding what to do, and what not to do, following a successful ditching could mean the difference between life and death – no matter what the time of year. The following article has been adapted from material submitted by Tony Rollason of Marinair Technology. Compiled by Tony, using information issued by Water Safety New Zealand, the Canadian Coast Guard, and the Canadian Red Cross we feel that it is a timely reminder that neatly summarises the basics of cold-water survival.

Hypothermia – The Silent Killer

Surviving a ditching may be just the first step towards a successful rescue. Survival will depend on many things, the type of equipment that the survivor has, the clothing they are wearing, and rescue response times. Being well prepared, and knowing what to do, will enable the onset of hypothermia to be delayed. So often hypothermia takes lives that might otherwise have been saved.

What is Hypothermia and How does it Kill?

Hypothermia occurs when the body core becomes cold. While the temperature of the environment and the skin can fluctuate to a large degree, our inner body core temperature must remain constant. If the core temperature fluctuates up or down by as little as one degree Celsius, serious medical problems can result.

In cold water, the skin and external tissues become cooled rapidly and a person can feel very cold. It can take 10 to 15 minutes, however, before the core organs are affected. Intense shivering occurs in an attempt to increase the body's heat production and counteract the large heat loss.

Once cooling begins, the body temperature falls steadily, and unconsciousness can occur when the deep body, or core, temperature drops by just five degrees from the normal 37 degrees Celsius. Cardiac arrest is the usual cause of death when the core temperature cools to below 30 degrees Celsius.

Warning bells should sound when shivering stops and the person becomes quiet and withdrawn. They may well be unaware that hypothermia has them in its grip.

How Long Can You Survive in Cold Water?

The accompanying graph shows average predicted survival times for an average adult in water of differing temperatures. They are based on experimental cooling of average men and women who are holding still in ocean water and wearing a life preserver and light clothing.

The graph shows, for example, that the predicted survival time is about 2.5 to 3 hours in water of 10 degrees Celsius. For comparable body sizes, males will cool faster than females.

Should You Swim to Keep Warm?

No! Although the body produces almost three times as much heat when swimming slowly and steadily, it is instantly lost to the cold water, due to blood circulation to the arms, legs and skin. Tests show that a person swimming, even in a life preserver, will cool three percent faster than when holding still.

Survival in the Water

Wear a life preserver. The very fact that you don't have to expend energy staying afloat will substantially enhance your survival time. Wearing an approved, high buoyancy device with proper head support will also prevent the head and mouth from falling into the water in the event that long term immersion causes the wearer to lose consciousness before rescue.

Wear warm clothing if possible. Woollen fabrics help trap water close the body, forming a barrier against the greater water mass.

Adopting the HELP or HUDDLE positions (see the accompanying illustrations) in the water will also greatly advance survival times.

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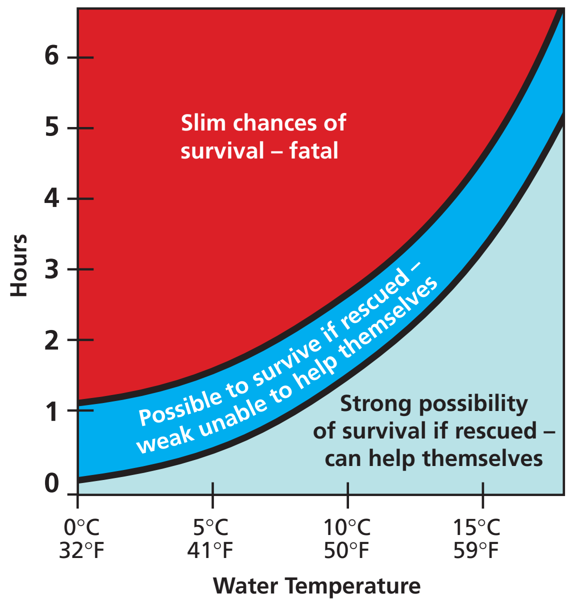
Cold Water Survival Chart



Graph courtesy of Tony Rollason.

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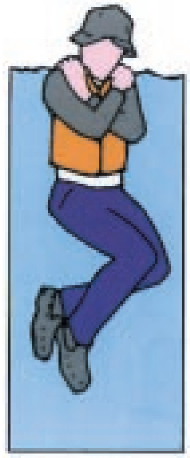
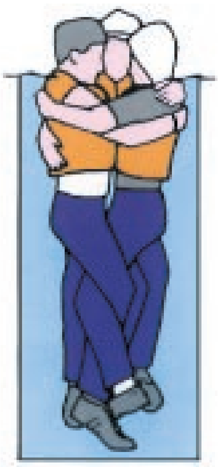


H.E.L.P.

(Heat Escape Lessening Posture)

- Head out of water, including back of the head.
- Arms against sides, chest and buoyancy aid.
- Lower legs crossed, knees together, raised as high as possible.



HUDDLE

- Heads out of water, including the back of the head.
- Arms hugging each other over buoyancy aids.
- Maximum body contact especially at the chest.
- Legs interwined.
- Talking to maintain morale.

Illustrations courtesy of Tony Rollason.

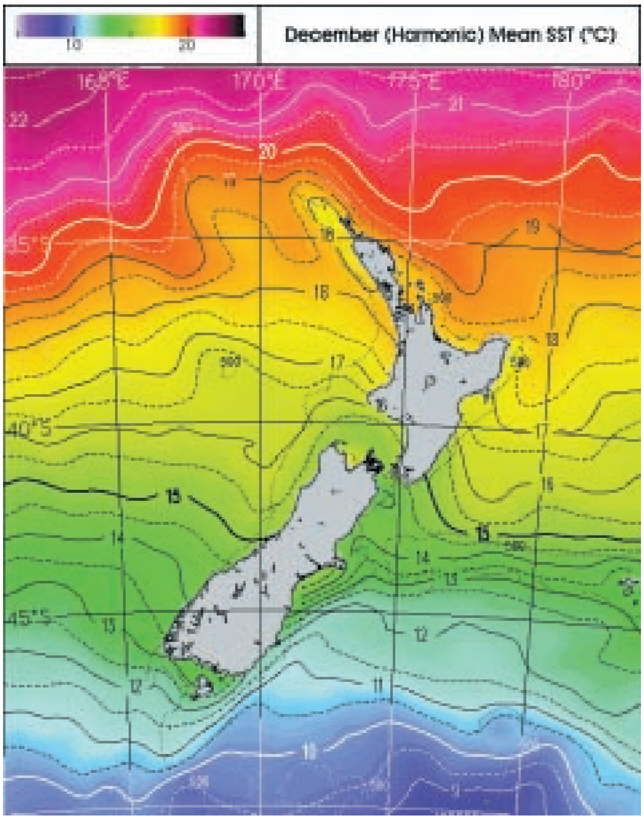
Air is Warmer than Water

Even when the wind chill suggests it is warmer in the water, it is still preferable to get out of the water if possible. Having an inflatable life raft available, even a simple survival platform (such as a piece of aircraft wreckage), will substantially reduce the risk of hypothermia amongst survivors.

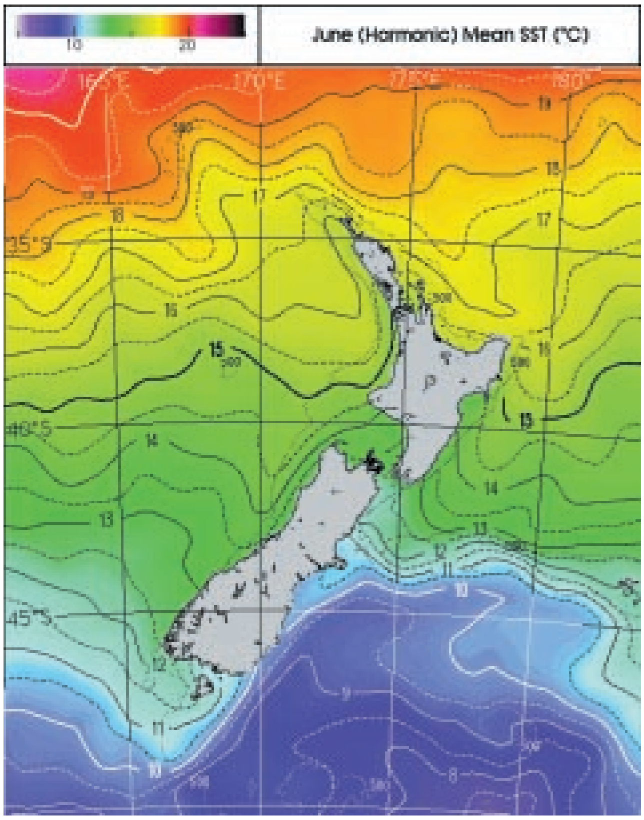
Body Temperature and Hypothermia Symptoms

37°C	Normal body core temperature.
36°C	Feel cold – still alert and able to help oneself. Numbness in legs and arms.
35°C	Mild hypothermia – shivering.
34°C	Clumsy, irrational, confused. May appear drunk. Slurred speech.
33°C	Moderate hypothermia – muscle stiffness.
32°C	Severe hypothermia – shivering stops. Collapse. Unsupported head falls in the water. Victim may drown if not wearing a lifejacket.
31°C	Semi-conscious.
30°C	Critical hypothermia – unconscious. No response to pain. Skin cold. May be blue/green in colour.
29°C	Slow pulse. Breathing may be difficult to detect.
28°C	Cardiac arrest. No obvious pulse. Pupils dilated. May appear dead.

Mean Sea Surface Temperature (˚C) for December



Mean Sea Surface Temperature (˚C) for June



Source, National Institute of Water and Atmospheric Research Ltd. (NIWA)

Hypothermia First Aid

During the Second World War, many hypothermia victims were successfully rescued from the water only to die later during recovery treatment. Subsequent studies showed that often the re-heating method of the day simply resulted in the super-chilled blood, present in the limbs and extremities, flowing back into the central core region causing further catastrophic lowering of temperature and cardiac arrest. Modern treatment techniques have vastly enhanced hypothermia survivability.

The type of re-warming necessary depends on the degree of hypothermia evident. Often it is difficult to measure inner body temperature. First aid for hypothermia varies greatly, depending on the mildness or severity of the case. In many instances, coldness and exhaustion are mistaken for mild hypothermia and vice versa.

The following guidelines may help you to estimate the extent of the problem and to determine the appropriate treatment.

"Tests show that a person swimming, even in a life preserver, will cool three percent faster than when holding still."

All Cases

Priority should be given to getting the victim out of any water and into a warm, sheltered environment. They should be given warm nourishing food, warm dry clothes, and encouraged to take mild exercise to increase their core body temperature. Note that all hypothermic patients should be handled gently, avoiding jolts that might adversely affect their heart function.

Mild and Moderate Cases

If the victim is conscious, talking clearly, and shivering vigorously the following steps should be taken:

- Give warm, sweet drinks. **Never** alcohol, coffee, tea, or cocoa.
- Encourage limited exercise.
- Apply warm (40 to 45 degrees Celsius) objects such as towels, water bottles or chemical heat packs to the head, neck, and trunk.
- **Do not** rub the surface of the body.

In moderate cases have the patient checked by a doctor as soon as possible.

Severe Hypothermia

Typically, the patient is getting stiff and is either unconscious or showing signs of clouded consciousness, such as slurred speech. Shivering may be reduced, or absent, and they may behave irrationally and fight attempts to help. In this event the patient should be transported immediately to receive professional medical assistance where aggressive re-warming can be initiated.

If help is more than an hour away, then you have no choice but to attempt to re-warm the patient yourself. This must be done gently and slowly. Violent heat shocks, such as putting the patient into a hot bath, can cause death.

- Send immediately for expert help.
- **Do not** attempt to administer food or drink if there is any sign of unconsciousness.
- Donate heat direct to the trunk of the patient's body by direct body contact. The rescuer should remove their own upper clothing and huddle with the casualty inside a blanket or sleeping bag if available.
- Apply warm (40 to 45 degree Celsius) objects, as for mild cases.
- Use Rescue Breathing only if the patient's own breathing has stopped.
- **Do not** attempt to re-warm limbs. This can cause the blood to flow to the limbs and away from the core where it is most needed. Super-cooled blood, in the arms or legs will also flow to the core, further lowering the temperature in that critical region.

Critical Hypothermia

In cases of critical hypothermia the patient can appear close to death. Do not assume that they are dead. Continue to attempt to re-warm the patient even if they appear dead. It is important that you proceed with re-warming in the field if expert help is more than one hour away.

- Handle the patient with extreme care.
- Tilt the head back to open the airway. Look, listen, and feel for a pulse and breathing. If there is any pulse, no matter how faint, **do not** administer CPR.
- Proceed to re-warm as in the case of mild and severe cases. **Do not** re-warm the limbs.
- Exhale warm breath on to the patient's face so that they breathe in warm air.

Patient Recovery

Body core temperature will lag behind skin temperature during re-warming. It is therefore important that the patient is kept warm for an extended period of time, even after an apparent full recovery is made or medical help arrives. It can take hours, and even days, to return to a normal stable temperature. The patient should not be re-exposed to cold during that time.

Summary

Hypothermia is always a critical survival factor following a ditching at any time of year in New Zealand waters. Being adequately equipped in all respects will greatly lessen the risk and enhance the chances of survival for you and your passengers. Remember that hypothermia is an insidious creature that can creep up on you, creating a debilitating condition almost before you become aware of it.

If you require further information on this topic, then consult your health professional or contact Water Safety New Zealand Incorporated. In the meantime, check that you have adequate lifejackets for all on board and, if frequently flying some distance over water, consider investing in an inflatable liferaft. ■

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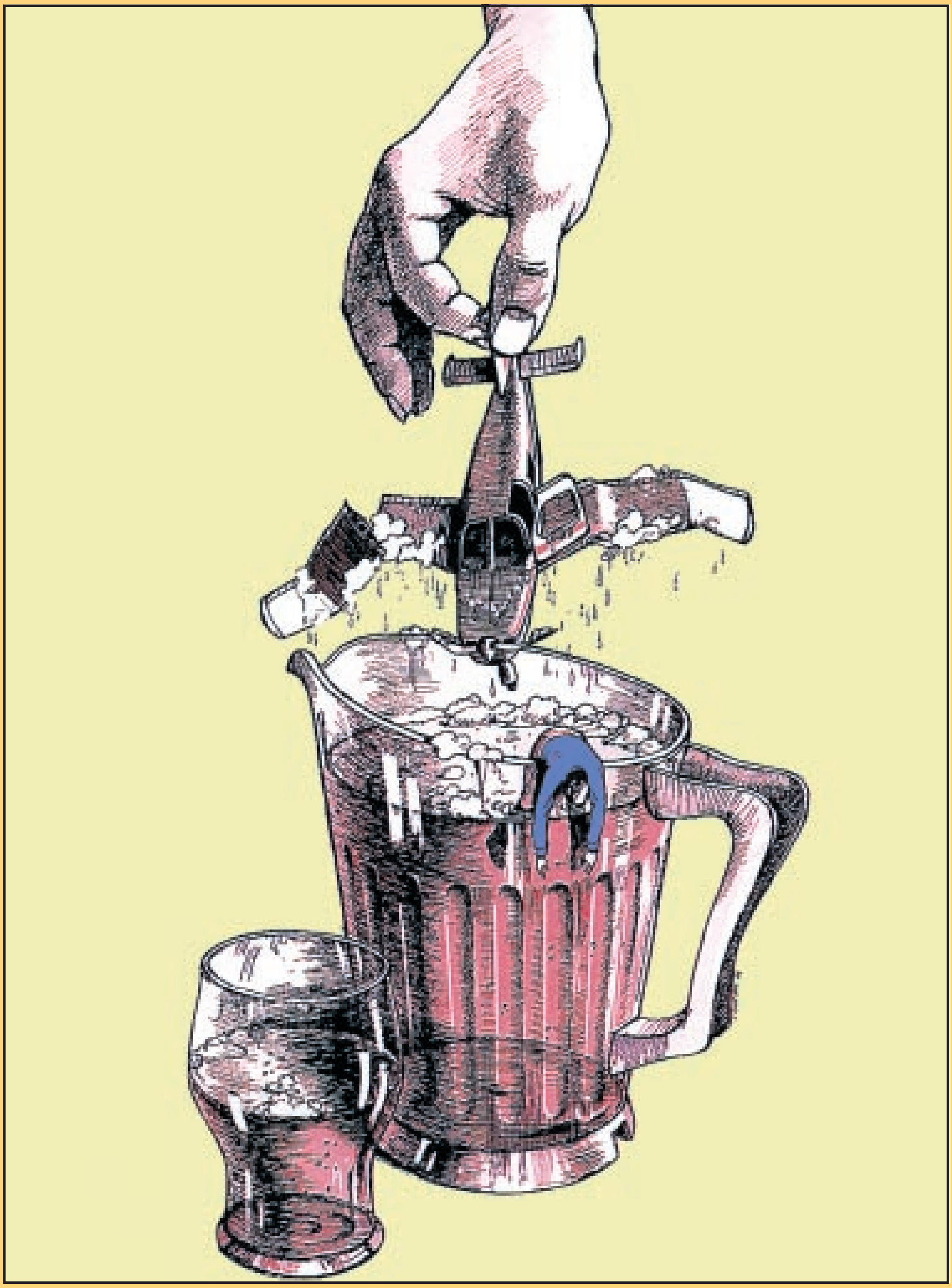

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