FLIGHT COMMENT

MAY JUNE 1974

Comments

An Argus was about to descend from altitude and the pilot gave orders to awaken crewmembers who were asleep in their bunks. In descent the pilot requested confirmation that the sleepers had been aroused. However, a misunderstanding between the routine navigator and the ASW compartment operator resulted in one pilot not being awakened until he felt moderate pain in both ears (he was wearing both ear plugs and a headset). The pilot had difficulty in removing his ear plugs and his left ear drum was damaged as a result of the plug wedging too deeply into the canal.

A *Safety Comment* submission tells the following tale. During the pre-start check a crewman brought two cups of black coffee to the flight deck for the pilots. As the co-pilot turned to receive his drink, which was being held over his left shoulder, his mike boom contacted the bottom of the cup and spilled the hot coffee down the right side of his face. The scalded area extended from the top of his eyebrow to his neck and resulted in second degree burns with blistering on the bridge of the nose, eyelid, lips and neck. A significant factor in the accident is that the eye could have been permanently damaged if the eyelid had not closed by reflex action. Accidents of this nature could occur in any aircraft where hot drinks are served and a few preventive measures should be employed. Cups should be only partially filled and then handled with extreme care—over the shoulder operations are a definite no-no—as one scalded co-pilot will attest.

The staff of CFB Portage la Prairie Fire Department have been named winners of the National Fire Protection Association (NFPA) "Grand Award" for 1973 fire prevention activities. This prestigious award is presented annually and the competition is open to all Municipal, Industrial, Government and Military Fire Departments and agencies throughout Canada and the U.S. Besides the "Grand Award", Portage was also awarded first place in the military division. Good Show Portage!

Front Cover. Cold Lake Starfighter as seen from the Airborne Sensing Unit's CF100. Photo by Capt R. MacDonald.

NATIONAL DEFENCE HEADQUARTERS — DIRECTORATE OF FLIGHT SAFETY

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THE URGE TO IMPRESS

By the time this issue of ***Flight Comment*** reaches the field many of you will be involved directly or indirectly in another Air Show season. This military participation in air displays allows us to demonstrate our equipment and abilities to hundreds of thousands of interested people across the country. Such participation can include ground displays, armament displays, parachute drops, rapelling from helicopters and most significantly, the precision flying demonstrations. Each type of display presents different problems and if we are to achieve positive results we must demonstrate the highest standard of professionalism which means that the safety of spectators and participants is an overriding consideration.

One of the main reasons for these displays is to maintain interest in military aviation by showing the public what we can do. This dictates that such shows should consist of manoeuvres that are pleasing to the spectators and not necessarily those that are difficult to perform. When flight paths are very low or close to the spectators, or when difficult or hazardous manoeuvres are performed showmanship is usually sacrificed because most of the audience cannot appreciate what is being done. Supervisors and participants must avoid the tremendous urge to impress their peers rather than the audience as a whole. This is not easy and experience has proved that individual performers often find the temptation to push it just a bit closer to the danger line almost irresistible. From personal experience backed up by statistics this is where things go wrong and all of the good that we have gained through so much hard work is nullified.

Now that it is your turn to be at centre stage, remember that any spur of the moment attempts to change a routine or reduce the margin for error can have disastrous results. Even if you get away with it you will know that you have let the team down because you could not control the urge to impress.

COL R. D. SCHULTZ
DIRECTOR OF FLIGHT SAFETY

FUEL SPILLAGE TRIALS

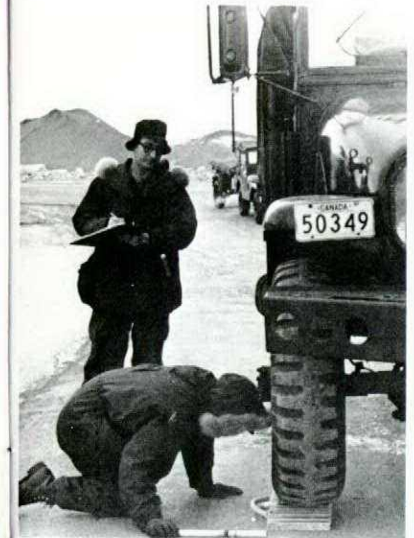
...air transportation of vehicles and GSE

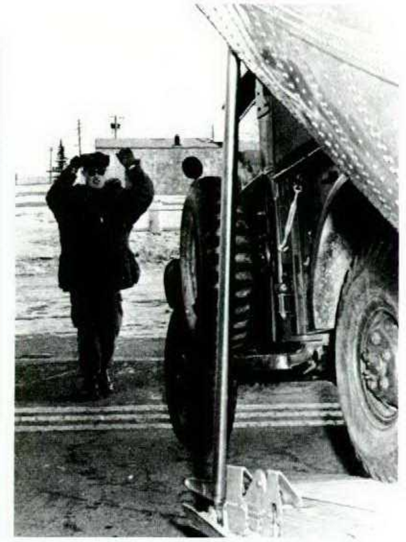
LCol MT Dodd

A gasoline spill, from vehicles or equipment during airlift, can be one of the more chilling and potentially disastrous emergencies that aircrew may encounter. Yet during recent years that have seen both the introduction of fully pressurized transport aircraft and a marked increase in the numbers of vehicles airlifted, repeated incidents of fuel spills have occurred, thus creating an intolerably high accident potential. Despite concentrated efforts by specialist staffs to provide instructions and procedures plus insistence upon rigorous vehicle inspection standards, spills have continued to occur. With the intent of correcting this situation Air Transport and Mobile Commands in March 1973 issued a joint trial directive to CFB Edmonton *"to investigate the fuel spillage hazard inherent in the air transportation of vehicles and GSE"*. The scope of the trial demanded the participation of several ATC and FMC units plus the involvement of most Base technical agencies. It was natural, since the Hercules is the prime vehicle carrier for the Canadian Forces, that 435 (T) Squadron at Namao should be assigned the major flight-test burden for the trials. Such was the case. What followed was an intriguing trial program which included some rather perplexing flight tests. This account of the trials is intended to highlight the Hercules involvement and add some pertinent comments on the test results.

At this point one might leap to the conclusion that the trial was unnecessary since the obvious way to prevent fuel spills would simply be to empty the fuel systems. From the flight safety aspect, this would indeed cure the problem; but unfortunately, this would not meet the customer's operational requirement. The customer, primarily FMC, wants the vehicles and GSE fuelled to capacity so that upon deplaning they can be deployed or utilized to their full range or endurance. Finding a satisfactory compromise between these two extremes of *flight safety* and *operational necessity* was, therefore, the overall requirement to be met by this trial.

To help find this compromise point several important aspects had to be considered. These aspects were to determine



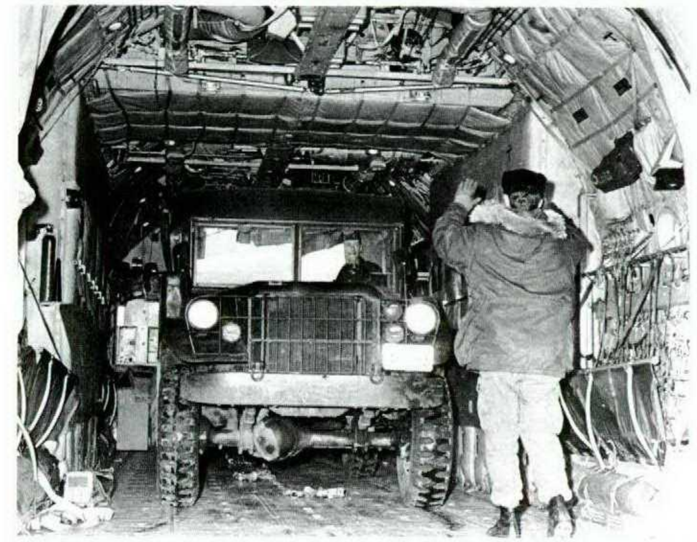


for each vehicle and piece of equipment the causes of fuel spills and leaks, the effect of rapid decompression on partially filled fuel systems and the levels of gasoline vapour concentration and dissipation during fuel spill incidents.

It was obvious from the beginning that unless care and caution prevailed the air trials could invite a calamity. Consequently, it was decided to first conduct a study of all applicable fuel systems to determine, to the extent possible, individual system peculiarities and probable airlift limitations; then conduct ground experimentation and testing. Once this was done the air trials could be devoted to proving the results of the ground tests plus measuring those factors which could not be duplicated on the ground (e.g., effects of rapid decompression and fume concentration levels). This approach worked well, saved many aircraft flying hours, and no doubt helped to reduce the number of air incidents during the trial.

Although nothing startlingly new came to light from the ground deliberations, they did serve to confirm that the causes of fuel spills and leaks continue to be: extreme aircraft attitudes, fuel surge due to acceleration, fuel surge due to sudden pressure differential, thermal expansion of fuel, mechanical defects in fuel systems and human error in preflight preparation. Keeping these factors in mind, the ground testing program determined maximum fuel levels for each test item for both normal and maximum performance flight conditions. The test vehicles and equipment were then ready for flight trials.

The selected flight test profile for the Hercules was in two parts. Part one consisted of a normal takeoff and climb to 15,000 feet MSL, followed by a rapid descent and normal landing. Continuous checks for fuel spills and leaks were made as well as measurements of gasoline vapour concentrations (using three explosimatic combustible gas indicators). If this part was completed without incident, vehicles and equipment were next subjected to extreme climb angles and a rapid decompression from 15" Hg differential. Part two, therefore, involved a maximum performance takeoff and obstacle climb followed by an unpressurized climb to 10,000 ft MSL. At the minimum aircraft weights used for the trials this technique gave aircraft floor angles of up to twenty degrees from the horizontal. At 10,000 feet, if all was still acceptable, the aircraft was repressurized and climbed to 20,000 feet so as to attain a pressure differential of 15" Hg. With all crew on oxygen a rapid depressurization was initiated followed by an unpressurized descent and landing. Again checks for spills, leaks, and gas vapour concentrations were made throughout



the flight. This flight profile proved viable for the Hercules trials and in slightly modified form, for the Boeing and Buffalo aircraft. A special flight was carried out to check the Voyageur helicopter for difficulties with the 1/4 ton SMP vehicle and other equipment.

Without exception all mechanically sound vehicles and equipment passed the first part of the flight test without incident. Such was not the case, however, in the second phase. Here, considerable trouble was experienced either during the unpressurized climb or upon rapid depressurization. These occurrences created several very explosive and unpleasant situations.

The worst case experienced was with the ECC 142103 multi-stop delivery van. With this vehicle there is no problem of spillage from a partially filled tank as a direct result of climb or descent angle, since the fuel filler neck reaches well above the top of the tank. However, upon rapid depressurization the situation changes dramatically when large amounts of fuel regurgitate from the filler neck. This phenomenon is caused by fuel system design. The filler pipe enters the tank at a bottom corner and serves as the only vent to the tank. Consequently, whenever the tank contains sufficient fuel to cover the filler neck entrance, any vapour pressure equalization must take place by percolation through the fuel. This is fine during engine running or even during unpressurized climb; however, when the outside pressure is suddenly reduced (as in the case of explosive decompression) the trapped vapour in the tank expands so rapidly that it forces quantities of fuel up and out the filler neck. In the case of the test vehicle, it had providentially been positioned with the fuel tank above the aircraft ramp hinge. Consequently, when the fuel regurgitated, a good deal escaped quite quickly by leaking out through the hinge area. Had the vehicle been close to the forward bulkhead, adjacent to most of the electronic equipment, the results may have been quite different! To avoid a recurrence of this type of incident, the trials report recommended that these multi-stop vans only be airlifted with an empty and purged fuel system.

Pollution-control equipped vehicles present a unique problem when airlifted in a fuelled state. Because the fuel system is effectively sealed once the filler cap is in place, the trapped gas vapour is unable to escape quickly during decompression. This can create sufficient pressure within the system to rupture lines or the tank. One such incident was narrowly avoided during the trials when the tank on a six-passenger crewcab vehicle was discovered grossly deformed after a test flight involving rapid depressurization. Until a satisfactory method of venting the fuel systems on these types of vehicles is devised, they too, should be drained and purged and have the tank cap loosened to allow venting to take place.

One particular vehicle to be tested that appeared at first glance to pose significant problems was the 1,000-gallon fuel bowser mounted on a 2 1/2 ton SMP chassis. Although no attempt was made to fly that vehicle with fuel in the storage tank, it was important to devise a means whereby it could safely be airlifted without having to undergo a complicated and time-consuming purging of the tank and pump system. The simple, yet effective, procedure used was to drain the tank and associated plumbing then place a quantity of dry ice in the tank leaving the tank open to atmosphere for about three hours. During this time the CO_2 released from the dry ice displaced sufficient residual fuel vapour to bring the gas concentration well below the explosive level. When flight tested the vapour readings from the bowser were minimal, even during decompression; however, the truck itself developed a similar leak to that experienced on several other 2 1/2 ton SMP vehicles.

The problem with the 2 1/2 ton SMP was one of fuel leaking from the engine compartment during unpressurized climb and/or rapid depressurization. After several abortive fixes it was finally cured by isolating the primer line from the tank, closing the main fuel shut-off cock, then running the engine until it stopped from fuel starvation. Once this procedure was adopted the 2 1/2 ton SMP passed the test flight without incident.

Numerous items of GSE were included in the trial. Most passed the flight test without serious incident; however, it was noticed that much of the equipment was in questionable condition for airlift, often having poorly fitting fuel caps, oozing fuel connections and general accumulations of external oil, grease, or hydraulic fluid. The trial group's recommendation that all mechanical apparatus presented for airlift be certified fit by a mechanic could probably help to improve this unhealthy situation.

An area for concern which remains unresolved is the matter of the multitude of non-standard installations of gas driven generators, compressors, etc., on vehicles and in trailers. Without individual testing, (which is impractical) it is virtually impossible to establish accurate fuel levels or other criteria for this equipment. Consequently, to be safe for airlift the fuel system on this equipment should be empty and purged.

The results of these extensive trials (about 1600 man-hours were required) have been seen in recently revised instructions for the airlift of fuelled vehicles and equipment. The compromise point between flight safety and operational necessity has been set at 75% tank capacity for most military pattern vehicles and 50% for GSE. There are exceptions which are covered by detailed instructions. They must be followed in order to prevent further incidents. It is, therefore, incumbent upon all personnel involved in the preparation, acceptance, loading and airlift of fuelled machinery to become completely familiar with the revised limits and procedures. The consequence of error could be graves.

ABOUT THE AUTHOR LCol Dodd joined the RCAF in 1955. After wings graduation he flew the C45 and B25 with 2 AOS in Winnipeg and then joined 435 Sqn Namao, flying C119 and C130 aircraft. Tours as a C130 instructor pilot and CPI were followed by a posting to Mobile Command in 1968 as ATC Liaison Officer and Staff Officer at MobCom HQ. Prior to his present position as Director Reserves Co-Ordination at NDHQ, LCol Dodd was the SOpsO and deputy CO of 435 Sqn.

GOOD SHOW

Capt R.D. Sword

CAPT R.D. SWORD

Capt Sword was at the controls of a T33 and discovered on takeoff after a touch and go landing that the control stick would not move rearwards past the neutral position. As an abort on the runway was not possible he flew the aircraft to circuit altitude and evaluated the control response. He found that while control at normal final approach speeds was inadequate, an approach at 160 knots would allow the nose to be raised for roundout through the use of elevator trim. On final approach control became difficult to the point where roundout could only be achieved through raising the flaps: this caused the nose of the aircraft to rise somewhat and allowed a firm but safe touchdown.

Capt Sword is commended for his rapid and correct assessment of the situation. His skilful handling of the emergency prevented the possible loss of an aircraft.

CPL D.J. FREMONT

Cpl D.J. Fremont

Cpl Fremont was carrying out a cockpit check after loading an alert aircraft in the Quick Reaction Area. As he descended the ladder from the navigator's cockpit he noticed something irregular in the port intake of the CF101.

Upon closer examination he discovered a crack in the port splitter vane. Being a W Tech A tradesman and not conversant with airframe technical matters Cpl Fremont followed through on his discovery and requested that an airframe technician examine the problem area. The airframe technician found two cracks on the port splitter vane, declared the aircraft unserviceable and the aircraft was taken off alert and replaced.

Cpl Fremont's astute observation and his thoroughness in following up and checking on his discovery revealed a technical problem that could have had serious consequences. His attention to the total aircraft as well as to his specific area of responsibility is indicative of the pride and professionalism with which he carries out his duties.

MCPL J.WYNEN

MCpl J.Wynen

MCpl Wynen was assigned to carry out a run-up on an Argus after a fuel mixture control unit change.

Prior to conducting the run-up, MCpl Wynen checked the CF349 and noted that low MAP was also a factor in the unserviceability. When he inspected the old FMCU, he found a screw missing from the butterfly valve. He subsequently removed the newly installed FMCU and found that the missing screw had caused severe damage to the impellor blades. The damage necessitated an engine change.

MCpl Wynen's methodical approach and determination to resolve what appeared to be a minor engine problem resulted in the discovery of serious engine damage. Through his superior knowledge, initiative and thorough investigation of the engine unserviceability MCpl Wynen prevented more serious and costly damage to the engine.

CPL E.C. NEUFELD

Cpl Neufeld, with another fire fighter, helicopter crewman and pilot, launched to carry out a search for two missing T33 aircraft. Shortly after takeoff the helicopter picked up an emergency homing signal and soon arrived over one of the downed pilots who had a small fire going. Because of high trees, the pilot was unable to land in the area. The helicopter crew chief therefore asked the fire fighters if they wished to volunteer to be lowered in the sling hoist. This was Cpl Neufeld's first flight in a helicopter and although he had never used a sling hoist, he immediately volunteered.

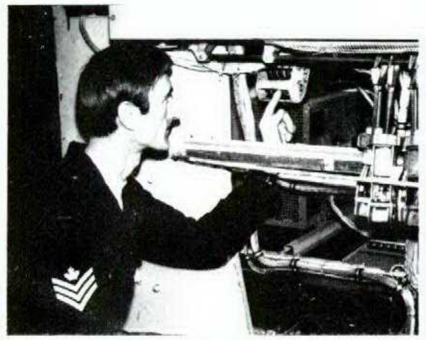
Cpl Neufeld located the downed pilot, who was in a dazed condition, and walked and assisted him to the sling. He then secured him in the sling and signalled for him to be hoisted to the aircraft. Cpl Neufeld then returned and extinguished the camp fire, recovered the pilot's emergency beacon and was himself hoisted into the helicopter.

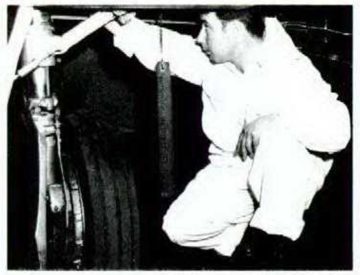
The crew continued to receive an emergency locator signal so they proceeded to home in until

GOOD SHOW


Cpl E.C. Neufeld


Cpl A.E. Allen


Sgt G.C. Llewellyn


Cpl T.O. Kelly


Cpl P.A. Aiston


Cpl J.H. Colwill

another camp fire was spotted. The helicopter was once more forced to hover because of the terrain and Cpl Neufeld was again lowered by hoist. The second pilot was located by his camp fire and, because of knee injuries, was assisted into the sling by Cpl Neufeld. Cpl Neufeld again extinguished the camp fire, retrieved the pilot's personal locator beacon and was then hoisted aboard.

The quick rescue of these two pilots, injured and in a state of shock, is directly attributable to Cpl Neufeld's courage and devotion to duty well beyond the call of his normal duties as a fire fighter. The fact that it was his first flight, and over unknown terrain at night, only serves to emphasize this act of rescue.

SGT G.C. LLEWELLYN

During a normal preflight inspection of a Hercules at Namao, Sgt Llewellyn discovered an abnormal binding in the throttles. He then conducted a thorough inspection of the throttles from the throttle quadrant through to station 245 where he found the cables frayed on two engines. He advised the aircraft captain and corrective action was taken.

Sgt Llewellyn displayed superior initiative by following through with the extra inspection. Moreover, the incident occurred after intensive flying duties on Exercise Oasis Caper and the slip crew and AMU were both anxious for a timely departure. In spite of these pressures, Sgt Llewellyn's professionalism prevailed and a potentially dangerous situation was averted.

CPL P.A. AISTON

While replacing all the 17th stage compressor stator vane segments (86 per engine) on two J79 engines, Cpl Aiston discovered five unserviceable segments. Although these stator vane segments are supplied from the R&O contractor as serviceable spares, only Cpl Aiston's thorough pre-installation inspection prevented usage of the faulty units. Cpl Aiston is commended for his extra vigilance and attention to detail.

CPL A.E. ALLEN

Whilst carrying out an "A" check on a CF104 aircraft Cpl Allen discovered a metal ring binder lodged against the inlet guide vanes. The metal binder was not readily visible and could easily have been missed by a pilot or technician during an external check. Only with the aid of a flashlight and by placing his head in a specific position could Cpl Allen see this FOD. The extra care and attention shown by Cpl Allen during this routine check undoubtedly saved a valuable aircraft.

CPL T.O. KELLY

While conducting an airframe familiarization session for pilots on a T33 aircraft, Cpl Kelly discovered a loose cap fulcrum fitting bolt. This bolt secures the main landing gear to the airframe. The bolt was retorqued and an inspection carried out on the remaining T33 aircraft on the base.

Although Cpl Kelly was not involved in an inspection of the aircraft at the time, his alertness in detecting the loose bolt was instrumental in averting possible landing gear malfunctions or a serious aircraft accident on a subsequent flight. Cpl Kelly is commended for his conscientious approach and timely follow-up action.

CPL J.H. COLWILL

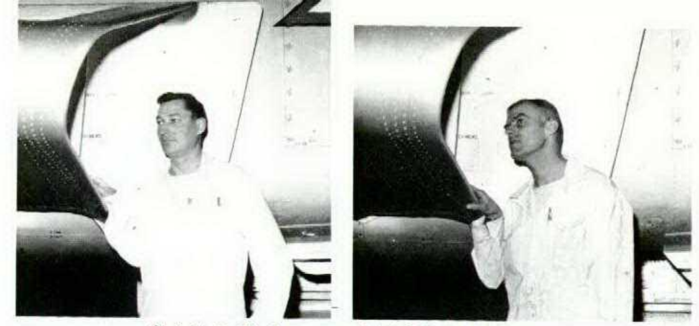
While performing a pre-loading inspection of a CF101 as an augmentee loader, Cpl Colwill, a Radar Systems technician, observed what appeared to be a lever on the armament door. Although not thoroughly familiar with the operation of the door he decided to investigate and discovered the protruding object to be the handle of a pair of pliers. He subsequently worked them loose and reported the incident to his crew chief.

Cpl Colwill's alertness and initiative quite possibly prevented a serious incident. His action exemplifies the contributions made to flight safety by conscientious and alert technicians.

CPL C.J. WEIMAN AND CPL T.M. KENNER

Cpl Weiman and Cpl Kenner were members of an engine crew assigned to carry out a ground run-up on a CF101 Voodoo aircraft. After the aircraft was positioned on the servicing line and prior to starting the engines, Cpls Weiman and Kenner carried out a FOD check of the area immediately around the aircraft and found several strands of what appeared to be wire bristles. Although it was night, with brisk winds and heavy rain, Cpls Weiman and Kenner performed further checks of the aircraft servicing line and discovered heavy concentrations of these bristles.

As night flying was about to begin, they immediately informed the servicing controller and a temporary halt to the flying program was called pending further checks of the servicing line, taxi strips and runway area. Subsequent investigation revealed that the rotary broom on a sweeper used earlier that day had come apart strewing bristles throughout the area.


Cpl C.J. Weiman and Cpl T.M. Kenner


Pte B.A. Pollock

Due to the high degree of alertness and attention shown by Cpls Weiner and Kenner, a potentially serious FOD situation and subsequent damage to aircraft was averted.

PTE B.A. POLLOCK

Pte Pollock was detailed to carry out a special inspection for signs of throttle cable fraying on three CF104 aircraft. He carried out the inspection as directed and then, on his own initiative, continued to inspect other aircraft. In one of the remaining aircraft Pte Pollock found a badly frayed cable — well below accepted tolerances. As this aircraft was not yet due for this type of inspection, Pte Pollock quite possibly prevented a serious incident or accident.

Pte Pollock is commended for his initiative and conscientious approach to his duties.

Society Notes

Colonel "Bud" Blimp CD DSO

Commander CBF Overshoot

is pleased to announce the engagement of

His Barrier

to Lt DW Schmiadlap

late of CFB East Rubberhool, Sask.

Personal Checklist

Pilot factor is involved in well over half of the Navy's major aircraft accidents. Many factors that decrease a pilot's ability to perform efficiently are well known. Among these are insufficient or incorrect training, personal attitude, fatigue, inadequate nourishment, illness, distractions and discomfort. A pilot is able to exercise control over most of these factors and if he does a little planning, they need not be factors which cause accidents.

The following is a four-item personal checklist for pilots and crewmembers:

- First on the list is **SLEEP**. *You should have at least 7 or 8 hours the night before flying*, maybe more, depending on your individual needs. Along with this goes general physical condition, good muscle tone, moderate exercise, and no excess weight on the frame. That 7 or 8 hours of sleep supposes an equal amount of time without any traces of alcohol or effects of a hangover in your system to reduce your efficiency. If you had too much to drink, then 8 hours of sleep probably won't be enough for you, because in that 8 hours your body will be oxidizing alcohol, and in the morning your frame will just begin to repair some of the damage it sustained. It's not ready to go aviating yet.

- The next item is **ATTITUDE**. As sleep encompasses a lot of related things, so does this factor. It refers to your basic attitude toward flying; your attitude toward flying on a particular morning. What influenced your attitude? Have a fight with the wife? Kids spill jelly on your freshly laundered shirt? Get chewed out by the skipper? Car payment overdue? Girl friend overdue? If you find your mind a mess of worries, you can't check this item as safe. If your attitude of the moment is one which keeps you from devoting full attention to the job, execute a 180-degree manoeuvre back to the ready room. The day may come when you've had your fill of flying right up to the brim. If that's the case, don't brood about it, talk about it – to your CO and your flight surgeon. Many times these problems can be, and need to be, talked out before getting back into a cockpit.

- Thirdly there is **FOOD**. Did you have a good breakfast, rather than just a doughnut and coffee? Or a cigarette and coffee? Or just a cigarette (a cigarette is nothing at all)? You can't operate without that precious blood sugar, and you won't get it unless you eat breakfast. Protein, man; that's the word. So make food the first item of your preflight on days that you fly – eat a good breakfast! Don't try to operate without proper fuel.

- Finally, check on **EQUIPMENT**. Do you have everything required? Or is your knife at home in the garage where you scaled the fish? Today it would be just your luck to have to use it. What kind of shoes are you wearing? Think you could walk home in them through the swamps? When was the last time you preflighted your flotation/survival equipment? Would you be adequately prepared for a nylon letdown into a cold mountain clime, or a swamp? Check that equipment with loving care.

These are just four items, which when put together, **SLEEP**, **ATTITUDE**, **FOOD**, **EQUIPMENT**, spell **S-A-F-E**. They're easy to remember. Think about them on your way to the line shack for the next flight. **SLEEP** – plenty, the right kind: body in basically good shape to accommodate the rigours of flying. **ATTITUDE** – a desire to fly and an ability to devote all your attention to it. **FOOD** – recent, and of the proper kind. **EQUIPMENT** – to get you home safely.

Satisfactory completion of this checklist may prevent a pilot factor accident. As a minimum, the knowledge that you are at least as ready for flight as your aircraft, will give a degree of self assurance that can make a big difference in the outcome of an emergency situation.

U.S. Naval Safety Center

Where are your pubs going?

Many publications are going to the wrong places, e.g.,

(1) In many cases CAS and non flying units are getting more flying publications than the flying units.

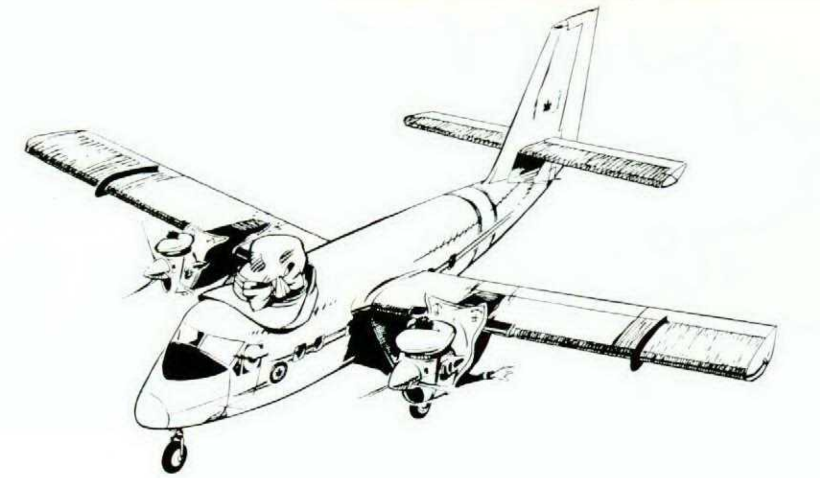
The Flight Safety Committee

"If we don't break out at Gagetown do we have enough fuel to make Chatham?"

ASTROLOG

gemini

May 22 to Jun 21

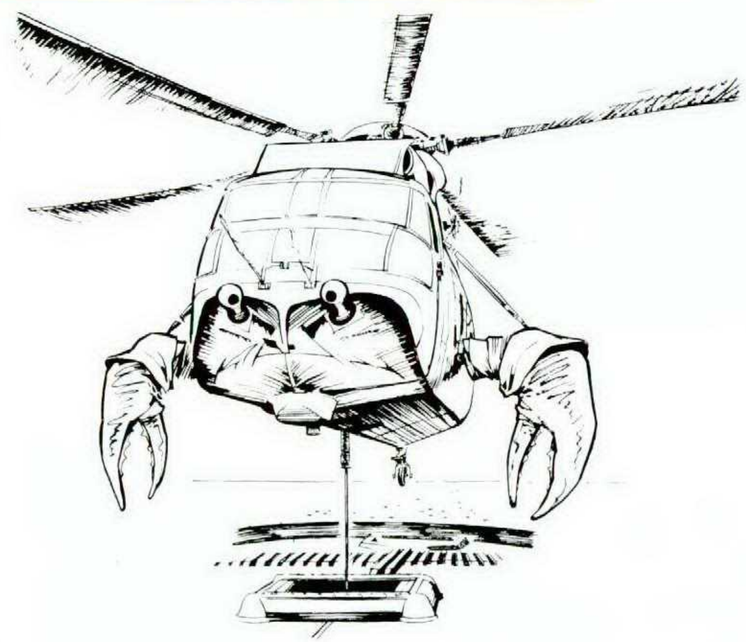


Do you know a tall, slender, bilingual navigator who talks, thinks and moves fast? When you finally catch up with him does he chatter away on a dozen different subjects – all at the same time? If he's forty and looks like seventeen and if his eyes flash at you quickly in spite of those dark "no sleep" circles then you're probably crewed with a Gemini. This quicksilver character is ruled by Mercury and his wings are permanently strapped to his heels. His dual nature makes it easy for him to do two things at once but he is easily side-tracked. While you're sugaring your coffee he'll be checking the met, flight planning, calling for fuel, and spinning his computer. By the time you've stirred in the cream he'll have completed the walk-around and be strapped in, waiting for you, and glibly asking what took you so long.

Gemini is at home in the air but his insistent urge to communicate can make him a bane to controllers. Ask him to ident and he'll read you his flight plan. And he'll always try to bluff his way out of a tight corner. If you're not happy about your fuel consumption he'll convince you that his figures are right and then blame the gauges! Yes, he's a persuasive fellow and although he seems to be "living on his nerves" he's invaluable in an emergency. He likes troubleshooting, meets crises swiftly and makes instant decisions. Now isn't that the kind of navigator you always wanted?

cancer

Jun 22 to Jul 23

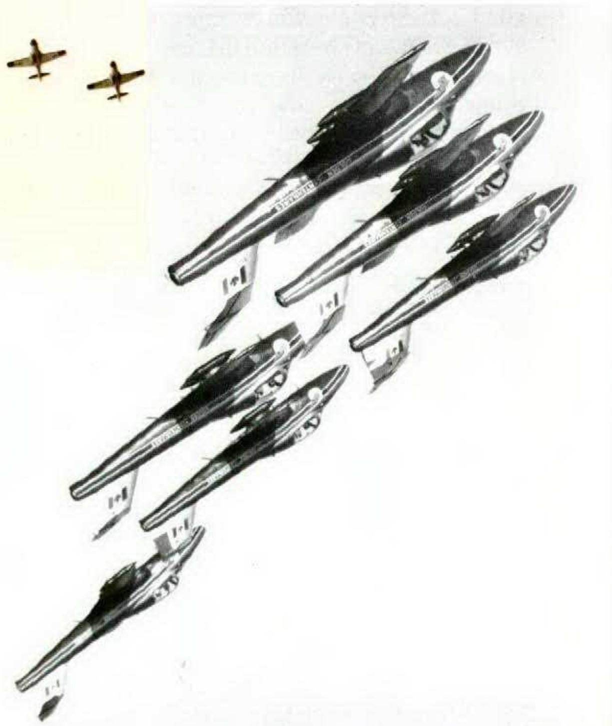


Cancer is a cardinal sign which means that members of the crab family were born to take responsibility – to lead, not to be led. If your flight commander is a Cancerian then you'll notice that he takes himself and his work seriously – and he likes to lead the formations. He doesn't mind a joke but don't let it interfere with the job at hand. Like the moon which waxes and wanes so the changing moods of the crab come and go. If he seems to be permanently frowning he may just be passing through one of his crabby, cranky spells. But don't be deceived by that crusty exterior. Under that hard protective shell is a soft, sensitive nature.

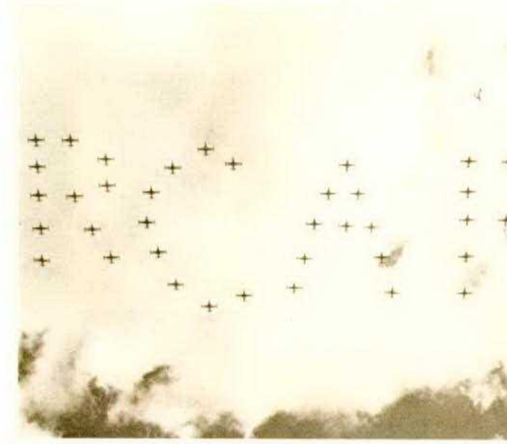
The Cancerian reveres tradition and the past and is famous for his memory. When it comes to airmanship he's on tops again. He will carefully base his actions on experience – either his own or someone else's: he's not too proud to learn from the mistakes of others.

You may not take survival equipment seriously but your friend the crab is always prepared for some future catastrophe: he may even give himself ulcers worrying about it. But if you ever do land in the bush with him you'll be in good hands. He'll be quite willing to look after you and you can be sure he'll be prepared for any eventuality. His flying suit pockets will probably be filled with a collection of goodies – food is almost as important as money to the crab. And whilst you are waiting for rescue don't be surprised if he breaks into loud cackling laughter. It's just the lunar influence and he really does have a good sense of humour.

Airshow Pictorial



Over the years Canadian Forces aircraft have flown thousands of hours preparing for and participating in air displays. Millions have been enthralled by the skill and precision of our formation teams and thrilled to the aerial beauty of individual aerobatic sequences. During this time there have been many tragic accidents directly related to airshow flying. Only a sincere adherence to the briefed routine, good airmanship and strict air discipline will bring those many hours of careful training to fruition in a successful accident-free airshow season.



Posters W5

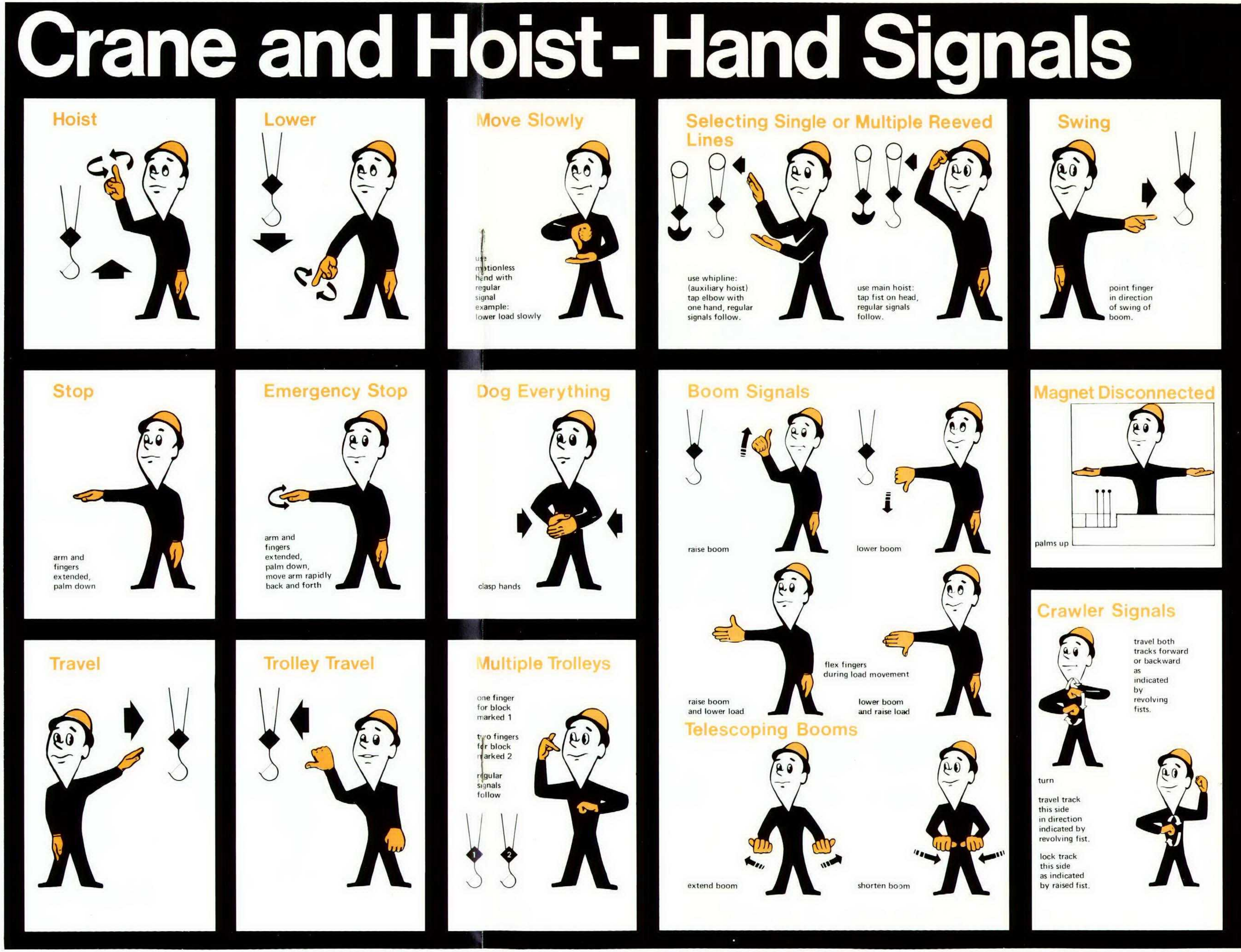
WHO? DFS produced posters are available in English and French and can be obtained through normal supply channels. Who looks at posters? Everyone does – so use them whenever possible.

WHAT? Posters fall into two groups: Messages with a minimum of words and strong visual impact or aide-mémoire information posters similar to the one illustrated here.

WHEN? Posters should form part of a dynamic program and must therefore be current. The most ineffective poster is the one which has been stuck on the wall longest. Posters should be changed regularly, e.g., publicizing winter clothing in July will probably not register too well. Information which must be displayed for extended periods should be rewritten in different formats or, at least, moved periodically to a different position.

WHERE? Messages and posters are most likely to be read where people congregate. The area should be well lighted – no one will strike a match or race for a flashlight to read your graffiti. Bulletin boards should be reserved for bulletins.

WHY? The value of posters in accident prevention programs is often questioned – usually because their purpose is misunderstood. Visual displays do not prevent accidents – people prevent accidents – but eye-catching posters are a means of presenting hazard information. Good posters continually highlight potential danger areas.



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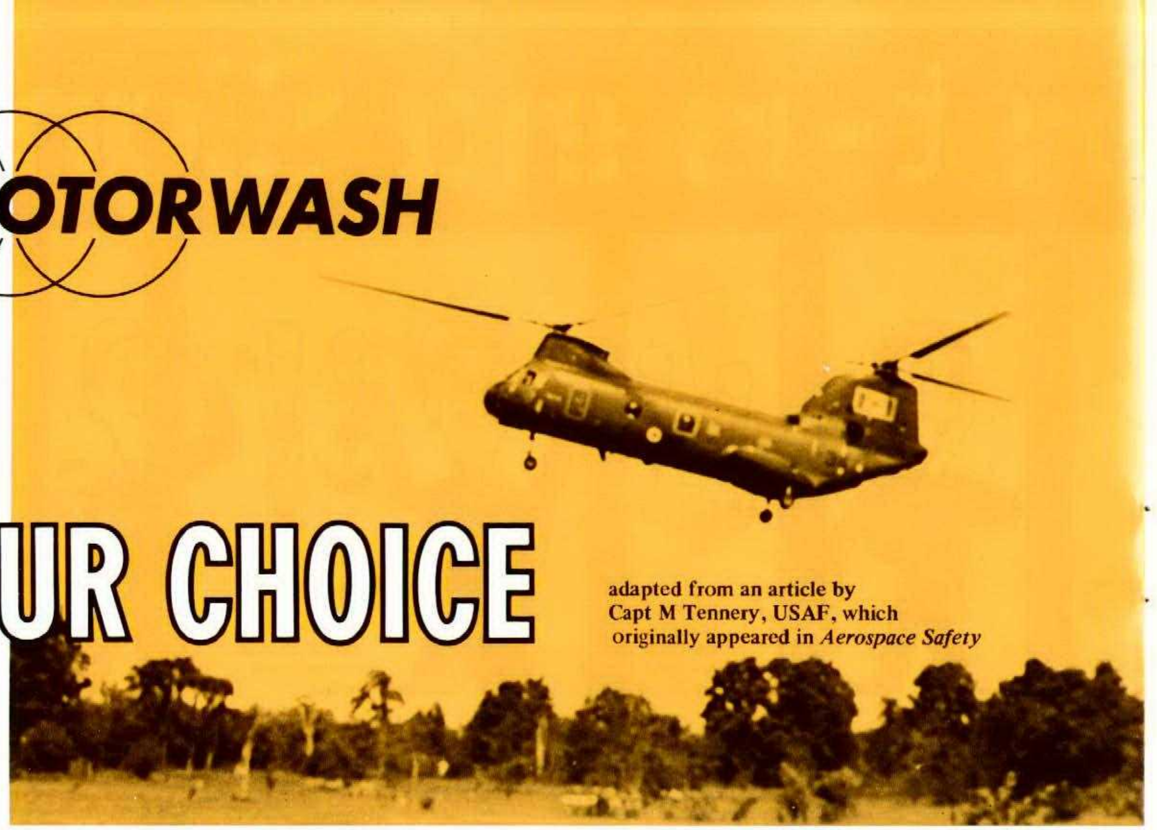
ROTORWASH



IT'S YOUR CHOICE

adapted from an article by Capt M Tennery, USAF, which originally appeared in *Aerospace Safety*

Except for a few critical seconds after takeoff, helicopter pilots can offer themselves some choice in the selection of an emergency landing site. This does not mean that we should fly around preoccupied with the thought of losing engines or rotor blades. It does mean however that we should develop some protective instincts and habits which will allow us a better chance of walking away from an emergency landing should one be necessary.

First, let's examine route selection. Use your imagination when you plan your route. Often a couple of pounds of fuel or a few minutes extra will fly you around that big lake rather than over it. There's more scenery on the beaches anyway and most likely a selection of suitable emergency landing areas. Flying over a valley instead of along a ridge if turbulence and other considerations allow it will offer better emergency landing sites. Although you may not necessarily be flying a single engine helicopter, other problems may dictate an immediate landing. During your route planning you should always consider the possibility.

Now let's discuss altitude and airspeed. The fixed wing philosophy of "the higher the better" does not necessarily apply to helicopter operations. We must think more in terms of high enough to autorotate and low enough to get the aircraft on the ground safely and quickly in case of other critical emergencies.

Airspeed can often be traded for altitude but remember—as you increase your speed you reduce the time you have to see and react to obstacles. The appropriate AOIs will contain the best autorotation speeds for your particular helicopter, as well as the height velocity charts. Knowing these and abiding by them when operationally feasible is a must.

Search and rescue flying and other operational roles present the problem of having to fly in areas where you cannot at all times keep an ideal emergency landing area available. We are not given a choice of route and airspeed is often controlled by how well we can see or what we are searching for. The pilot is left to accept aircraft damage if an emergency occurs requiring a landing. You must then in these circumstances think in terms of making an emergency landing which you, your passengers and crew can walk away from. The idea of protecting the cockpit/cabin area is your biggest concern. The following is a discussion on some ways to do this. The particular helicopter you fly and its mission will have considerable bearing on what you do. This discussion is intended to stimulate your thinking in this area and is not intended to be directive. *It's still your choice!*

When an emergency occurs, the terrain within gliding distance should be assessed for its energy absorbing capability. If sufficient altitude is available head for an area which seems to offer the best choice without attempting to select a specific touchdown spot. When the time available is very short, the choice may be limited to a variety of individual obstacles, but it is still a choice as long as you maintain control of your helicopter.

Now let's get down to specifics:

OPEN TERRAIN

Before instinctively heading towards open terrain, consider the following:

- Can I reach the open area with normal glide without attempting to stretch it? (Check your AOIs for maximum glide speed and minimum rate of descent airspeed—they are probably different!)
- Does the surface permit a running landing in case of a hard, fast touchdown?
- If a fast touchdown must be accepted can I control the aircraft enough to prevent drift or swinging?
- If the surface is poor, do density altitude and gross weight permit a zero speed touchdown or must a minimum ground roll be attempted?

TREES

Accident experience shows that landing in trees is hard on the helicopter but not as hard as you may think on the people inside. When a tree landing is unavoidable, the following should be considered in selecting a touchdown spot:

- The height of the tree is less critical than the height above ground where the trees begin to branch. Tall trees with thin tops allow too much free fall height before the aircraft reaches cushioning branches.
- When faced with spring or short trees, the most densely and evenly wooded area would be good. This ideally allows the bottom of the helicopter and the rotors to create a cushioning effect at the same time as they contact the trees.
- Landing in sparsely wooded areas may be more difficult than in dense forests. Individual trees may act more like hard obstacles rather than energy absorbers. A rotor may strike a tree with one blade while the other is free thus tipping the aircraft on its side.
- Brush type vegetation would probably not present a major problem; however, tree stumps or large rocks that are capable of puncturing the cockpit and cabin may well be concealed.
- Dead trees are dangerous as they offer little energy absorption and tend to puncture the fuselage.

In general, emergency landings in trees may be most successful if a zero or near zero ground speed is attained, and if high rather than low rotor RPM is held to keep the downward velocity at tree impact as low as possible.

WATER

There has been and will continue to be debate among helicopter pilots (except for those flying the "million dollar yacht") about what to do when you ditch a helicopter. Roll it left, roll it right, don't roll it. What you do depends on the type of helicopter you fly, but two things can be constant if you don't have a "floater"; one, have doors open when you contact the water, and two, don't prematurely evacuate the helicopter—wait for the main rotor to stop.

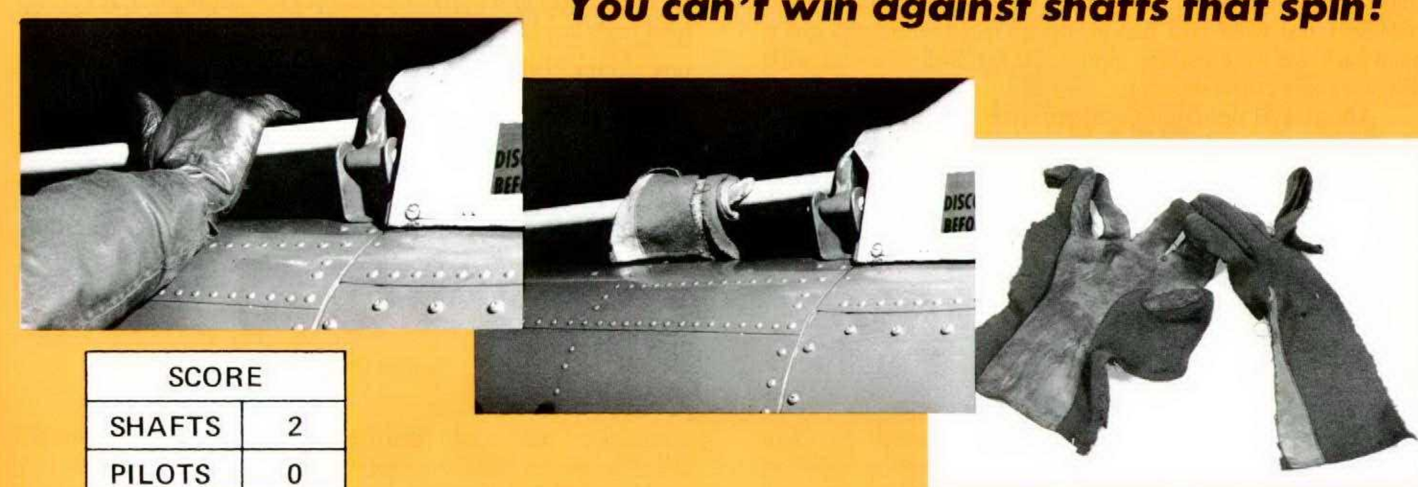
SNOW

Selecting the landing area should not present too much of a problem unless you are in whiteout conditions but there may be some surprises under the snow surface. There is also a problem of obscuration on the final portion of your landing: your choice of a zero speed landing to miss the hidden obstacles under the snow will be tempered by the desire to stay out of the snow bubble just before touchdown.

A well planned and executed emergency landing can be less hazardous than a wild thoughtless approach into a large established field. Once you have made your final choice, stick with it and concentrate on the approach. The best advice is to use standard procedures and not to aggravate your problems by using non standard or unproven techniques.

Except on certain operational missions, it's your choice to fly at an altitude, at an airspeed, and over a route that gives you an option in case of an emergency landing. Are you doing it?

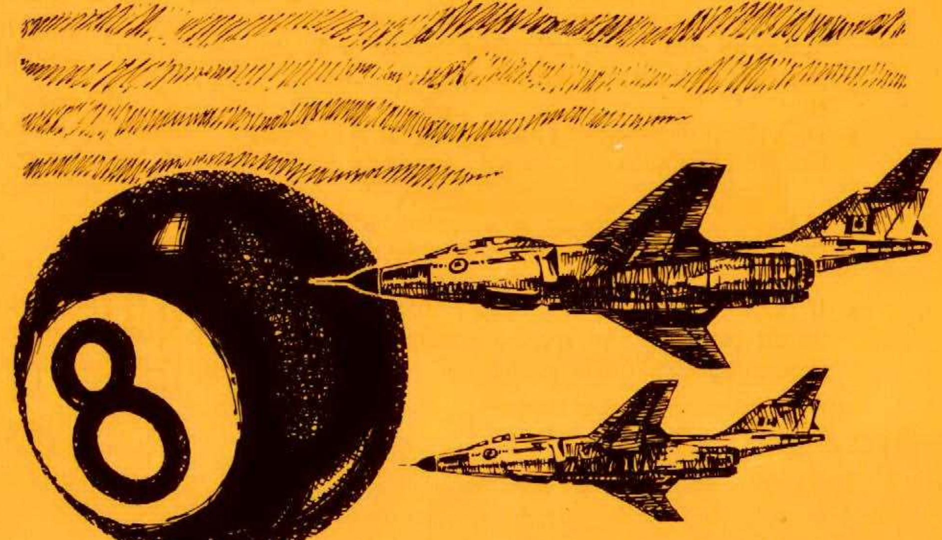
You can't win against shafts that spin!



SCORE	
SHAFTS	2
PILOTS	0

CLOSE CALL · OPERATIONAL HAZARD · SAFETY SUGGESTION

VOODOO meets



"Dear Mr Editor,

I don't know if you can use this or not but I'll submit it anyway. Somebody might get something out of it. I know we did although it seemed I'd read it somewhere before as I was going through it."

The mission was Gander to Chatham and included some AI practice with the manual GCI site at Goose. After some frustrating communication checks with Gander Centre we were handed off to GCI for the AI portion of the mission. We had requested that the intercepts be carried out as far south as possible but we were worked in an area which required a 420 nm trek to homeplate.

We bingoed with 9600 lbs, which was a bit under programmed, but the controller needed that one extra run to complete his quarterly requirements. On the way we requested a groundspeed check and were informed that we were making 400 kts. This worked out to about 4500 lbs fuel remaining at Chatham and since both Chatham and Loring were forecast good VFR, no problems were anticipated.

It became obvious fairly soon, however, that our ground speed was not what GCI had given us. When we finally got a Tacan lock we were making about 320 kts. Still no sweat with VFR wx and a cruise descent.

About 120 nm from Chatham we are in cirrus at 35,000 ft and are passed Chatham wx as 900 and ½ and dropping rapidly. In a couple of minutes we get reports of 300 and 1 and then 200 and 5/8 so we request wx at Summerside and Loring. Summerside is 700 scattered, 900 overcast with 4 mls in rain and fog. Loring is 2500 and 5, so although it's into the wind and a bit further we divert to Loring.

About 80 mls east of Loring the wx there starts to drop but is still VFR. With fuel remaining estimated at 1200 lbs overhead (enough for one tight circuit) we want priority, so we declare an emergency. Irradiate has a bit of problem getting the info we want from Loring but finally comes up on guard and talks to Loring approach through the Caswell GATR and we have our info.

After trying to contact Boston Centre unsuccessfully we go to Loring approach and after attempts on two frequencies make a request for radar approach with a 10 nm turn onto final. After talking them out of a clearance limit of the 30 nm fix we begin our descent through moderate turbulence which lasts to about 25,000 ft. Wx now 700 and 3/4 in snow. ILS seems to be working but as it is not flight checked we request a PAR. On base leg we are informed PAR has failed and we are forced to take an ASR. Pilot in No 2 aircraft checks seat pin out.

Final is fairly routine in snow and we break out at 3/4 ml with the approach lights off to the left. A bit of a deke and we put the formation on the runway. The snow has not started to accumulate and braking action is good. Both aircraft get the feed tank low light just before shutdown (1050-1200 lbs).

On taxi in, ground control says he has Chatham on the line and someone wants to know how much petrol we have remaining. We state we'll debrief Chatham when we get to Base Ops.

I don't really know what lessons can be learned from this except to repeat the old adage about "when things start to bind......" It wasn't any individual occurrence in this series of events that put us behind the eight ball but together they certainly raised the pucker factor.

On the Dials

In our travels we're often faced with "Hey you're an ICP, what about such-and-such?" "Usually, these questions cannot be answered out of hand; if it were that easy the question wouldn't have been asked in the first place. Questions, suggestions, or rebuttals will be happily entertained and if not answered in print we shall attempt to give a personal answer. Please direct any communication to: Base Commander CFB Winnipeg, Westwin, Man. Attn: ICPS.

Rules of Thumb

Several Rules of Thumb designed to aid the aviator in quick airborne calculations have been published in CFP 148, Annex A and they are well worth reviewing periodically to keep ourselves up to date on their application to the various phases of air navigation and IF. Now, for you keen drivers here are a few more rules of thumb that you may wish to use during instrument approaches to help you peg rates of descent and to give you an idea of circular distance to go around an arc approach.

First, to determine your descent angle (in still air) from the IAF to the FAF or to determine your desired descent angle on an en route descent, use the formula:

$$\frac{\text{ALT (AS A FL)}}{\text{DISTANCE}} = \text{N}^{\text{O}} \text{ OF DEG OF PITCH CHANGE}$$

Example No. 1: You have 15,000 feet to lose in 30 nautical miles so $\frac{150}{30} = 5$ degrees pitch change.

Example No. 2: You have 12,000 feet to lose in 12 miles so $\frac{120}{12} = 10$ degrees pitch change.

If you wish to know what your initial rate of descent will be, multiply your pitch change by your Mach times 1000. In the first example, 5 degrees pitch change x mach 0.6 x 1000 = 3000 feet per minute; it seems to work out quite well in actual practice.

Next, to determine your distance around an arc for an arc approach, here are two rules of thumb. The first method takes a little figuring but with the second rule you can determine the approximate distance around any arc at a glance and this could be important. As an example, in the event of lost communications on a radar en route descent in which you have to go back to the IAF for an approach, knowing the total distance to go and thus the fuel required for the approach could be quite useful in a clutch situation. Both examples will use an arc of 90 degrees but not $2\pi r$.

Method 1: Using the 1 in 60 rule, if the 90 degree arc was at 60 DME, it would be 90 miles around it. Since the arc is at 15 DME, it is $\frac{15}{60}$ or 1/4 of the distance. A simple formula is

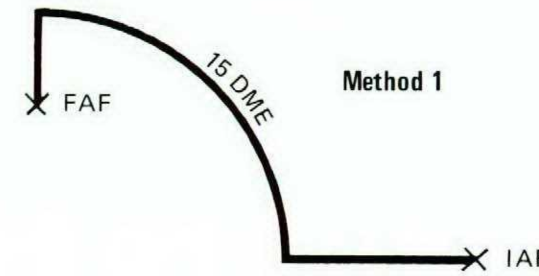
$$\frac{\text{DME x DEGREES OF ARC}}{60} = \text{DISTANCE OF ARC}$$

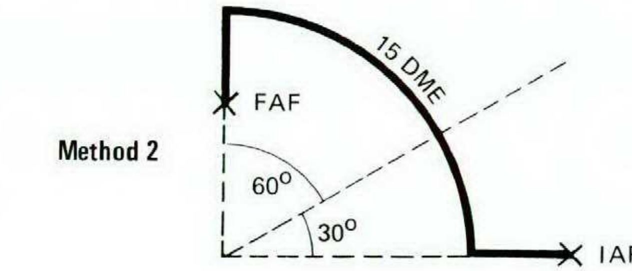
$$\frac{15 \times 90}{60} = 22\ 1/2 \text{ miles}$$

Method 2: Using the 60 degree triangle as a base for figuring, you know that all sides of a 60 degree triangle are equal and if you cut a 60 degree triangle in half, it cuts the distance on one side in half and the angle to 30 degrees.

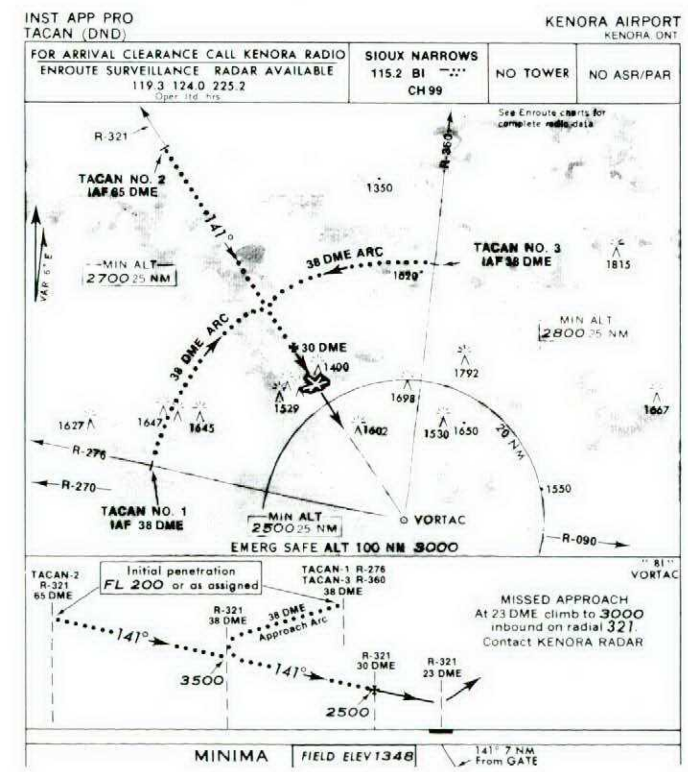
The 90 degree arc makes up one 60 degree triangle and one 30 degree triangle. The distance therefore is 15 miles plus 7 1/2 miles or 22 1/2 miles total.

In another case, if you had to fly through 120 degrees on the 18 DME arc the total distance would be 36 miles because you have travelled through two 60 degree triangles.

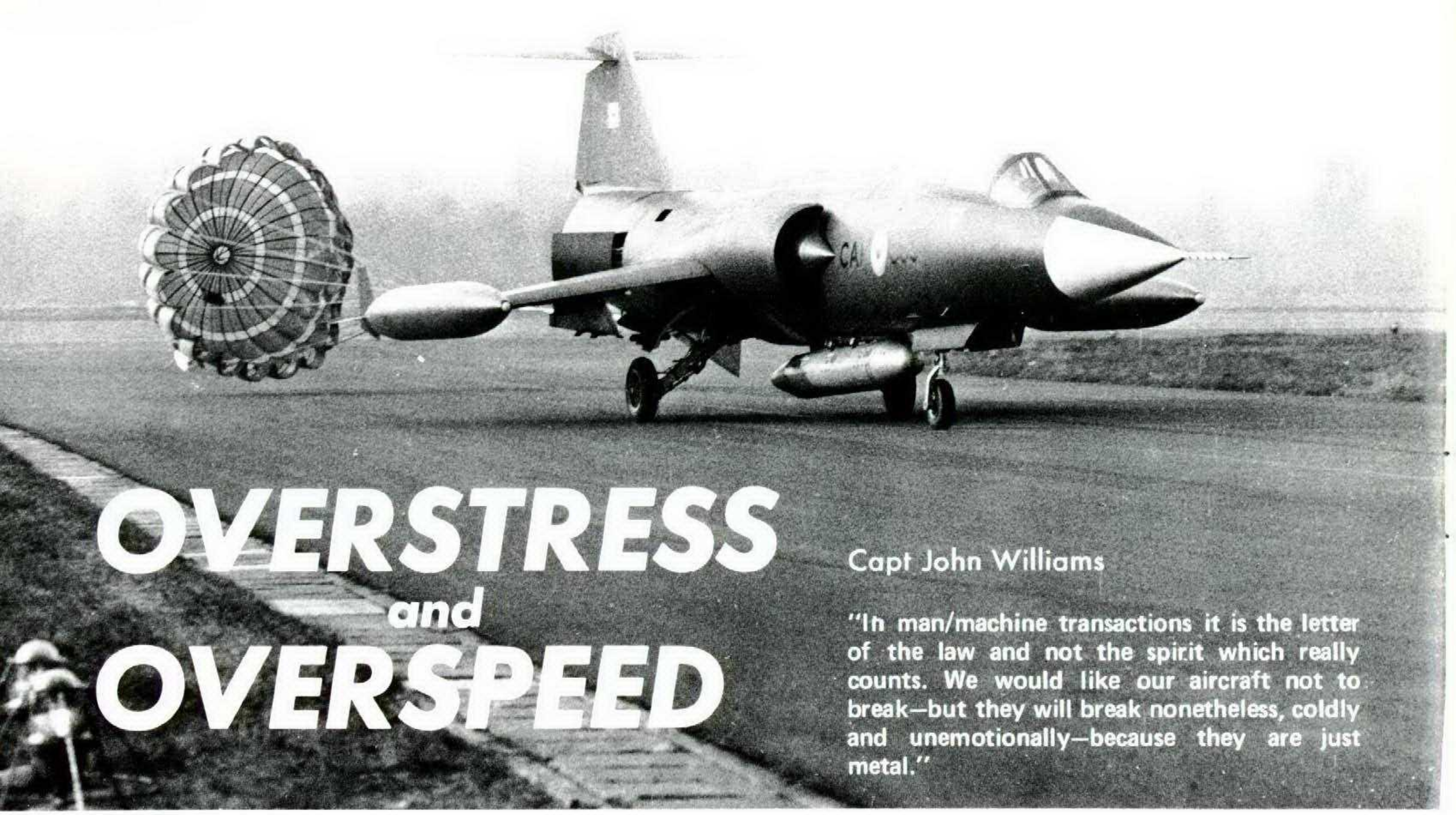




As examples of arc approaches you might take a look at Portage, Low Altitude, Tacan 2 with an 8 DME 126 degree arc, or at Kenora High Altitude with two arc approaches. There are also many similar approaches in the USA.



Well, that's it for this edition. We hope these suggested rules of thumb are of some use to you in computing data without reference to pencil, paper, or computers during the heat of shooting a bad weather IF letdown.



OVERSTRESS and OVERSPEED

Capt John Williams

"In man/machine transactions it is the letter of the law and not the spirit which really counts. We would like our aircraft not to break—but they will break nonetheless, coldly and unemotionally—because they are just metal."

Stand around a pilots' bar long enough and you're almost bound to hear someone or other expounding on the subject of "g" limits and what his particular aircraft is, or is not, designed to take. I am interested in this particular subject—as most pilots are—because I would like to avoid catastrophic failure of any portion of my own airplane about as much as any other pilot. But I am not an engineer or even a metallurgist, and to understand most tomes on this subject one would have to be so qualified.

During the past year or so I have studied this matter in my spare time hoping to eventually write an article in layman's terms which would clarify any points in question.

First of all, it must be obvious that in the design of any aircraft there has to be a tradeoff between weight and strength. An aircraft could probably be built to withstand 30 "g", but its structure would be so heavy that it would never get off the ground. It has therefore been decided that fighter and trainer aircraft generally must be designed to withstand a load of approximately 7.5 "g" without objectionable permanent deformation of the primary structure. The key word here is "permanent". You'd better believe your bird is deformed when you are pulling a lot of "g", but unless you go beyond your 7.5, it will reassume its normal shape when the load is removed. This figure of 7.5 then is known as the *limit load*.

Aircraft designers being the sort of people they are and knowing the sort of people we are, realized that once in a while this load might be exceeded just a touch. If someone is in your six o'clock and shooting or if you're in the middle of a low pullout it'd be downright frustrating to go all to pieces because of an extra half "g" or so. Well rest easy guys, because a safety factor is thrown in which allows 1.5 times the limit load to be applied without failure. However, this can only be done once and then all bets are off, and just that once will virtually guarantee permanent deformation. This doesn't mean rivets pop; this means spars bend—serious stuff like that. If you multiply the limit load by 1.5 it becomes the *ultimate load*. If you exceed the ultimate load you break-up—it's as easy as that.

Or is it?

Lots of planes have broken up in flight, and most of us would bet that they didn't exceed 11 "g". Why then did they break?

The chances are excellent that they broke because of metal fatigue. Metal fatigue is something we're all familiar with. When you lock your keys in the car and have to use a coathanger to open the lock, you probably employ metal fatigue to open the hanger. Sure the metal of a coathanger differs from that of an airplane, but let's just use it as an example anyway.

If you want to break the wire of a coathanger you know that you're going to have to flex the wire repeatedly. You also know that you can choose between making a small bend a whole lot of times, or a large bend a few times. You are applying a cyclic stress to the metal. High stress requires very few cycles, moderate stress requires many more, and low stress may require almost an infinite number of cycles to cause failure—but failure is inevitable.

Metal has a memory. You can break that hanger wire by flexing it ten times right now, or you can flex it nine times today, put it aside for ten years and give it the tenth flex then. It'll break because it "remembers" that it only needed one more cycle.

Aircraft designers know that their product is going to be subjected to a certain amount of stress during its operational career. I suppose that to reduce the matter to absurdity they would be pleased if the product of their drawing boards would last exactly to its design life and then collapse into a pile of scrap aluminum. That would be the ultimate in efficiency: exactly enough strength for the job and not one bit more. Fortunately that isn't how things work, and it's a good thing for us drivers, because historically we keep changing the ground rules—after the designers are long out of the picture.

I think we can be sure that Mr Douglas didn't picture his C47 flying after almost forty years, nor did Mr Lockheed realize that his T33 would surpass the quarter century mark. The 104 and 101 are both twenty year old designs, and I would hazard a guess that neither was initially designed for more than two thousand hours of flight.

Imagine the memories that some of these birds have (and I refer to the "metal memory" touched on earlier). How many hard landings can occur in one thousand and forty months of flying? How many tiny overstresses may have been applied in 7300 days? Think of all the gust loads, all the rolling "g" ....the mind reels and boggles.

The point is that we have unconsciously thrown a curve to the designers. We have exceeded the design limitations and since the aircraft is now in being we can only compensate for this by imposing strict operating limitations. We limit a bird initially designed for 7.5 "g" to 6 "g" because we know it's getting older, and that role change is causing more stress than the design specifications called for. This is fine and dandy until some guy who "read somewhere" that the plane was designed for 7.5 goes ahead and pulls just that. If it only happened once it probably wouldn't matter, but how often might that happen in five years? In ten? The metal remembers even if we don't, and when the time comes it has amazing potential for reminding you.

Now so far the only kind of stress I have mentioned is "g", but there are other possibilities, and perhaps the most common is speed. Let's say you're flying along low level at 540 knots. You pull up for a dive bombing delivery and as you hit 450 you drop takeoff flap (its kinda nice for the pullout). But accidentally you go beyond the restraint and lo and behold you've got landflap. Those beauties were designed for 240 knots and very little "g". You've just oversped them by over 200 knots and probably over "g" 'd them too. All bets are off again: The designers simply never considered that we might be so careless. In fact, they don't know themselves how many times you can get away with this one—they couldn't find a test pilot crazy enough to run flight tests on it.

It's pretty easy to figure out what would happen if one of those flaps broke off or was shoved to the up position though. If you can roll once per second with full aileron deflection just think what you can do with full flap on one side and nothing on the other. If you weren't knocked unconscious by your head hitting the canopy when it all began you'd be treated to quite a ride.

You know, it's not so much the guy who causes his own overstress and comes apart in the air who worries me. It's the guy who climbs into what he believes to be a serviceable aircraft and has a catastrophic failure in flight because the guy before him or maybe the guy ten months or ten years ago "got away" with something and so didn't write the bird up.

Some years ago I read an excellent article which touched on the fact that some pilots attribute human characteristics to aeroplanes when in fact they have no such qualities. The author pointed out that a plane would just as soon fly into a mountain as not, just as soon stall as fly et cetera. It seems obvious that there is truth in this—and it must be recognized by all of us.

Your airplane has no hidden reserves of strength, and no self preservation instincts. It will hold together for exactly as long as the designers programmed it to—*if* and only if it is flown the way it was designed to be flown. Don't get yourself out on a limb expecting design safety factors to protect you when they just aren't there. In man/machine transactions it is the letter of the law and not the spirit which really counts. We would *like* our aircraft not to break—but they will break nonetheless, coldly and unemotionally—because they are just metal.

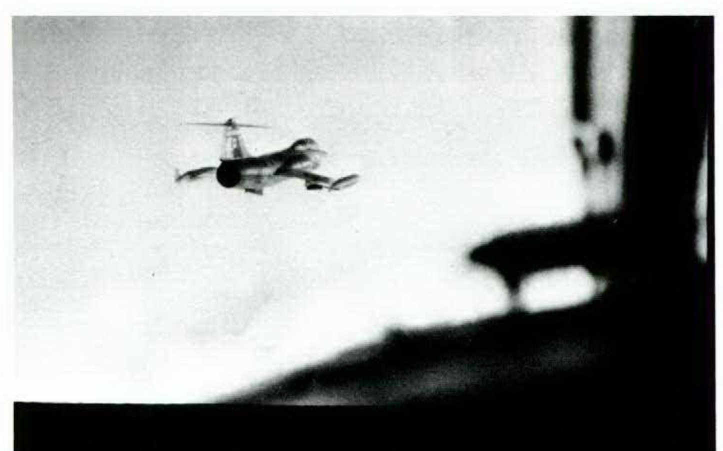
It may come as a surprise to some readers that in every aircraft there are some vital components which everyone knows will break before the plane's design life is up. Such parts are simply programmed for replacement at certain time intervals which are well before the predicted breaks occur. That is one reason why you can't say to yourself even when an airplane is relatively new, "Well it was designed for 2000 hours and it only has five hundred: there is lots of strength in the old girl still". There may be a wing fitting or a stabilizer spar or some other major assembly that is programmed for replacement at 550 hrs. You are attributing three times the lasting power that that part had to it. And you are wrong in so doing.

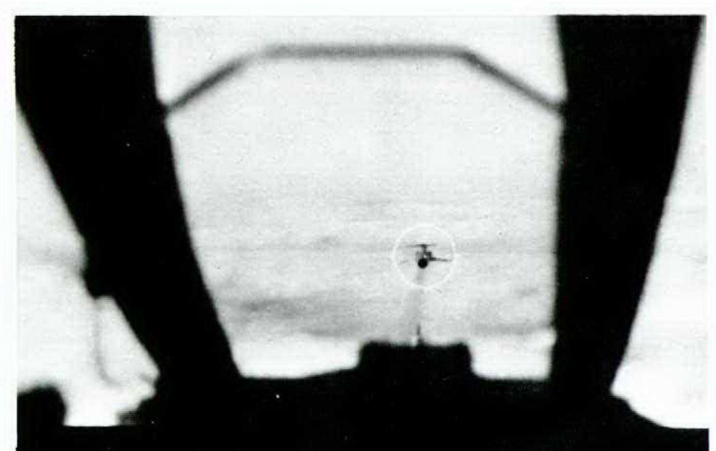
So what does all this mean? It surely doesn't mean that we're flying fatigue-cracked hardware does it? No it doesn't, for one very important and little known reason.

We have available to us for checking our possible overstresses some highly complex technical equipment and some really qualified technicians. We have X-ray, Dye Penetrant, Eddy Current, Ultrasonic and Microscopic testing available—but we have to be told if a special look is required.

It would be nice to think that some day everyone will conform to all aircraft operating restrictions, but it would also be totally unrealistic. As long as we have to dive bomb we're going to keep pulling out, and when that ground looks too close by all means pull as hard as you can. Just tell us about it later. The life you save may be your own.

As long as we fly air combat missions we're going to have the occasional case of planes going through jetwash at high "g" and high speed. That's a calculated risk; something we all get paid for. For heaven's sake though, write the airplane up when you get home. It's just like that coathanger; the bump you felt might be the first cycle—or the ninth. You can't afford to gamble in a game with stakes that high—and we can't afford to lose you.





...accident reconstruction for

FLIGHT SURGEON TRAINING

Capt J. A. Winship
DCIEM

At 1310 hrs on Mar 7, a young pilot was gathering up his chute and seat pack contents as he watched the smoke curl into the air from his burning aircraft. Was he going to be here for minutes or days? This question was soon answered by the arrival of the rescue team. In attendance were a base flight safety officer, a squadron commander, a senior civil aviation medical specialist, an engineering officer, a safety systems specialist, a photographer, a film crew, a DFS representative, a human factors team from DCIEM's Accident Investigation Group and *eleven flight surgeons!*

A typical accident response? This may come as a surprise, but *yes* it was! It wasn't a major air disaster but a Canadian Forces flying accident which had been re-enacted as a teaching vehicle for Canadian Forces flight surgeons.

Twice yearly, a group of doctors (usually 10 Forces Medical Officers and one or two National Health and Welfare doctors) arrives at the Defence and Civil Institute of Environmental Medicine in Toronto to begin a nine-week course in aviation medicine – The Flight Surgeons Course.

The course is conducted at DCIEM's School of Operational and Aerospace Medicine. Here the future flight surgeons become qualified to supervise and enhance the operational efficiency and safety of the air operation by the practice and application of Aviation Medicine and the allied sciences to human biological problems of manned flight, and associated operations in the ground environment under all climatic conditions.

The course is basically broken down into a number of phases:

Stress of Flying

The Flight Surgeon is introduced to the combined stress aspect of man in flight. He gets a brief introduction to theory of flight, advanced aerodynamics, meteorology, air traffic control and aviation physiology.

Simulators

In support of the theoretical aspects of manned flight, simulator exposure is provided through the use of hypobaric chambers, the human centrifuge and static cockpit simulators.

Actual Flight

In this phase he gets his initial exposure to flight and actually controls a light aircraft in flight. He will further visit static displays of large passenger aircraft on inventory of the commercial airlines, and also visit airline pilot training facilities.

Field Experience

The embryo flight surgeon now proceeds on an operational field tour and meets military pilots for whose physical and psychological welfare he will be responsible. He will meet these pilots in their own operational habitat. The physician will fly approximately eight fixed wing and rotary wing aircraft on CAF inventory and visit support and SAR facilities.

Accident Investigation

One week is now totally devoted to accident investigation considerations. Both civil and military accident and incident investigation principles are studied. This week is described in more detail later in this article.

Special Visits

This is the clinically oriented phase of the course where specialists in all clinical disciplines critical to the health and survival of the pilot give presentations. Visits to special institutes are often programmed.

The author playing the role of a downed pilot.

Capt "Ab" Lamoureux, BFSO at CFB Moose Jaw, briefs on some aspects of the "accident".

Presentations

Individual interviews are carried out and the flight surgeons present their dissertations. Course critique and student assessments are completed. A long and difficult course finally comes to its rewarding conclusions at a graduation ceremony where graduation certificates and flight surgeons wings are presented.

The week of accident investigation training is carried out by DCIEM's Accident Investigation Group. The week starts out with presentations on the reasons for carrying out accident investigation – best approach and methodology of investigation and discussions on current problems associated with accident investigation. Throughout the week emphasis is maintained on human factors aspects, both physiological and psychological. It should be mentioned here that both military and civilian incidents are discussed as there is often much in common between the two situations. Very frank discussions of past accident investigations form an integral part of the week as the experience and achievements of others in the field are drawn upon for many lessons.

By the end of the week the flight surgeons begin to achieve an orientation to the business of accident investigation. At this stage the best thing we could do would be to visit an actual accident scene. Since scheduling becomes something of a problem for this, we have done the next best thing and brought the equipment from an actual accident to our classroom.

An ejection seat, parachute, seat pack and recently ejected pilot are set in place and we have the scene described at the beginning of this article.

The past Flight Surgeon's Course 7401 was the first to go through such an accident simulation exercise and we already have improvements to make. Eventually, we may even present them with a burning aircraft wreck, but that is not really the important aspect. The important lesson is an orientation to detail, some practical experience in the business of accident investigation and some first-hand exposure so that if the crash bell does ring, the flight surgeon will not be "green" about the job that lies ahead.

The "Board of Inquiry" sits and deliberates.

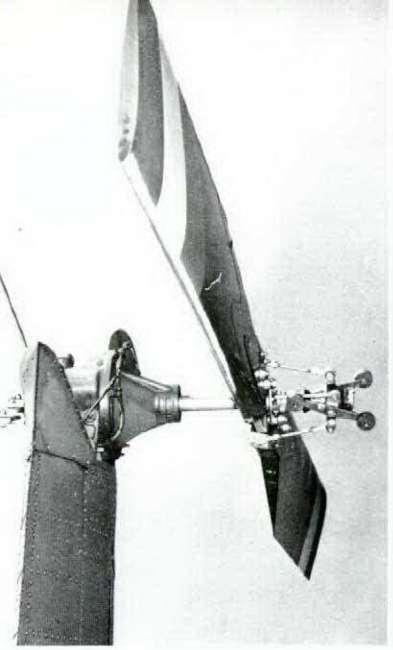
The "butt snapper" is explained.

A detailed examination of the dual visor helmet.

It's still happening!

"During a training check ride in a T33 both the back seat pilot and the front seat check pilot set the wrong pressure on the altimeter subscale. i.e., 29.82 instead of 29.92. Because of good weather and further checks made during descent the errors were noted before any serious incident occurred. The station altimeter setting was 29.83 which made the error very understandable because of the unusually low altimeter setting".

from a recent incident report

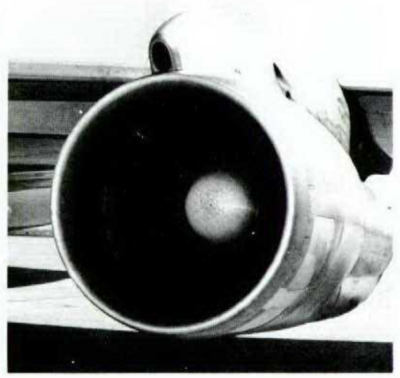


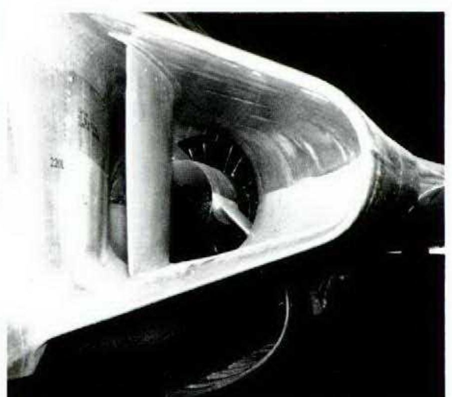
Rotors

Helicopters are known familiarly as choppers – and with good reason. That chopping action is done by main rotors and sometimes by tail rotors and sometimes by both. Whether it's a MarCom Sea King, an ATC Labrador, a Training Command Kiowa or a MobCom Huey, these birds all have one thing in common: their rotor blades can be lethal. The CAF inventory of rotary wing aircraft has increased considerably in recent years and these machines are now a familiar sight at all our bases. The unique properties of the whirlybirds allow them to land virtually anywhere and this has also increased your exposure rate considerably. Familiarity and complacency go hand in hand where helicopters are concerned so remember:

- only approach or depart *as directed*,
- keep loose articles away,
- the main rotor blades can drop very low,
- keep your nose out of the tail rotor.

AIRCRAFT DANGER AREAS





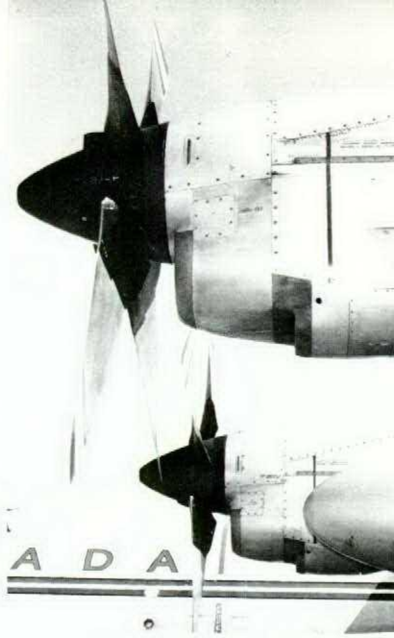
Intakes

Jet engines are sustained by gobbling up huge amounts of air but these super-suckers will also very quickly swallow anything else that comes within range of the intake – and that includes people. In recent months, a Voodoo pilot clambered out from beneath his aircraft and was promptly sucked into the intake by a hungry J57. Only the quick action of the groundcrew prevented a serious accident. So stay away from that great suckerhole because engines are not very fussy about their diet – they'll chew on anyone. And even if they don't pick on you for the main course they'll be happy to take your hat, ear defenders or any other loose article you may be carrying as an hors d'oeuvre. FOD damage costs thousands of dollars every year in lost resources – not to mention the indigestion it causes the engines.

Propellers

Propellers on fixed wing aircraft are like tail rotors on helicopters except that they are usually attached to the wings and not to the tail. Again, like tail rotors, they have taken a heavy toll over the years. Recently a Hercules pilot was forced to feather two engines as three late passengers headed for his aircraft ***directly towards the rotating props.*** Aircrew and AMU personnel have to be continuously alert to the problems of passenger/aircraft encounters. Technicians and Servicing Crews working in the vicinity of propellers are also operating in a danger zone.

There are tales of personnel who walked through propeller arcs and got away with it but it's not recommended as a good gamble. By comparison, your chance of winning a million dollars on the Olympics lottery is a sure thing – even if you don't have a ticket.



Recent incidents would indicate that we have become so used to aeroplanes as an everyday mode of transport that we are treating them with less respect than they deserve. These birds may seem pretty docile and gentle in the air but once on the ground they are all quite ready and certainly able to: (a) suck you in, (b) blow you out, (c) chop or (d) mince any unwary human who unwittingly or unthinkingly challenges the beast.

Some of the more obvious danger areas are illustrated on these pages but the list is by no means comprehensive. Flaps, elevators, wheels, electronics equipment – any part of every aircraft has hazard potential. It is essential to remember that these machines are masses of moving parts sewn together with high voltage electrical and high pressure hydraulic lines. Unfortunately they can't think or shout a warning to us if we're heading for trouble. It's up to us to keep our heads – by staying clear.

Exhausts

The mass of air sucked in at the front end of a jet engine eventually finds its way out through the exhaust pipe but before it regains its freedom it is subjected to some rather harrowing experiences. First it is seized by the compressor which squeezes and warms it up a little. Some is then tapped off to warm the pilot's tootsies but most of it is fired into a combustion chamber where it is soaked in fuel and ignited – heating up to more than 3000°F. It is then minced through one or more turbines before being shot ignominiously through a long exhaust tube. Having been sucked in, speeded up, compressed, burned, bled off, minced, diffused, and finally ejected it is not surprising that this same mass of air is just waiting for you to step too close. If it doesn't blow you over it will throw rocks at you and remember – even when the engines are shut down the exhaust pipes stay hot for a long time.

GEN FROM 210

CH135, TAIL ROTOR DISCONNECT

The aircraft was on a maintenance test flight and landed so that technicians could make a control adjustment. This adjustment was needed to eliminate high frequency vibrations which were being transmitted through the anti-torque flight controls. Whilst the technician was removing a bushing at the tail rotor control servo/control rod connection, the helicopter's nose moved 30 to 40 degrees left. The pilot, fearing injury to technicians on the right side, lifted the helicopter into a low hover. The swing to the left stopped momentarily then increased in severity and the nose pitched down to the right. The helicopter made several complete turns before the tail rotor contacted the ground. The machine then came to rest on its right side with the main rotor blades and transmission 30 feet away. Fire broke out in the aft cabin section as the crew exited. The technician nearest the flames received minor burns and one other suffered back injuries.

The investigating board determined that, whilst making an adjustment to the anti-torque servo cylinder with the helicopter rotors turning, the technician removed a nut from a bolt end and inadvertently disconnected the directional control linkage. This allowed the servo to initiate full pitch to the tail rotor causing the helicopter to go out of control.

Comments to the editor

RCAF ANNIVERSARY

This year witnesses the 50th anniversary of the RCAF. Many organizations are observing the event with special events and celebrations.

The Canadian War Museum (CWM) has over the years obtained various historical memorabilia, uniforms and equipment concerning the fifty years of RCAF history. The CWM is concerned, however, that many interesting items concerning the RCAF and kept as souvenirs by ex-RCAF members, may eventually be lost. Pieces of flying equipment, technical data, reference books, flying clothing, early types of uniforms, maps, badges, buttons, medals, squadron mementoes, photographs, flying log books, weapons, foreign souvenirs, etc., are all of interest to the CWM.

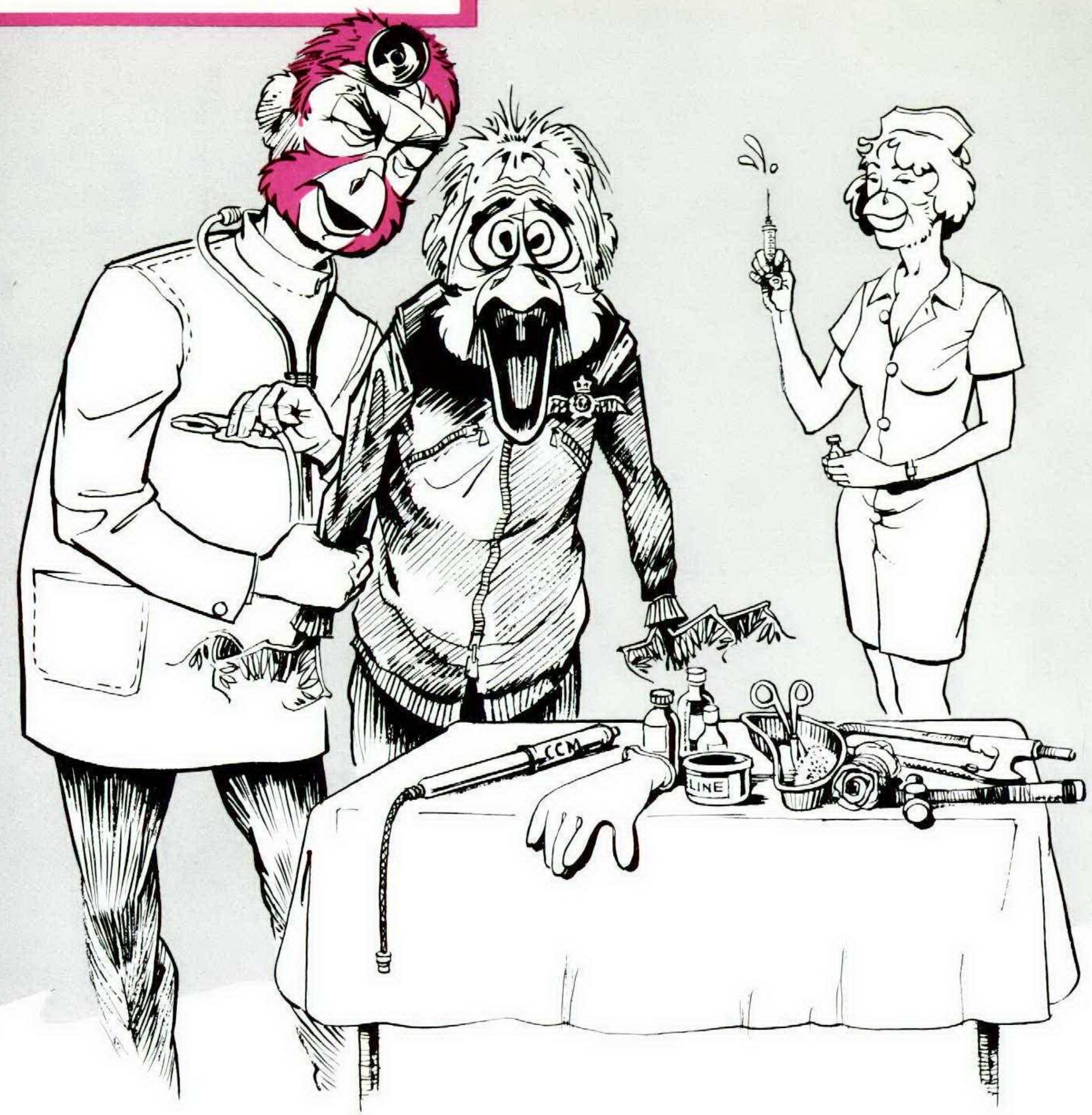
On the occasion of the 50th anniversary the CWM invites any ex-RCAF members with such memorabilia to contact the museum. The museum wishes to record the location of such items, and if specifically appropriate to the CWM's requirements, to obtain the items on loan or as a donation for the museum's RCAF historical inventory.

Various items cherished by ex-RCAF members (as well as Canadian members of the RFC, RNAS, RAF and CAF) may be very unique and significant to RCAF history. It is hoped that your readers will advise the CWM of what they have in order to help commemorate the 50th anniversary of the RCAF.

L.F. Murray
Chief Curator
Canadian War Museum
Ottawa K1A OM8

courtesy 422 Squadron CFB Gagetown

BIRD WATCHERS' CORNER

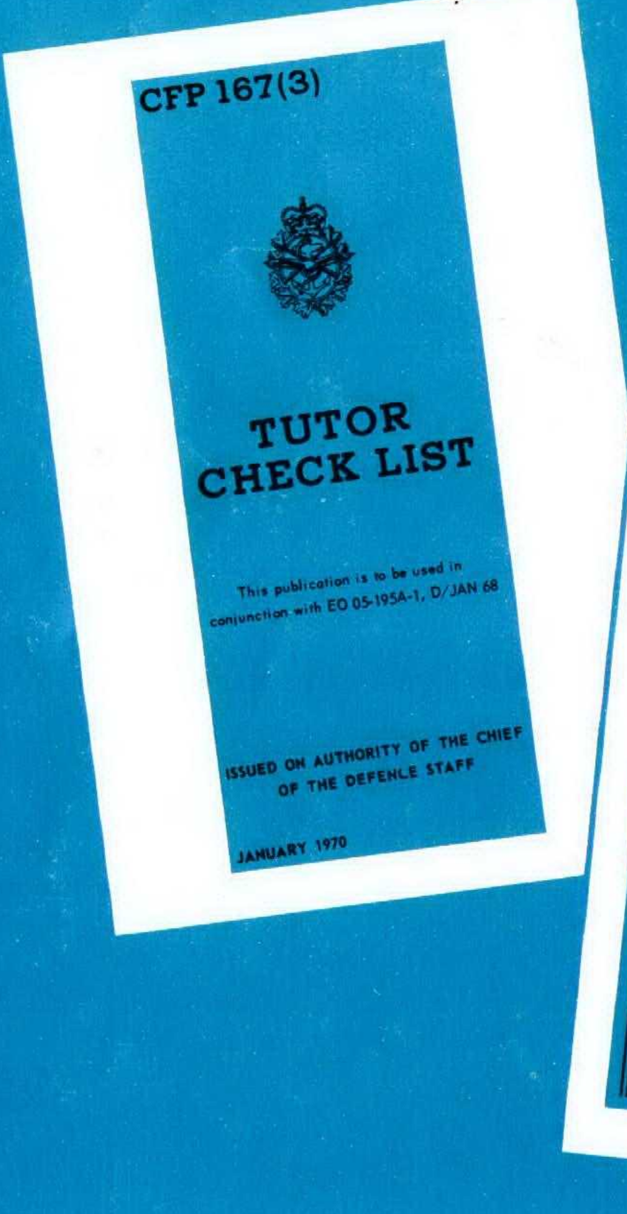


QUICK CURING QUACKER

Once a year all fliers make a special journey to the nest of the Quick-Curing-Quacker. This friendly old bird lives in a spotlessly clean habitat and is always surrounded by a flock of white-feathered fledglings who assist him in his work. Together they probe and prod the pilot's plumage, look down his beak and into his ears to ensure that he will stay bright and chirpy and not fall out of the sky for another year. If the flier is overweight from too much corn he is forced to diet and the older, grey-feathered types who are starting to moult get special treatment to keep them air-borne. Those lazy late birds who forget about this annual visit soon get the message when the chirpy chirurgien cheerfully chirrups!

GET-YOUR-CHECK-GET-YOUR-CHECK -OR-YOU'LL-STAY-ON-THE-DECK

Youll get by...


CFP 167(3)

TUTOR CHECK LIST

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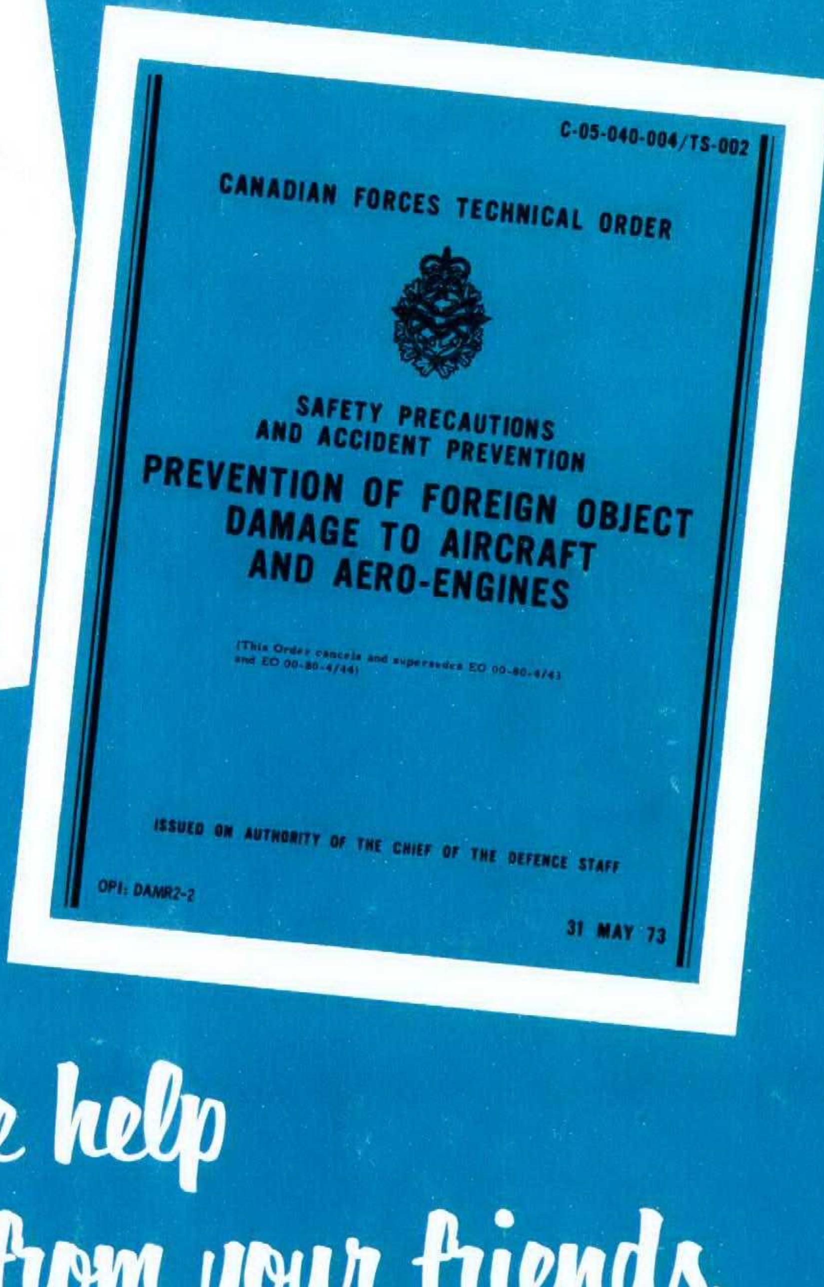
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CANADIAN FORCES TECHNICAL ORDER

SAFETY PRECAUTIONS AND ACCIDENT PREVENTION

PREVENTION OF FOREIGN OBJECT DAMAGE TO AIRCRAFT AND AERO-ENGINES

(This Order cancels and supersedes EO 00-80-4/43 and EO 00-80-4/44)

ISSUED ON AUTHORITY OF THE CHIEF OF THE DEFENCE STAFF

OPI: DAMR2-2

31 MAY 73

...with a little help from your friends.