FLIGHT COMMENT

MAY • JUNE • 1971

Comments

US Army Aviation Digest points out the remarkable phenomenon that aircrew eject in ample time when the need to eject is obviously the result of an outside influence, such as combat action. But, all too often ejections are delayed while pilots attempt to correct self-imposed emergencies. By then, it's too late!

Recently an FSO submitted a demand to Command for a typewriter. Because his job as Sqn FSO included coordinating the Flight Safety efforts of nine UFSOs who often operated away from base for long periods of time, he felt that he had justification for the request. *To emphasize the need, his submission was handwritten.* Then it was injected into the supply system. Two months later the demand arrived back on the FSO's desk along with a memo stating "this demand will not be actioned unless submitted in typed format in four copies". His demand had not left the base!

Several Flight Safety Committees have discussed the idea of putting velcro tape on helmets, strobe lights and flashlights. This would enable a pilot to attach either of the lights to his helmet in an emergency, thus leaving both hands free.

The Twin Huey shown on the front cover is the first of 50 to be delivered to the CF between now and early 1972. They will go into service with 427 Sqn at Petawawa, 403 Sqn and 422 Sqn at Gagetown, 430 Sqn, Valcartier and 408 Sqn at Namao.

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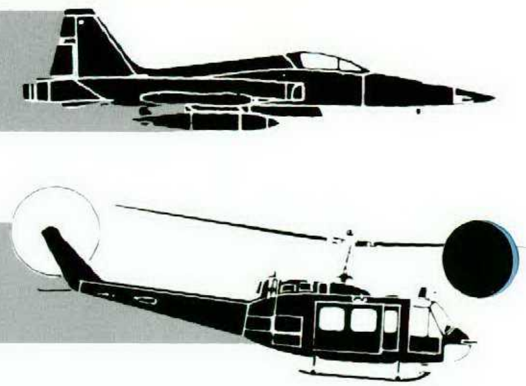
The WHY and the WHEN

In looking at the record to determine WHY accidents happen, we should not overlook WHEN they happen, as this could in fact be one of the reasons WHY. The record shows that during the past three years, 50% more accidents occurred in the summer months than in the winter. In other words, the onset of fair weather signalled an increase in the number of accidents. Can this be because:

- aircraft operations tend to be more controlled in the winter because we have recognized the weather hazards?
- as fine weather approaches, so the push is on to log hours, to exercise, to train, to uphold commitments during leave and postings?
- there is a tendency among pilots to go VFR when for several months the only way to go was IFR?
- the old spring fever urges us to leave behind those winter woes, to enjoy the sun, to become carefree and perhaps careless?

Whether this information comes to you as a surprise or not, the important thing is to do something about it before another year's statistics are added to those mentioned above.

COL R. D. SCHULTZ
DIRECTOR OF FLIGHT SAFETY



Low and Slow - Not So!

Maj R. R. Wheeler NRHQ

There is a misconception about tactical support aviation (helicopter and propeller fixed wing) which should be laid to rest. It holds that the flight envelope is low and slow. About the low altitude there can be no doubt, but as for being slow... The generally accepted maximum limit for low-level jet attack is about 200-250 feet at 500K. Interestingly enough in terms of vision, the rate of data presentation to a pilot's eye at that speed and altitude is the same as flying a rotary-wing aircraft at about 40-50 feet at 100K. Tactical aviation flights are often required to fly below 50 feet; for example, a recce helicopter may fly at 3 feet and 60K. Vision is therefore vitally important for survival in this flight environment.

Most aviators are not concerned with their vision after the flight surgeon gives them the OK. The visual category is arrived at by measuring visual acuity either by cycloplegic examination or by simply reading a chart. This examination is done in a hospital environment. However, in the flight environment there are other influences which can reduce this statically measured visual acuity. Perhaps we should be measuring operational visual acuity. But, since there is no way of doing this we rely on training and experience to enable pilots to deal with these influences; it is part of the initial and on-going pilot training, as knowledge of their effects is the best defence against them.

Vibration is commonplace in flying. It comes from external sources such as air turbulence, and it comes from internal sources like the mechanical system (prop or rotor) which keeps us in the air. These forces interacting with the fuselage cause the vibration problem. The vibrations may be merely bothersome causing minimal physical discomfort, but in one frequency range they may be deadly. In the 8-35Hz (cycles per second) range the eyeball itself sympathetically vibrates with the fuselage. This can lead directly to difficulty in focussing on near and distant objects and to a decrease in visual acuity. Because it has a control function over the eyes, the organ of balance in the middle ear, when it is subjected to linear acceleration in the form of vibration, can compound this visual problem. These visual effects are first noted in peripheral vision from which many important bits of data concerning altitude, attitude, and motion are derived in low altitude flight.

Wires are the bane of low-level flying and it is noted in studies that wire strikes by helicopters are much more common than by fixed-wing aircraft in comparable flight patterns. Alertness and concentration help pilots to minimize the detrimental effects of vibration on vision. Although there have been significant improvements in the last decade, vibration reduction awaits the state of the art.

The peripheral visual fields (not usually tested extensively in annual aircrew medicals) are of prime importance in providing a multitude of subtle visual data which when integrated with other sensations provide attitude, altitude and relative motion information. These integrations are vital to successful low-level flying because the visual data are offered at or near the maximum rate at which the brain can coherently use them.

What other traps are there at low level? A well known one is the contrast of light and shadow. Flying over an unbroken stretch of calm water, over a featureless expanse of snow or ice, or over a canopy created by dense bush or jungle, a pilot will have very few contrasts and shadows to provide attitude information for him. Add to these situations haze, fog, snow or rain, and visual clues are even further reduced: and the price of being unable to judge altitude accurately may be high.

Rain can also present an interesting and potentially fatal illusion. When rain is blown across perspex the apparent horizon tends to fall below the true horizon. This illusion is produced by the generally reduced visibility in rain and the actual deflection of light rays from the ground in the rain droplets. The downward deflection may be as much as 5° which at 1 mile from touchdown may be an error of 200 feet. In other words, you could actually be 200 feet lower than you think you are.

Recent studies here in Canada have recorded pilots' eye movements in actual low-level terrain-following tasks, especially in map reading. The results showed that much of the time (up to 75%) the pilot was "heads in". This is a long time without the input of external visual clues which are so important to the low level pilot. The solution to this problem is not in the cards for the immediate future, but emphasis on the importance of the external scan will help. Perhaps some time in the future we will have heads-up displays of vital flight information so that the need to look in will be greatly reduced.

As the use of helicopters increases in the CF today, more and more pilots are coming into the tactical support environment. The environment has many particular problems and some at least are visual. With good operational visual acuity and knowledge of these problems, pilots will be able to deal with them successfully.

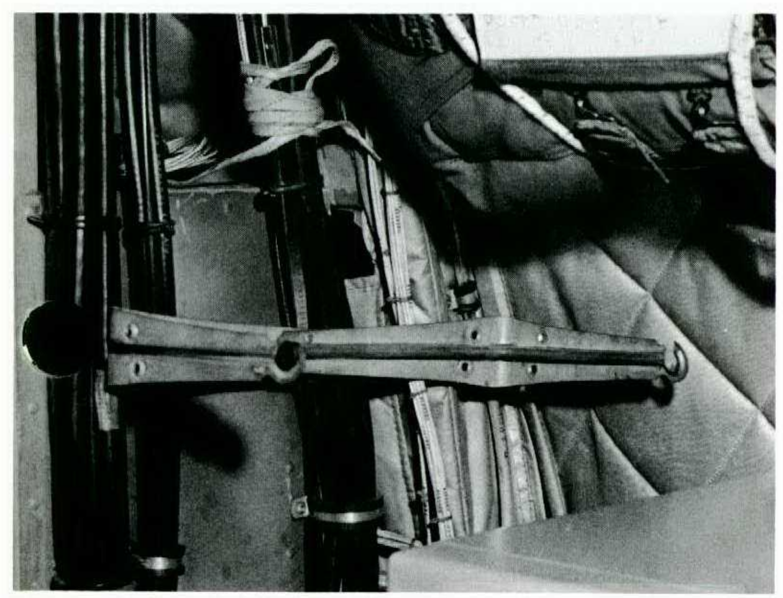
Whop Whop Whop!

After refuelling at night, aircraft "A" was hovering along the runway to a parallel revetment. As it turned left, its tail rotor struck the untied main rotor blade of aircraft "B", parked to the rear of aircraft "A". This caused aircraft "A's" 90° gearbox to separate. The aircraft bottomed collective, resulting in a hard landing which collapsed the left skid. A main rotor blade then struck the side of the revetment, causing major damage to the complete drive train and main rotor blades of aircraft "A". Aircraft "B" had incident damage to one main rotor blade. The crewchief of aircraft "A" was not wearing a seat belt and was thrown from the aircraft, but escaped injury. There were injuries to the crew and there was no fire. Flying rotor weights severed the airfield main power line and hit a BOQ and latrine. The assistant airfield commander was injured when a main rotor weight flew through his room. He was not struck by the weight, but injured his shoulder, when, from fright, he jumped approximately 10 feet across room, striking a wooden shelf.

Moral: When hovering in restricted areas, use ground guides! If in doubt, land, shut the aircraft down and ground handle it into the parking area.

USABAAR Weekly Summary

What is it?



This example of misguided ingenuity was discovered at the "Radio Position" of an Argus where its apparent function was to hold a roll of paper. Two L-shaped shelf brackets had been bolted together into the form of a U and were attached to a metal ruler. The ruler had then been jammed into a bundle of electrical wiring and lashed tight with a skate lace.

Fortunately, heavy insulation had so far protected the wires. But the possibility of the metal cutting through to them was very real - so also was the risk of serious damage to the electrical system (and possibly to the innovator himself), had the apparatus cut through to the wiring with aircraft power on. Just another of the hazards people expose themselves to by resorting to buckshee modifications.

Radar, Wx, and the Pilot

Maj R.H. Rousham

CFHQ/DARTS

"Turn right, heading zero three zero. This turn is to avoid heavy precipitation." No doubt, particularly if you've flown when CBs are around, you have been told this before, when being vectored by radar. Not long ago, as a pilot was being radar vectored on departure, in nasty weather, his aircraft was struck by lightning. The pilot was (almost) thunderstruck! Why hadn't Air Traffic Control vectored him around the weather? Well, why not?

Since radar was first introduced as a tool of air traffic control, its usefulness has been acknowledged most enthusiastically in bad weather. When that bad weather consists of heavy precipitation, radar invariably picks it up; the controller then attempts to eliminate radar returns caused by weather in order to see the radar return from the aircraft. Thus he can usually forewarn pilots and Met of approaching precipitation, and what may be hazardous flying conditions. But not always!

While pilots and forecasters appreciate this side benefit of radar weather reports, the controllers for years have cursed at their struggle to see a T33 in the middle of Comox type sunshine. They have unanimously insisted that future Air Traffic Control radar be capable of eliminating radar returns from precipitation, as well as providing good radar returns from aircraft.

Two factors which determine the likelihood of weather phenomena being received by the radar antenna are the relationship between potential target size and the wave-length of the radar emission, and target reflectivity. The shorter the wave-length the smaller a potential target may be (and incidentally the more power required). Thus, the shorter the wave-length the greater the precision and therefore the greater the chance of cloud (water droplets) and precipitation being received. This is a factor when selecting radar for aviation purposes, whatever its specific role may be.

Battered Voodoo radome - the result of a lightning strike.

Like radio, radar is divided into frequency bands:

FREQUENCY BAND	OPERATIONAL WAVE-LENGTH	
X	3 cm	Precision Approach Radar and Weather Surveillance
C	5 cm	Weather Surveillance
S	10 cm	ATC Terminal Surveillance
L	23 cm	ATC Area Surveillance
UHF	50 cm	ATC Long Range Surveillance

CIRCULAR POLARIZATION

Precipitation is one of the most frustrating sources of clutter from the viewpoint of the early warning or air traffic control radar operator. Its area of coverage as well as its location on the indicator is a variable; also, the degree of clutter varies directly as the size and density of raindrops. Researchers working on antenna design discovered that a circularly polarized electromagnetic wave reflected differently from spherical bodies than from other shapes. For any target of complex shape there is one plane of polarization for maximum return and one for minimum return.

RF (radio frequency) energy radiated from radar antennas is normally either horizontally or vertically polarized: however, the plane of polarization can be made to rotate continuously by a special device built into the antenna. It was discovered that spherical objects (raindrops) reflect circularly polarized transmitted energy with the plane of polarization rotating in the opposite sense; whereas other objects, such as aircraft, cause no change in the direction of rotation of polarization of most of the reflected energy. The antenna with the circular polarization attachment will accept only those echoes whose RF fields are rotating in the same sense as the transmitted energy; hence it is possible to cause precipitation echoes to be rejected by the antenna.

The reflectivity of hydrometeors (as in "Hydrometeors Keep Fallin' On My Head") is dependent on such factors as drop-size, concentration, liquid or frozen state, and shape. The met observer can exploit this, relating reflectivity to the precipitation rate with a large degree of accuracy. The boffins, however, can also design radar have emission systems for Air Traffic Control radars that transmit and receive energy with unequal horizontal and vertical components. This means that they emit elliptically polarized energy to combat the variations in shape, thereby obtaining further rejection of the rain at the antenna. The feature, known as variable circular polarization, is not yet incorporated in any Air Traffic Control radars in Canada.

It can be seen then, that radar designed to suit the needs of Air Traffic Control is not suited to the needs of the forecaster, and that pilots prefer both weather and ATC functions simultaneously. It is partly because the radar requirements of Met and ATC are in conflict, that the Canadian Meteorological Service has established special weather surveillance radars (WSR) at a number of locations across Canada:

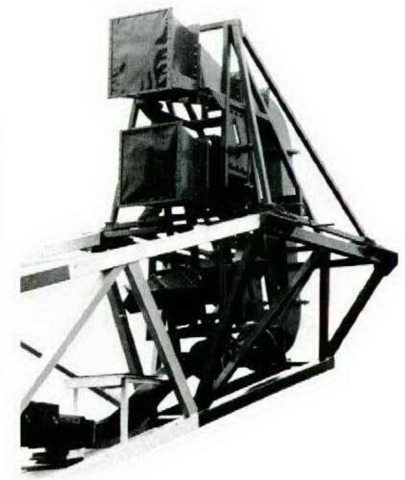
VANCOUVER	MONTREAL
EDMONTON	QUEBEC
LONDON	HALIFAX
TORONTO	GANDER
OTTAWA	

The coverage provided by these units varies from [illegible] miles radius at London, Ottawa, and Quebec, to 250 miles radius at Gander. Their capabilities are described in the article "Thunderstorm", on page fourteen.

It is important to remember that although the WSR are located at airports, they are in the Weather Forecast Office, not in the Air Traffic Control Centre. There the radar display is interpreted by a qualified observer and the information - which includes the up-dating and validating of aviation weather forecasts and issuing special weather sequences when required - is disseminated to the many interested agencies. Besides being used as a weather watch and for short range forecasting, the records obtained from WSR observations are utilized in atmospheric research, hydrological studies, and climatological studies.

Only at Ottawa however, is there both pilot-to-forecaster service (PFSV) and weather radar service. Thus, although Comox, Namao, Cold Lake, Chatham, Shearwater, Greenwood and Goose Bay have PFSV. their forecasters only have the weather radar information they obtain in radar reports from Air Traffic Control, These reports are provided when weather phenomena show on the radar, and are tracked only when controller workload and air traffic activity permits.

New ATC radar was installed recently at Lahr and Comox. Whereas the old CPN 4 MPN 11 radars operate in the S frequency band (or 10 cm wave-length) with selective linear/circular polarizers, the new radar operates in the L frequency band (or 23 cm wave-length) and has a fixed, non-selective circular polarizer. In addition, the four new terminal radars recently ordered by MOT will operate in the L Band. Thus, those features designed particularly to reduce or eliminate weather interference, are being incorporated now in new Air Traffic Control radars, and just for that reason!



First of the new CF 2-beam, double curvature, L-Band antennas. Use of the L-Band reduces rain effect in the volume of radar coverage.

All this must make it seem that the pilot suffers most, as with advancing technology, radars are developed independently to meet the specialized needs of Air Traffic Control and Meteorology. Research is being conducted, however, to develop a means of displaying the periphery of precipitation areas on controllers' radar in a way that each controller can, if the need arises, independently select a presentation to determine the existence and whereabouts of heavy precipitation without compromising the display at other radar indicators.

Even if the research should be successful, the weather detection role of Air Traffic Control radar will necessarily remain secondary to the primary function of separating and directing aircraft. Nevertheless, Air Traffic Controllers hope that once new radar is installed, they will, when necessary, have the facility to say: "Turn right, heading zero three zero. This turn is to avoid heavy precipitation".

Good Show

Cpl P. Bourque

Pte T.G. Jones

Cpl H.J. Caine

Pte A. Varga

CPL. P. BOURQUE

While conducting a primary inspection on a Tracker, Cpl Bourque noticed a small piece of metal in the wing root section of the aircraft mainplane. Further investigation revealed that the piece of metal had come from a cracked wing fold-hinge assembly. As he continued his inspection he found two additional cracked fittings on the same aircraft. A subsequent inspection of all squadron aircraft uncovered similar defects.

Cpl Bourque's alertness undoubtedly prevented the development of a serious in-flight hazard. In addition, his timely detection of this fault averted the need for a costly and time consuming maintenance program.

CPL H.J. CAINE

Cpl Caine, a radar controller at CFB Portage la Prairie, was on duty in the Portage Ratcon when he received an emergency call from a Tutor pilot. The pilot had just taken off in IFR weather and was experiencing a series of strange noises. He also reported smoke in the cockpit.

Cpl Caine quickly assessed the situation and began vectoring the pilot for a surveillance radar approach. Although the aircraft was in an area giving heavy returns on his radar from ground clutter, Cpl Caine calmly kept his target identified and had the aircraft on the ground in less than five minutes. A very accurate approach was needed because the visibility had dropped to less than a mile (well below surveillance radar limits) by the time the pilot was on final.

The following day Cpl Caine received a call from Winnipeg Centre asking for assistance in locating a light aircraft lost somewhere near Portage. Again the weather was IFR - visibility two miles, ceiling 200 feet. Cpl Caine was able to establish radio communications with the lost pilot who although he was on a VFR flight plan and had never flown instruments before, was in cloud. He also disclosed that he was losing altitude.

With a series of DF steers, Cpl Caine vectored the pilot towards Portage and eventually picked him up on radar about ten miles west of the runway. In a calm and reassuring manner he then directed the agitated pilot to a safe landing.

In each of these emergencies, Cpl Caine displayed excellent knowledge of operating procedures and equipment handling. His calm and competent manner was a major factor in the successful recovery of these two aircraft - an example of professional radar controlling at its best.

PTE T.G. JONES

While conducting a periodic inspection on a Chipmunk as part of his on-the-job training, Pte Jones discovered what appeared to be a hairline crack in one of the laminations in the lower right hand main-spar attachment points. He brought this to the attention of his supervisor and after further examination they found that the crack was half an inch long. A subsequent inspection of the fleet revealed one other aircraft with a crack in the same area.

Pte Jones' initiative, alertness and thoroughness resulted in the detection of a hazard which could have led to an accident.

PTE A. VARGA

While inspecting an Albatross propeller, Pte Varga discovered a hairline crack in one of the blades. The crack could easily have been missed because it extended along the edge of the blade rather than across it.

Pte Varga's competence in performing a routine inspection may well have prevented an in-flight breakup of the propeller, possibly with catastrophic consequences.

MR. C.T. DAVIS

As a 707 was taxiing away from the Comox ramp, Mr. Davis, a civilian fuel tender driver, noticed that the door for the ground power receptacle on the forward fuselage was open. Although he did not know the purpose of the panel, he correctly assumed that it had been left unlatched inadvertently and that it was therefore a possible flight hazard. He immediately informed the tower who passed the word along to the pilot in time for him to have it closed before takeoff.

Mr. C.T. Davis

Cpl J.A. Sorenson

Had the panel not been fastened, it would likely have torn off in flight, possibly striking a vital part of the aircraft. Alert observation and conscientious reporting by Mr. Davis prevented the hazard from developing.

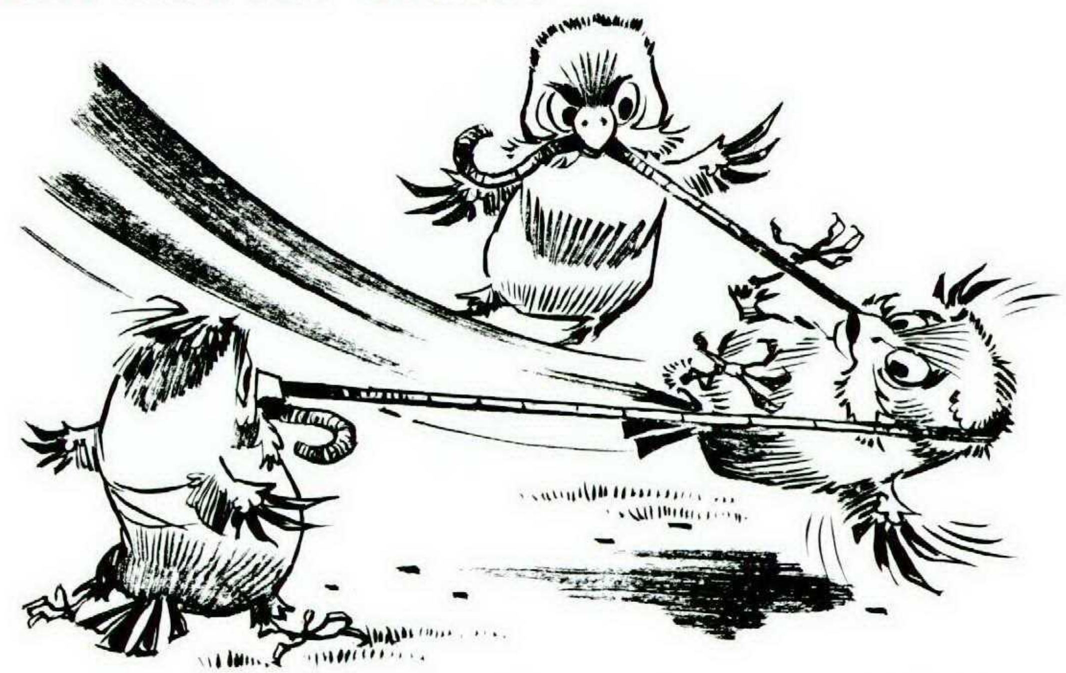
CPL J.A. SORENSON

Cpl Sorenson was conducting an engine PI on a Hercules when he noticed that a section of tie-bar was missing from the inlet guide vanes on number four engine. Realizing that the missing tie-bar might have been ingested by the engine (not all Hercules engines are fitted with IGV tie-bars), he informed his supervisor who initiated a thorough inspection of the engine. The inspection revealed damage on the first stage stator blades and on the second stage rotor blades.

Cpl Sorenson demonstrated a conscientious inspection technique in bringing the missing IGV tie-bars to the attention of his supervisor. His regard for detail prevented a possible in-flight engine failure.

On a recent visit to Maritime Command, Col R.D. Schultz, Director of Flight Safety, personally presented Cpl G. Rowe with a Good Show scroll. The award was in recognition of Cpl Rowe's rescue of a man who had fallen out of a helicopter. The rescue account appeared in the Jan-Feb issue of Flight Comment.

Watch out for Wires



...they can turn your whole day wormy

Training on the Water Bird

a new role for HU-21

Capt G. K. Urquhart

HU-21 is Maritime Command's Training and Utility Squadron and as such has the responsibility of providing qualified helicopter aircrew for operational duties. Recently they were assigned the additional task of training pilots in the art of water-handling of the Sea King helicopter.

Helicopter Utility Squadron Twenty One, located at CFB Shearwater, has three roles: training, search and rescue and utility, or fleet support. The squadron unit establishment is seven aircraft, five of which are CH124 Sikorsky Sea King anti-submarine helicopters. The remaining two are CH124U (utility) aircraft which have had all sonar and armament systems removed to enable them to carry passengers and freight and take part in search and rescue operations.

Aircrew training is the primary role - each year, twenty-four pilots, eighteen tactical co-ordinators and sixteen observers are trained by HU-21. They are trained for eventual anti-submarine warfare (ASW) duties with HS-50 squadron. Pilots arriving for training fall into two broad categories - pipe-line and experienced fixed-wing pilots converting to helicopters. New pilots and those converting undergo a full conversion course: captain status on non-tactical aircraft, an instrument phase leading to an Instrument Rating Check, and training in low-level instrument procedures applicable to the ASW tactical mission. Pilots with helicopter experience are given an abbreviated refresher course. Destroyer deck landing training is conducted by HS-50.

Navigators receive 24 hours in the Sea King during their Tactical Co-ordinator Course. They become familiar with the helicopter while performing tactical manoeuvres, navigation exercises, search and rescue patterns and personnel hoisting.

Observers spend 16 hours practising normal, alternate and emergency operations on the sonar reeling apparatus, carrying out personnel hoisting and gaining practical experience tracking submarines.

Late last year, the squadron was given the responsibility of familiarizing an additional fifty pilots a year with yet another facet of the Sea King - emergency water landings. The aircraft's ASW role demands that it spend most of each mission in a forty-foot hover over its submerged sonar dome. Although it is a twin-engine helicopter, single-engine hovering is only possible under conditions of minimal all-up weight and low outside air temperature. An engine failure under average conditions will almost certainly result in an emergency landing on the water. In most cases the pilot will still have control of the aircraft and often will be able to water-taxi until he picks up sufficient forward speed for a single engine takeoff. To be able to do this, pilots must be familiar with the water landing, handling and takeoff characteristics of the Sea King. Until recently however, practising emergency water landings was not permitted. This was because the Sea King, although it has a boat hull configuration, eventually takes on water through various antenna and drainage points. In addition, effects of salt water create a serious corrosion problem. After each ASW mission the aircraft must be washed down with fresh water to minimize the effects of salt spray.

Rescue divers in a collapsible dinghy are continually standby during water landing training.

Prior to last November, the only water landing course available to CF pilots, was conducted by the United States Navy. A limited number of Canadian Sea King pilots were sent regularly to HS-1 Squadron in Key West, Florida, where they underwent one hour of ground training followed by a forty-five minute flight.

In early October modification began on one of the utility Sea Kings to provide a specially configured helicopter for our own water bird training. It means a saving

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An FSO Speaks

The Flight Safety Officer at Sea

Capt R. N. Dubois
HS50

FIRST STAGE OF A HAULDOWN RECOVERY The helicopter is hovering over the deck; as soon as the static electricity has been discharged, the man on the left will connect the hauldown cable to the messenger which is being lowered.

There are probably more graduates of the Flight Safety Officers' Course in HS50 Squadron than in any other unit of the Canadian Armed Forces. The reason for this is the requirement that each Helicopter Destroyer Detachment carry its own FSO. At sea, the Detachment FSO is a representative of the Squadron FSO. He implements the latter's policies and follows his directives. However, owing to the distance separating them, as well as the difficulty of rapid communications, there is plenty of scope for his own initiative.

The Detachment FSO is directly responsible to his Detachment Commander, and he is also expected to advise the Captain of the ship on matters concerning safe flying operations. This is an extremely important part of his duties, since in most cases the Destroyer Captain is not an aviator. The Detachment FSO's aim is the same as that of all other FSOs, although the means he must employ to arrive at this ultimate "no-accident operation" are somewhat different. Here are some of the problems he encounters:

Since the Sea King is powered by two turbine engines, FOD is a constant problem. The average sailor, when he joins a ship, has never heard of FOD and the problems it presents to aviation. Therefore, the ship's company must be educated on the subject and must often be reminded of the possible results if a cigarette butt or small rag were ingested by the helicopter engines. A crash ashore is messy, but a crash on the deck of a destroyer could be disastrous. Not only would we lose a helicopter, but possibly the entire ship, and the ship's company would be threatened. Periodical reminders in Ship's Routine Orders, a short address on the ship's broadcast, or an article in the ship's newspaper usually have the desired effect of educating the ship's company on flight safety matters.

Another problem which is perhaps unfamiliar to the shore bound aviator is garbage disposal. At sea, the ship's garbage is disposed of without the benefit of primary or secondary treatment, by throwing it over the stern.* This procedure usually attracts large numbers of sea birds which are not easily digested by aircraft engines. It is therefore necessary to ensure that garbage dumping is prohibited while flying operations are in progress.

Normal maintenance activities become a major chore when a technician has to use one hand to hold on, when working on a rolling deck. It becomes necessary to emphasize to the maintenance crew, the importance of their work, and the need for concentration on the task at hand.

Another problem associated with rough seas is fatigue. It is impossible to get proper rest periods when the ship is tossing and rolling, a problem that is well documented and supported by medical studies. This leads to fatigue in both aircrew and maintenance personnel. When the problem is combined with periods of sustained

Sea King - with rotor engaged - secured in the Beartrap, on the deck of a DDH.

operations, it falls upon the FSO to advise his Detachment Commander and the ship's Captain, diplomatically of course, when aircraft operations may become dangerous due to fatigue.

Weather over the ocean can become treacherous. Accurate weather forecasts and reports are limited, and the Detachment must depend on ship's observations and the meteorological knowledge of the Detachment and the ship staff. Each ship carries a meteorological observer, who can give a very knowledgeable opinion of what will occur, but he is not an official forecaster. Combined with this is the not unusual phenomenon at sea, of dense fog forming almost instantaneously. Most launches are carried out beyond the range of a shore alternate, and inevitably the helicopter must come back to the only available airfield, its parent ship. Approach aids are extremely limited. The FSO must, therefore, concern himself with the weather conditions existing for every launch and recovery, and must be prepared to offer advice to the Detachment Commander and Captain when he feels the weather conditions are unsuitable.

These are some of the problems the Detachment FSO must face when he goes to sea. There are many others, for example, investigating incidents with very limited diagnostic equipment. All these problems combine to make his job challenging. He does not claim that his work is more difficult than that of other FSOs, *but, it is different.*

* **New ships in the fleet are equipped with onboard garbage disposal.**

Captain Dubois joined the RCN in 1964. After completion of pilot training and helicopter conversion, he joined HU21 squadron at Shearwater for Advanced Rotary Wing training. He then remained with HU21 as a utility pilot for 2-1/2 years. In 1969 Captain Dubois was transferred to HS50 squadron, also at Shearwater, where he has been employed as a pilot and flight safety officer on HMCS Annapolis Helicopter Detachment.

No way out

Capt A. Cooper

The summer morning quiet was split by the piercing shrill of the crash alarm. It was an awkward moment for the base rescue flight because both of their H21 rescue helicopters were unserviceable - one on inspection and the other down with an oil leak. It was found that 9640, the aircraft with the oil leak, was just being readied for a ground run and airtest. The flight crew would be able to do the air test on the way to the search if the ground run checked out. At the briefing the crew of the rescue helicopter were given the story. Two CF5s had collided in flight about 75 miles northeast of the base. The third aircraft in the flight had reported the accident and was circling the crash site. He reported having seen two parachutes.

The ground run on 9640 was satisfactory and the air test on the way to the search area indicated no problems. Fortunately, a fuel dump had been located at a logging camp dirt strip about 20 miles from the crash site and the camp facilities could be used if needed.

Later in the afternoon, the helicopter crew picked up one of the missing pilots and flew him to the logging camp from where he was flown to base in an Otter aircraft. With darkness approaching and their flying time for the day (6 hours) running out, the crew of the rescue helicopter decided to spend the night at the logging camp.

They ate well, slept seven hours, and were up dawn to renew the search for the other pilot in an area of dense bush and marsh. Later in the day they were asked to lower a safety systems technician into the wreckage of the CF5s. (Because two chutes had been observed, the technician was to check whether or not one of them might have been a drag chute.) At the time the request was received, 9640 was being refuelled and one of the pilots who had been flying since early morning was being replaced. After considering the request, the Captain suggested that a CH113A helicopter do this task with 9640 spotting the location for the CH113A. This plan was agreed to and with 9640 leading, the two helicopters set off.

Arriving at the site, the Captain of the 9640, flying from the left (co-pilot's) seat, did a power check and then established a hover 50 feet above the heavily wooded spot into which the other helicopter was to lower the technician. As 9640 began moving off from the hover, one of the observers reported seeing a pilot's dinghy in the bush. Realizing that this might lead to the discovery of the other pilot, the Captain flew a low level circuit to

come back over the position. When he was again established in the hover, approximately 30 feet above the 50- to 60-foot trees, he found that he had overshot the spot by about 50 feet. At this point the Captain decided to back up, simultaneously noting that his hover required 44 inches of manifold pressure at 2700 RPM. According to both pilots, the slow rearward flight required very little additional power, exactly how much they weren't sure because they were looking outside the cockpit at the time. After moving rearward about 40 feet the pilots sensed a power loss and discovered that the RPM was down to 2300. The manifold pressure remained at 44 inches which is the maximum manifold pressure or power the engine could produce at 2300 RPM under the existing atmospheric conditions, which were close to standard day. The Captain suspected an overpitched condition so he simultaneously checked that he had full throttle, lowered the collective slightly, stopped rearward flight and tried to gain forward airspeed. The ground below the aircraft sloped away and was heavily wooded making a landing impossible. As the aircraft moved forward and down the slope the Captain checked that the carb heat was cold, that the mixture was rich and the fuel boost pump on however in spite of all these actions, the loss of 400 RPM meant that nothing the pilot could do would keep the aircraft flying. When the Captain realized this, he alerted the crew and passengers to prepare for the impending crunch. He then prepared to settle the aircraft into the trees. It descended slightly nose high, the rear rotors striking the trees first, and as the rotors contacted the trees the pilot applied full up collective to obtain a minimum rate of descent. The aircraft came to rest on its side on relatively level ground atop a secondary ridge. The crew and passengers escaped with only minor injuries. The descent had been very gentle with little forward speed. Once the dust settled the crew turned off the magnetoes, fuel boost pump and battery; however, the engine continued to "diesel" until shut off with the mixture control.

Intensive investigation centred first on the engine to determine the cause of RPM loss. Fuel and oil samples were taken on the spot and all engine controls and cables checked. When these checks proved negative the engine and transmissions were removed for inspection by the overhaul contractors. Close scrutiny and subsequent test bed runs of the engine and all its components revealed no reason for the reported loss of power. Examination of all three transmissions revealed no damage that could have overloaded the engine and caused the drop in RPM. The case for ruling out an engine malfunction was further strengthened by the subsequent reports of the crew: they recalled no detonation or engine roughness; no increase in vibrations; no splitting of tachometer needles; no erratic or unusual instrument indications; no warning lights; no flight control problems. The crew also reported a violent overspeed of the engine after rotor blade separation.

Having virtually eliminated the possibility of a mechanical malfunction, the investigation turned to the capabilities of the aircraft to do the job and subsequently to the actions of the crew.

AIRCRAFT CAPABILITIES

Maximum power available was 1425 BHP at 2700 RPM and 51.5 inches of manifold pressure. The aircraft weighed 12500 pounds. To maintain hover, 1240 BHP was used at 2700 RPM 44 inches of manifold pressure. This left some 185 BHP surplus. When moving into rearward flight, assuming a rearward pitch of an additional 10°, a further 30 BHP would be required to maintain altitude. These calculations are based on standard day conditions with no wind. Though the conditions weren't standard day, they were close enough to make the difference insignificant. Had they in fact been applied, it would have meant a further slight reduction in engine performance.

The investigation then turned to the 155 BHP available for further manoeuvre after the aircraft began rearward flight. What had happened to dissipate it and cause an overpitched condition? It should be noted that once an overpitched condition is reached the RPM will rapidly bleed off and because of the very nature of the control system of a helicopter, movement of the controls, no matter how small, will require power, the rate and degree of movement dictating the amount.

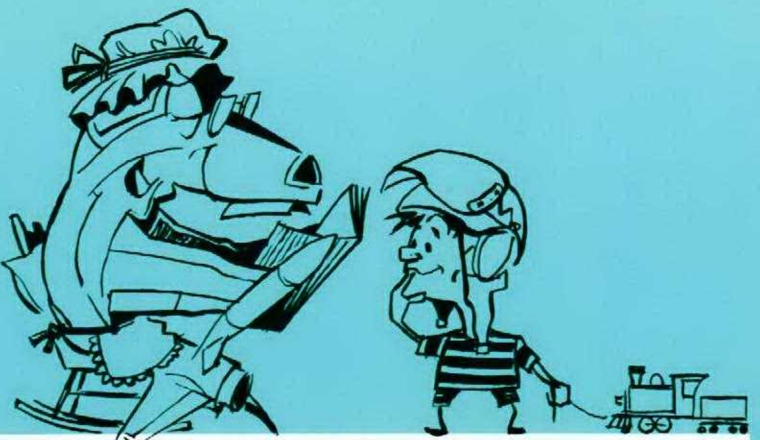
What the pilot was attempting was a rearward hover outside ground effect (OGE). This is a difficult manoeuvre in any helicopter but more so in a tandem-rotor helicopter because of the tendency for the nose to tuck in rearward flight. Two factors cause this. First, rearward flight results in the forward rotor encountering the turbulence from the rear rotor. The second factor arises from the inherent stability of a helicopter with regard to airspeed; in other words, the helicopter will attempt to return to its speed prior to the control input. Hence, as it moves forward the nose tends to pitch up to stop this departure from the hover. Conversely, as it moves rearward the nose pitches down. Rearward hovering OGE is seldom practised or attempted by helicopter pilots, and it is even more difficult when flying from the left seat in the H21 because the dual engine/rotor tachometer is canted toward the right making it difficult to see.

There are several other points which should be considered in this particular accident. Rearward flight OGE is a questionable manoeuvre at any time and in this case the all up weight was 12500 pounds. In addition the Captain chose to occupy the left seat, and his first pilot the right. Although the first officer was relatively inexperienced on type, he was fresh and alert. Further, there was no coordination or sharing of duties in the cockpit. For example the RPM had decreased to 2300 before it was noticed by either pilot.

REARWARD FLIGHT

As rearward flight is initiated, power must be increased to maintain altitude. In this case witnesses indicate that when rearward flight was initiated a rate of descent resulted. The natural and instinctive reaction of the pilot would be to arrest this rate of descent with power; however, as more power is required to arrest a rate of descent than to maintain an altitude, this would place a higher demand on the engine. At this time the aircraft was close to its power limits and only a slight movement of collective pitch would result in an overpitch condition, or in other words, a loss of rotor RPM. Realizing the overpitch condition, the Captain attempted to stop the rearward movement and achieve effective translational lift in forward flight. This manoeuvre requires more power (until effective translation is achieved), thus aggravating the overpitch condition. The situation now is an overpitched rotor system and the helicopter in a higher rate of descent. Corrective action for this is to unload the engine by decreasing collective in order that the RPM can be regained. This manoeuvre, commonly referred to as "milking", requires a definite reduction of collective for some seconds; however, a substantial height loss is the result. Being restricted in height and terrain the Captain attempted to "milk" by short rapid reduction and increase of collective. This would have the effect of increasing G and therefore weight, further compounding the power-required situation.

There are lessons for all in this account. Certainly the pilot didn't have the chance to sit back and "armchair" his way out of his predicament. The time available to him to react when he found himself boxed in was a matter of seconds; information contained in the analysis of the accident is a result of months of work by investigators. The lessons however, have a familiar ring. Our operational roles require men and machines to fly close to their limit or lose effectiveness. As someone once said - this is like cycling at the edge of the cliff to view the valley below. Too far away from the edge and you can't see the valley - too close and the concentration required to prevent falling over the edge deters from getting the job done. The answer is some degree of reasonable compromise which leaves a margin of safety in that if anything unforeseen happens, you still have an out!

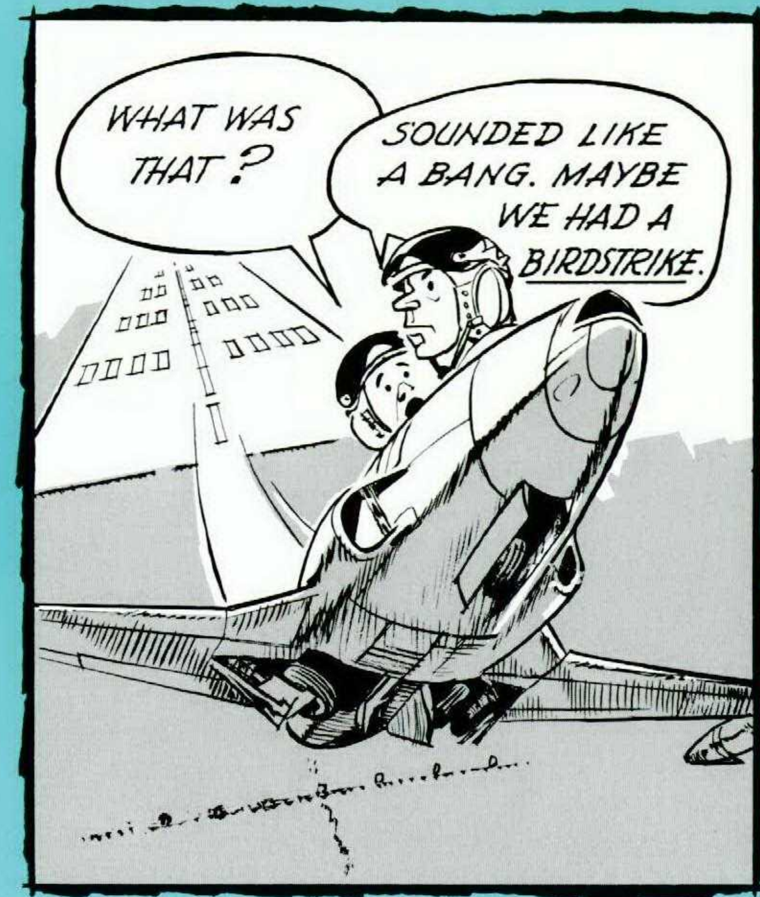


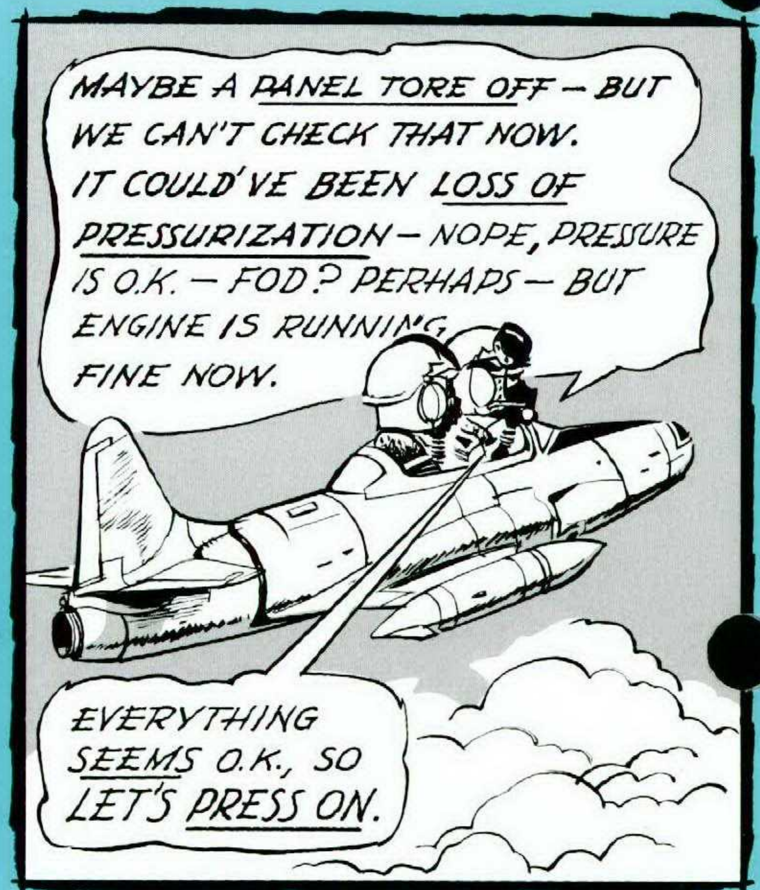
AIRSOP'S FABLE

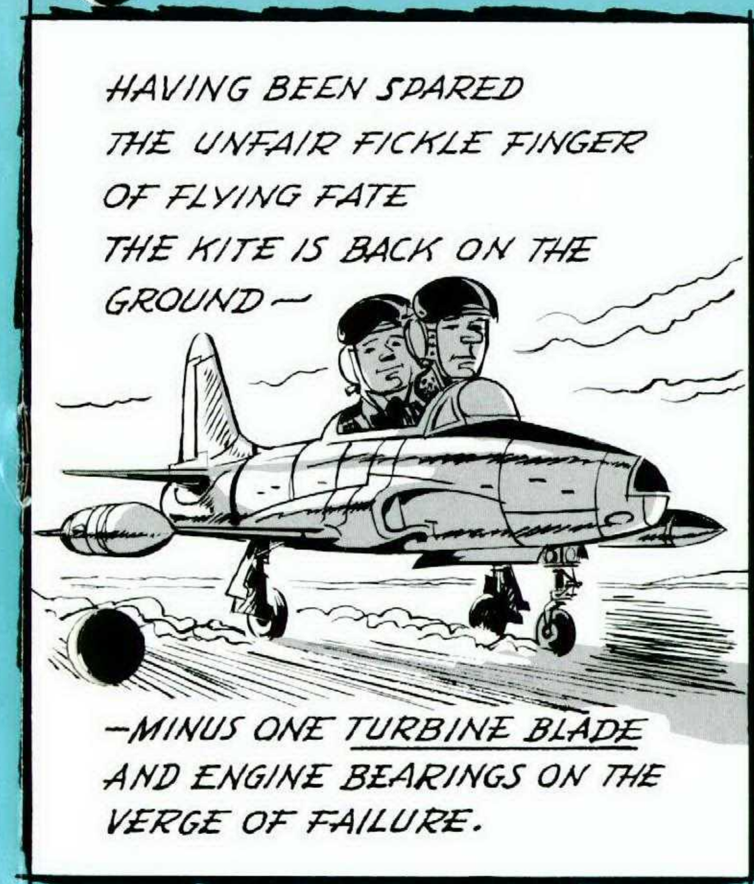
EVERYTHING YOU ALWAYS WANTED TO KNOW ABOUT BANGS*

*But were never taught

Bang! Bang! Bang! Bang! Gotcha! or PRESSONITIS







MORAL:

IF YOU HAVE AN AIRFRAME BANG -

—LAND!

IF YOU HAVE AN ENGINE BANG -

—LAND!

IF YOU HAVE ANY BANG —

LAND AS SOON AS PRACTICAL!

DON'T PRESS ON!

Thunderstorm

Mr. C. Bourque BMETO CFB Bagotville

Thunders, lightnings, presters and whirlwinds are caused by the wind enclosed in a thick cloud, which by reason of its lightness, breaketh forth violently, the rupture of the cloud maketh a crack, and the divulsion by reason of the blackness causeth a flashing light.

Anaximander 600 B.C.

The word "Thunderstorm" in an aviation forecast, regardless of any modifying adjectives such as "risk of" or "tempo", invariably leads to questions: "When is it going to start? How long will it last? What is the lowest ceiling and visibility expected?" The interest shown in the subject stems from the fact that the thunderstorm commands great respect and occasionally has a profound effect on our everyday activities.

THUNDERSTORMS AND GEOGRAPHIC LOCATION

The basic requirements for the formation of a thunderstorm cloud are unstable air, some type of lifting action and air with high moisture content. The geographic location of a region therefore often determines the frequency of thunderstorms. In North America, the fewest number of thunderstorms are recorded in the Arctic where, at some locations, none have been reported to date. This is the result of the dampening effect of the cold water surfaces, the low angle of the sun's rays and the comparatively low moisture content of the air usually present in this region. By contrast, Florida, which receives the sun's rays at a relatively high angle all year, is surrounded by warm water and is usually under the influence of moist Maritime Tropical air, has a yearly average of between 70 and 90 thunderstorm days.

THUNDERSTORM FREQUENCY IN CANADA

In the spring, as the numerous lakes and muskeg break open, the dry Continental Arctic Airmass which covers much of southern Canada in winter is gradually replaced by warmer and moister air. At this time also, the weak Bermuda High Pressure Area gains strength and begins pushing warm, moist air northward across the United States. The occasional invasion of this air into southern Canada during late spring along with the increasing angle of the sun's rays marks the beginning of the thunderstorm season in Canada. Beginning in May, the thunderstorm season reaches its climax in July and tapers off to end for all practical purposes in October. As you might expect, southwestern Ontario being the southernmost Region in Canada, has the country's highest frequency of thunderstorms. Windsor has an annual average of 33 days of thunderstorm while Toronto has 22 days. The lower frequency at Toronto is caused by the stabilizing effects on the warm moist air of the relatively cold waters of Lake Ontario. The Prairies, particularly southern Alberta and extreme southern Manitoba, follow southern Ontario closely for the title of the area with the highest frequency of thunderstorms. In these regions the total number of days with thunderstorms varies from 20 to 26 days per year. In the Maritimes and British Columbia fewer thunderstorms are found along the coast than inland. Newfoundland, which is influenced by the cold Labrador Ocean Current and has coastal waters seldom exceeding 50°F, reports few thunderstorms. The frequency varies from an average of almost 7 days yearly at Gander to a low of less than 2 days at Belle Isle. In the Maritime Provinces the yearly average works out to 10 to 15 days.

THE THREE STAGES OF THE THUNDERSTORM

Thunderstorms, whether of the air mass or frontal type, are produced by convective motions due to instability - the lighter air rising in the center of the cell, and away from the centre, the heavier air sinks. The thunderstorm therefore represents a violent and spectacular form of atmospheric convection. It is usually composed of a number of separate cells in various stages of development. New and growing cells can be recognized by their clear-cut outline and cauliflower tops while the top of mature cells will appear less clear-cut and are frequently surrounded by cirrus type clouds. The diameter of these cells may range from one to a few miles across. Individual cells progress through three distinct stages: the cumulus stage, the mature stage and the dissipating stage.

The cumulus stage which normally lasts 10 to 15 minutes is characterized by updrafts throughout the cell. It is not unusual for these updrafts to reach 3000 feet per minute in the upper part of the cumulus cloud and extend several thousand feet above the visible cloud top.

The mature stage which normally lasts for a period of 15 to 30 minutes, begins when the raindrops and ice particles have grown to the extent that they no longer can be supported by the updrafts. The falling precipitation drags air along resulting in a downdraft. The strongest updrafts in a thunderstorm occur early in the mature stage when the speeds may exceed 6000 feet per minute. Downdrafts speeds of 3000 feet per minute are not uncommon. In-flight research on severe thunderstorm gusts has actually measured a vertical velocity of 12,480 feet per minute. The structural stress and turbulence that an aircraft would be subjected to at these extreme velocities would be great.

Early in the mature stage very heavy rainfall may occur but usually lasts for only 5 to 15 minutes as the storm core passes over. During the mature stage the cloud tops usually grow to 30,000 or 35,000 feet and may break through the tropopause, occasionally reaching heights up to 60,000 feet.

Penetration into the stratosphere indicates extremely strong convective forces and often results in severe weather at the earth's surface. In storms releasing large hail (3/4 inch or more) penetration of the tropopause is normally of the order of 5000 feet. Extreme penetrations of 9000 feet and over have been observed in tornado-producing thunderstorms.

The dissipating stage which normally lasts 30 minutes is characterized by rapidly weakening updrafts and downdrafts. During this phase the thunderstorm degenerates into layers of stratified cloud from which light or intermittent precipitation may fall for a considerable length of time.

THUNDERSTORMS AND LIGHTNING

Lightning is the most spectacular element encountered in a thunderstorm, the most startling to pilots and probably the least understood. Lightning involves electromagnetic potentials in the order of 10 to 100 million volts, and currents sometimes exceeding 100 thousand amperes. It is a fact that an average thunderstorm may fire 10 to 20 strokes of lightning per second.

The U.S. National Advisory Committee for Aeronautics (NACA) conducted a study which showed that 90% of lightning strikes on aircraft occurred during flight within 5000 feet of the freezing level and where the air temperatures were between +10°C and -10°C. The frequency falls off rapidly with increasing height above the freezing level, but strikes can occur at any altitude up to the top of and even above the cirrus anvil.

The first lightning discharge can take place when the heavy cumulus cloud top reaches -21°C. At our latitude in summer this normally occurs at about 22000 feet. The total path length of a lightning discharge is usually between 1 and 10 miles and may be initiated when an aircraft passes between two opposite charged clouds or precipitation areas resulting in cloud-to-cloud lightning. In this case, the aircraft disturbs the electric field between clouds and also serves as a bridge for the discharge resulting in a strike on the aircraft. A quick succession of strokes quite often follows along the trail of ionized air created by the first stroke. Nonetheless, NACA has found that in 55% of the lightning strikes on aircraft during a 10-year period, no lightning at all was observed in the vicinity before or after the discharge.

Although statistically not considered a major flight hazard, lightning has been shown to cause expensive damage to radomes, fin caps, antennas, and so on, in addition to producing holes in thin metal skin. In a few cases damage was severe enough to be a potential structural hazard.

Lightning discharges to aircraft, recorded over a number of years, have averaged about 1 strike per 2500 hours of flight for propeller driven aircraft, 1 strike per 3800 hours of flight for turbo-prop aircraft and 1 strike per 10,400 hours of flight for pure jet aircraft.

THUNDERSTORMS AND WEATHER RADAR

Radar has been and will continue to be one of the most important tools available in probing the thunderstorm. Many clouds, especially those containing only very small droplets, are not detected by radar at all, but convective cloud such as heavy cumulus and cumulonimbus contain droplets large enough to be reflected by radar.

Good ground-based weather radar will normally begin to detect weather echoes only when the cumulus tops reach 14000 to 16000 feet. Sometimes convective clouds grow explosively once they have reached this stage of development. Here the freezing process may be important due to the release of heat of fusion which adds energy to the updrafts and results in rapid development of the entire cloud. Cases of cumulus clouds building to the cumulonimbus stage at a rate of 5000 to 7000 feet per minute have been observed. In other words, providing extreme conditions of moisture and instability are present, a cumulus with its top near 15000 feet may grow into a cumulonimbus reaching to 35000 feet in a period of 3 to 5 minutes. Normally of course, the elapsed time for a cumulus to grow into a thunderstorm is of the order of 10 to 15 minutes.

All values of echo tops refer to the uppermost limit of moisture that may be detected by radar. It should not be assumed therefore that height of echo data refers to the top of the convective cloud. In other words, the heavy cumulus top may reach 23000 or 25000 feet and the radar showing echo top at only 20,000 feet.

MOTION OF THUNDERSTORM CELLS

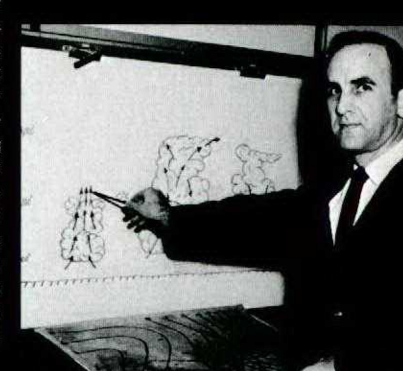
Studies have shown that the motion of cells (single cells or small clusters) is closely related to the wind direction and speed at the 700 MB level (10,000 feet). Large convective echoes 15 nautical miles or more in diameter are associated with thunderstorm complexes composed of many individual thunderstorms. Unlike the smaller cells, the large echo masses *do not* move with the wind at any specific level. The echo speed is generally less than the wind speed and the direction is nearly always to the right of the upper winds by an average of 15°, but varying between 0 and 40°. The interpretation for this behaviour is the formation of new convective cells on the right flank.

CONCLUSION

Thunderstorms may occur individually or in groups, and at times present an almost solid wall of convective clouds. However, most of the low clouds in the region of a storm do not extend to very high levels. With average airmass thunderstorms, less than 10% of the sky at the 20,000-foot level is normally filled with convective clouds. The regions around or between adjacent cells are likely to be turbulent (severely so at times) and heavy hail can occur in clear air in the area beneath the anvil tip.

cont'd on page 23

Mr. Bourque joined the Canadian Meteorological Service shortly after graduating from the University of Moncton in 1956. Following brief tours at Moncton, Goose Bay and Fredericton, he attended the Meteorological Officers' Training Course and was subsequently transferred to CFB Summerside. He served as duty forecaster there for four years before being posted to Marville in 1964. His tour in France was cut short a year later when he was promoted to his present position.



Air Ops in FMC

Maj D. J. Peters
SOFS, FMC

As we all know, Mobile Command is expanding its air component in the coming months and it is timely for us to look at how we have done so far in the field of air operations. From a modest beginning, with air units that included the CH112 and CH113A helicopters and L19s, the Command has expanded its air fleet to include Otters, Hueys and CF5s. Soon to come into the inventory are Twin Hueys and Bell LOHs, and much preparation is presently underway to ensure that the new aircraft are used to advantage.

Many of FMC's exercises in the past year have included air elements, the small numbers of assigned aircraft performing sterling service in safely moving troops and equipment around the exercise areas. For example, on NIMROD CAPER in Jamaica in March 1970, one helicopter, alone, lifted 824 troops and 21,000 lbs of equipment. There can be no doubt that the troops appreciated the saving of footslogging through the steaming jungles.

With the great mobility that the helicopter gives a Commander, fewer troops are necessary for an operation, and what troops there are can be moved around the operations area with great speed. Our helicopters have operated in Norway, and the Canadian Arctic also, with equal success in supporting land force units. With the greater number of aircraft coming into the Command, many more exercises will be air-supported and increased numbers of aircraft will be assigned to the exercises. Great! We'll now be able to move twice as many troops and twice as much equipment. Or will we? Why the doubt? Well, we can only fly if the aircraft are serviceable; and there are many ways in which an aircraft can become unserviceable. Not the least of which is damage caused by personnel unfamiliar with air operations in general, and aircraft in particular. Land force vehicles, whether they are tanks, APCs, trucks, jeeps, or what have you, are built to withstand the rugged terrain over which they operate. As a result, personnel can not normally damage these vehicles by careless entry or rough usage. The same is not true of aircraft. Of necessity they are very thin skinned and fragile. The various protuberances sticking out of the front or side of the aircraft are vital to its successful flight. If these protuberances are used as handholds, for example, safe flight can become impossible. Similarly, the wing, tailplane and rotors are lifting surfaces that are equally necessary for an aircraft to fly. Any damage, however slight, to these parts could also make flight hazardous or impossible.

Contrary to general belief, helicopters don't normally take off or land vertically but require clear lanes for approach and departure, much the same as fixed wing aircraft do. This is particularly true on hot days or when the helicopter is heavily loaded. If a land force unit is to be supplied or moved by air, there must be a landing area of sufficient size for the pilot to safely deliver his aircraft. As mentioned earlier, consideration must be given to the approach and departure lanes and these must be free of tall trees, telephone and power lines, and so on. Similarly, the landing zone itself must be free of tree stumps, defensive wire, loose debris, and the like. Pilots will not hazard their aircraft by attempting to support a unit that has not made reasonable attempts at the preparation of a safe landing zone.

The word "safe" has been used several times in this article, and that is what this is all about - FLIGHT SAFETY. What is Flight Safety? Well, it means the efforts expended by many people to ensure that an aircraft will perform a given military task and avoid damage or destruction. To accomplish this, a great degree of skill and cooperation is required of all persons associated with air operations. This means, beside the aircrews and aviation technicians, the cooks, the supply personnel, the engineers, and the troops to be lifted, to name but a few. Any thoughtless action by any of these could jeopardize an aircraft and perhaps cause its loss.

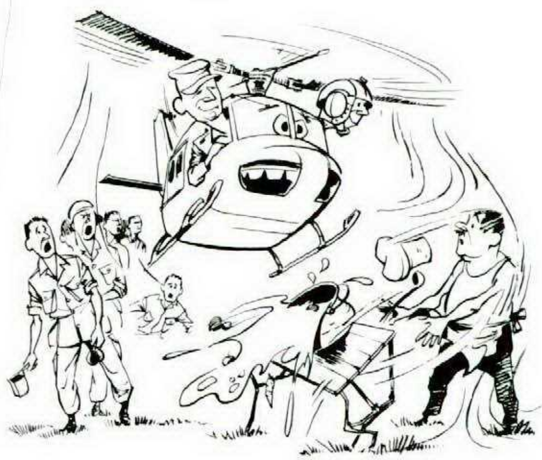
A point should be made here. Time and again people say that flight safety is all right for peacetime operations, but in an emergency or wartime situation flight safety will shut its office, and mission accomplishment at any cost, will become paramount. Not so. Flight Safety can be even more important in an emergency or wartime situation to preserve the Command's resources. Mission accomplishment in an operation must be weighed against the risks involved and the possibility of the loss to the commander of his resources. The Canadian Forces have relatively few aircraft to perform the myriad of tasks that are required; any accelerated loss of aircraft due to a misunderstanding of the needs of mission accomplishment can quickly reduce the inventory to a level where very important missions can not be undertaken.

The American losses in Southeast Asia are of great concern to the Commanders there, despite the great resources in the United States and their ability to replace losses quickly. How then should our own Commanders be concerned? Where do we get our replacement aircraft? An American general was quoted in the US Army Aviation Digest as saying "Action must be taken by all Commanders to change the attitude that, in a combat environment, anything goes. Safety equals efficiency which equal combat effectiveness".

In the coming months, four new helicopter squadrons will be formed in Mobile Command on bases that are not at present major air bases. The problems involved in such an undertaking are monumental, and officers at many levels are expending a great deal of energy in making the necessary plans to accept these squadrons into inventory. Our aircraft strength will be almost doubled by early 1972. Our land force people must be ready by that time to fully utilize the capability of such a fleet, most of which will be helicopters. This means that the land force people must receive certain prior training in airmobile operations to a degree that airmobile operations are second nature to them. At present, the appropriate staff in FMC HQ are preparing a course of instruction that will be given to all ranks to ensure their participation in the flight safety program. To this end, Senior Commanders are being prepared for the coming squadrons by participation in a short flight safety course at the University of Southern California. There is every indication that shortly after the squadrons arrive, the land force people will be sufficiently trained to perform one of Mobile Command's varied tasks - Mobile Operations.

In the stability operations environment, movement of infantry and field artillery units by helicopter has become the rule rather than the exception. The movement of field artillery by air has been proved invaluable time and time again in combat, but the movement by air of large numbers of troops who are unfamiliar with aviation creates a number of problems.

To assist both the ground soldier and the aviator in obtaining a better understanding of the problems involved in the movement of troops by air, the following are guidelines for helicopter etiquette:



A Guide to Helicopter Etiquette

For the Soldier

You must accept the fact that helicopters are noisy, wind-producing beasts. When a helicopter becomes noiseless and windless, it automatically becomes motionless and useless, so plan your operations accordingly. Don't insist that the Pilot land you in the chow line; there's an off chance that he *will!*

Two wrongs don't make a right! The soldier who tries to retaliate by flailing the main rotor blade of an offending Huey with a tent pole or an entrenching tool is courting disaster. Sandbags, when properly used, are lifesavers.

Improperly used, i.e., lying on a helipad, slingout area, or LZ (Landing Zone), they become tools of destruction if sucked up by the rotor wash. The latter applies to ponchos, cartons, zone markers, and so on. The soldier who allows debris, equipment, and antennas to clutter a tight LZ during an extraction may find his stay in the LZ extended because the aircraft that was going to extract him becomes a FOD (Foreign Object Damage) casualty.

The CG (Centre of Gravity) on the Huey depends on the seating arrangement and the loading of the aircraft. A sudden change in attitude of the helicopter caused by a sudden change in position of the personnel in the helicopter may or may not be overcome by the pilot. Don't start unloading the aircraft until told to do so by a member of the crew. Besides, you may break a leg if you jump from the helicopter at an excessive height - some have.

When clearing an LZ for an extraction, make it big enough to allow the pilot a little room for error. Clearing the LZ with the main rotor blade of a Huey is exciting, but in most instances it is expensive and nerve-wracking, especially to the pilot. And don't forget - if that helicopter crashes during approach or departure, you may become the object of the floundering chopper's wrath.

Nothing unnerves a pilot more than an unannounced explosion in the trees right in front of his chopper as he tries to nurse it out of a tight LZ, so don't fire any weapons (or throw grenades) out of the aircraft without the aircraft commander's approval. To do so is to overtax the central nervous system of all concerned.

The practice of getting the pilot's attention by tapping on his helmet with a rifle barrel is somewhat risky. If you must talk to him, have the crew chief or the gunner relay your message. They know whether or not he is too busy to talk. If at all possible, avoid conversation with the pilot during approach and departure.

Remember, the pilot at whom you rant and rave for blowing dust into your chow or dusting off your tent may be the same one you can't praise enough when he comes in and hauls you out of an LZ surrounded by the enemy. So be a little tolerant - he probably didn't intend to blow your mess tent down.

For Pilots

Don't land your helicopter in the middle of the chow line. If there is one thing that is sacred to every soldier, it's his food. Don't fill it with sand and debris.

Land far enough away from all tents, buildings, and bunkers to preclude blowing them full of sand or blowing them over. One-holer outhouses are especially susceptible to the latter. If your passenger insists on being set down in the middle of the troops or buildings when another suitable area is within walking distance, pretend the intercom system is on the blink and you can't hear a word he says. The troops on the ground will love you for it!

Don't drop in unannounced; establish radio contact. If this is not possible, overfly the area and give the personnel on the ground a chance to police the area, secure loose objects, and pop smoke. The wind may have shifted since you were last there, and a downwind approach can be rough on the old torque meter, not to mention the possibility of the skids ending up around your ears.

Landing an LOH in the middle of a VIP welcoming ceremony is not a recommended practice. If you see troops in formation, guidons flying, and the band standing by, you will probably be safe in assuming that the men have not gathered to watch you 'post-flight' your LOH. Unless you are carrying persons participating in the ceremony, don't land.

All aviators are aware of the requirement to run the Huey engine at flight-idle for a 2-minute cooldown prior to engine shutdown, but after the 2-minute period expires, shut it down! Or better yet, drop off your passengers and move to a shutdown area away from the troops if such an area is available.

When passengers board your aircraft, give them time to get seated, fasten their seatbelts, and secure their personal gear before you start pulling pitch. Personnel hanging from the skids during takeoff create an unpleasant and unsafe condition.

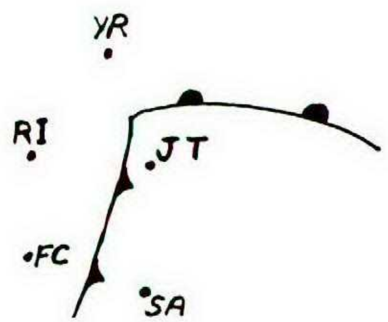
So all land force personnel don't know everything there is to know about helicopters - you might find it difficult to organize and conduct a fire mission. And when you've finished your day's work in the cockpit, parked your aircraft, eaten dinner, and hit the sack, stop a moment and reflect - if it weren't for all those troops and howitzers out there, you might find going to sleep rather difficult.*

The thinking of many people must change, then. The aviator must understand the ways of the land force people and vice versa. Pre-conceived ideas must be put-aside to accept fully the combined nature of our operations. With the cooperation of all, and a desire for safe air operations, we will go a long way to satisfying the aim of the Flight Safety program - "to prevent the accidental loss of our aviation resources". With the cooperation of all in Flight Safety, we will go a long way to ensuring the successful outcome of FMC operations and, finally, with the cooperation of all in Flight Safety, we will ensure that a pleasant flight into the boondocks does not terminate in an unpleasant walk out.

* Helicopter etiquette reprinted from the US Army "The Field Artilleryman", Fort Sill, Oklahoma.

How's your Wx?

Here are some actual weather situations. Your problem is to match the weather reports with the stations on the map.



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C. 25ΦE100Φ15 180/37/21/3014/004/SC2AC7 108
D. -XM5Φ18Θ2½S- 160/33/33/3408/998/S4SF3SC3 106
E. 60Φ200-Φ7 125/62/61/1424/989/TCU2CI3 815

Answers page 24

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: Commandant, CFFTSU, CFB Winnipeg, Westwin, Man. Attn: ICPS.

From Missed Approach to Landing

In the March/April issue of "On The Dials" the following question was asked: "In the event of radio failure during missed approach procedure, what routing and altitude would you fly to your alternate?" This question has given rise to some interesting discussions which revealed some obvious problems with some not so obvious solutions.

Questions arose regarding the flight profile when proceeding to the alternate with loss of communications:

(1) What route are you going to fly? Will it be via direct or by a suitable connecting airway?

(2) What altitude will you fly? Will it be MEA for a victor airway or will it be a low frequency requirement which will provide obstruction clearance on the route? Will either of these altitudes satisfy the fuel requirement for every situation?

(3) What does ATC expect under these circumstances? Where during the flight or the flight planning has mention been made of your specific actions? Correct! None, just a specific alternate airport.

First, by way of problem solving, let us see what action Air Traffic Controllers will take when these circumstances arise. They must block all possible routings and altitudes and pray that their radar does not fail. It is an uncomfortable situation. Although the odds of experiencing radio failure are very slim these days it is still a risk that ATC is taking.

What can the pilot do to help eliminate this loop hole? He could enter in the remarks portion of the flight plan the route, altitude and time enroute to the alternate. This could be a satisfactory solution. Unfortunately the method is not reliable, as remarks are not always passed beyond the departure centre.

Consideration was given to a possible revision to the flight plan to include pertinent alternate airport information in the body of the flight plan, but again the problem of transmitting this "seldom-to-be-used information" arose.

For the moment we must realize that the problem does exist however remote you may feel it is, and we must make every possible effort to eliminate it.

If you find yourself in a tight situation, whether you are driving a CF104 or a C47, and there is any doubt as to your completing the approach successfully, advise the controlling agency of your intended route, altitude and time enroute to your alternate. If you do not receive clearance before descent and you do have communications failure, ATC will then know what your flight profile to your alternate will be.

cont'd from page 8

of time and money and ensures that all pilots receive exposure to water bird training and allows for a more extensive syllabus.

To reduce corrosion in the water bird, all landings are carried out in fresh water. All vents and drains in the lower part and underside of the fuselage were sealed, and unpainted static surfaces sprayed with paralktone preservative. All unnecessary antennas except the UHF antenna, were removed. The latter, remaining below the waterline, resulted in communications blackout after each landing. Relocation of the antenna has since eliminated this problem.

Arrangements were then made to have the USN provide one of their water bird pilots to train H21's instructors. Over a two-week period, two squadron pilots completed the instructor course and were assigned the task of producing a training syllabus.

In early November pilot training commenced. Familiarization begins with a lecture on the hydrodynamic characteristics of the Sea King. This is followed by a detailed pre-flight briefing, much of which is devoted to discussion of the various situations which might affect the pilot's course of action after a water landing, or controlled ditching.

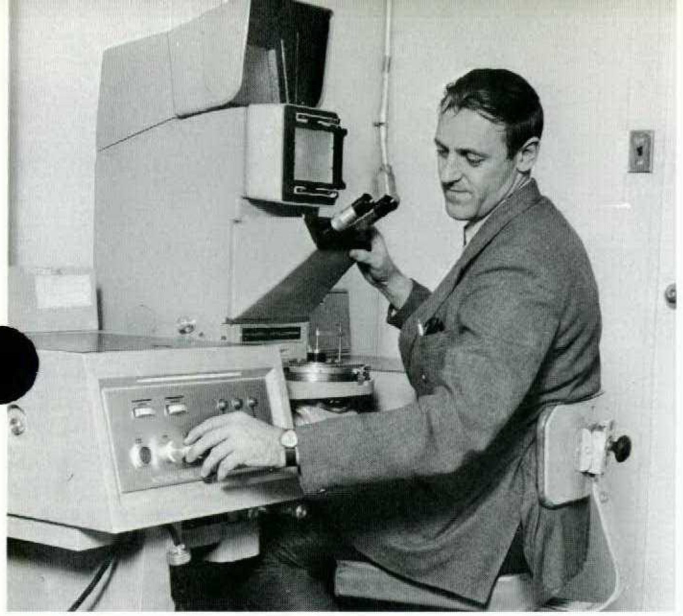
The flying phase consists of a ninety minute flight during which the pilot practises dual and single-engine takeoffs and landings, water taxiing and simulated engine failures in a forty-foot hover. This is the flight configuration in which an engine failure is most critical. Experience is gained both by landing in the water and flying out after single engine failure.

After all Sea King pilots have initially undergone the water landing familiarization, they will be re-qualified every two years. The experience gained during this course should allow the pilot to properly assess the aircraft's capabilities in the water and increase the probability of a safe return should he be forced to land in the sea.

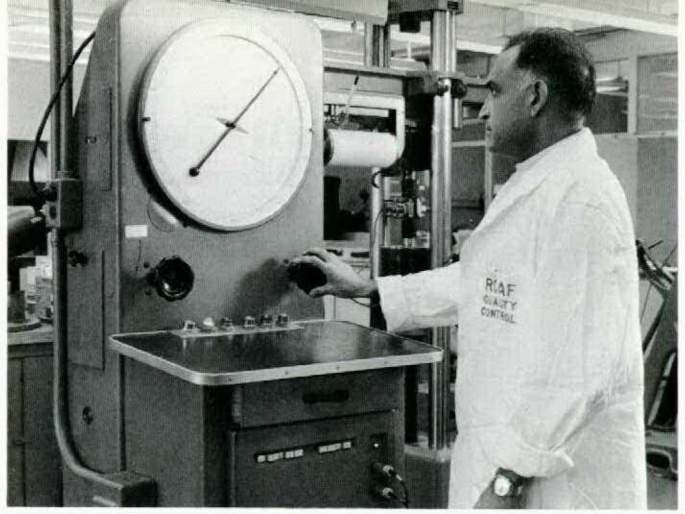
Evaluating the potential of eddy current or ultrasonic inspection of defective wheels.

QETE

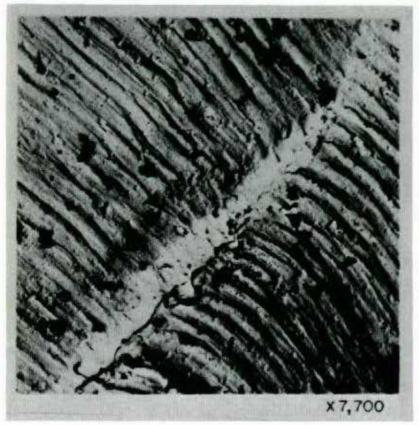
Metallic Materials Laboratory



Metallurgical analysis establishes the sequential details of original processing and the subsequent in-service failure modes.



Mechanical testing of wheel sections establishes actual physical properties.



Electron fractograph shows regular crack progression during fatigue stages of failure.

Materiel failures appear as cause factors in some 15% of all CF aircraft accidents. At any time, when metallic materials are suspected of being accident initiators, the Metallic Material Laboratory of QETE stands ready to assist accident investigators. The lab provides an extensive range of information and advice to support the investigation team.

In general terms QETE's analysis includes, confirmation of causes, and recommendations for both short and long term corrective action, such as inspection methods, frequency of inspections, and the rejection criteria to be used to maintain operational capability. Perhaps a specific example will better illustrate QETE's support role and investigative techniques:

A rash of wheel failures on the Tutor aircraft in 1968 led field investigators to suspect a progressive cracking of wheel rims. Several samples were forwarded to QETE for failure analysis. Preliminary visual analysis by QETE engineers confirmed the field investigators' suspicions, and the units concerned were informed that probably all the Tutor wheels were deteriorating.

In association with the Aircraft Maintenance Development Unit, (AMDU) Trenton, nondestructive test methods were investigated to develop an optimum field inspection technique. Inspections in the field confirmed the QETE prediction only too well - a majority of wheels were found to be in an advanced state of deterioration.

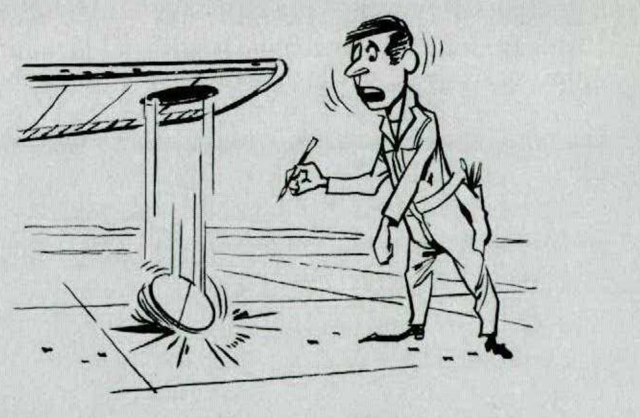
QETE meanwhile, in association with specialists at the National Research Council and the Department of Energy, Mines and Resources, had continued the study into the cause, mode, and rate of failure. Extensive mechanical, metallurgical and chemical tests showed that the Tutor wheels' basic properties were adequately close to the design requirements. The final failure was due to fatigue cracking, but initiation was largely due to corrosion and stress-corrosion areas. When these grew to a critical size, fatigue cracking was initiated. Electron fractographic analysis determined that the period between fatigue initiation and final rupture was related to the number of landings. The average number was three hundred.

These findings were discussed in conference with Training Command, the Directorate of Aerospace Maintenance, DFS, AMDU and the wheel manufacturer's representatives. On the basis of QETE recommendation, it was decided that new, stronger wheels for the fleet was the solution.

During the 9-month procurement lead time, the aircraft had to be kept operational on existing defective wheels. A schedule was drawn up to sort wheels by the degree of deterioration present. Rejected wheels were to be used as slaves - installed on aircraft undergoing maintenance to permit continuing use of serviceable wheels - while inspection techniques and frequencies were drawn up in accordance with QETE and AMDU findings. QETE provided rejection criteria which were later revised depending on the availability of wheels, and utilization requirements.

The project can be judged successful in that no accidents due to wheel failure occurred during the period. Present maintenance and inspection procedures preclude recurrence of the original problem.

If you are requested to send items to QETE for failure analysis, please resist the temptation to fit broken pieces together; try to provide both halves of any broken component and do not attempt to clean the items. Also, please forward all available information such as UCRs, photographs, drawings and specifications, and witness reports. These contributions are essential in helping QETE to keep you safely airborne.



Dangerous Chemical Reactions

Flashlight batteries are usually made of graphite and zinc. Electricity is generated by chemical reaction between the zinc and the graphite. The same "battery" can be created on your aircraft if you write on aluminum with your graphite pencil. In one case, an inspector drew a pencil line around a crack in an aluminum wing skin. Two months later the crack wasn't a problem because the entire disc fell out. The pencil mark acted as a perfect can opener. Instead of graphite pencils, carry a grease pencil and use it properly.

- F5 Service News

Gen from Two-Ten

LEARN FROM OTHERS' MISTAKES—you'll not live long enough to make them all yourself!

TUTOR, LOSS OF THRUST Upon completion of a normal instrument training mission, the instructor and student returned to the aerodrome to practice traffic patterns and circuits. On overshoot from a touch-and-go landing, the aircraft was cleaned up and power reduced to 70-75% to maintain an airspeed of 175K. Upon receiving clearance for a closed pattern the instructor advanced the throttle. At approximately 85% a sound similar to loss of cabin pressurization was heard, followed by a loss of thrust and a decrease in EGT and RPM.

Throttle movement was stopped and the instructor pressed his airstart twice for a few seconds. The student also pressed his airstart once for a few seconds. The engine did not respond. They last observed the RPM as it was decreasing through 17%. The throttle was never moved from the 85% position. A decision to eject was made at 130K, approximately 400-500 feet AGL. Both instructor and the student escaped uninjured.

Investigation of the engine at the contractor indicated that seized rollers on the right hand bleed valve caused the valve to stick, also, one synchronization cable was pulled from its attachment which was cracked since manufacture.

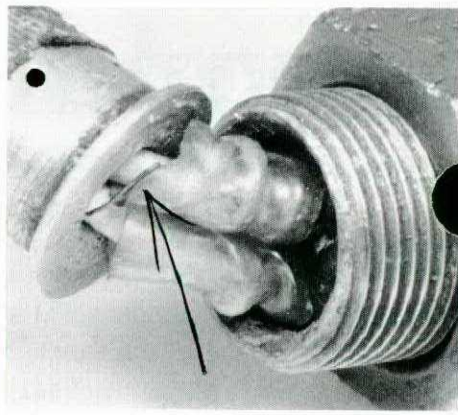
An extensive program to eliminate all suspect causes of Tutor engine malfunctions is under way.

DAKOTA, ENGINE FOD So you thought FOD was a problem associated only with jet engines? Unfortunately it isn't so limited in scope, as was illustrated by a recent incident in which a crash-landing was averted only by the crew's skillful handling of the situation.

Someone had left a piece of lockwire lying around which had found its way into the left engine's magneto primary wiring circuit. The wire eventually punctured the insulation and shorted out both magnetos, causing the stokers to quit in the left engine.

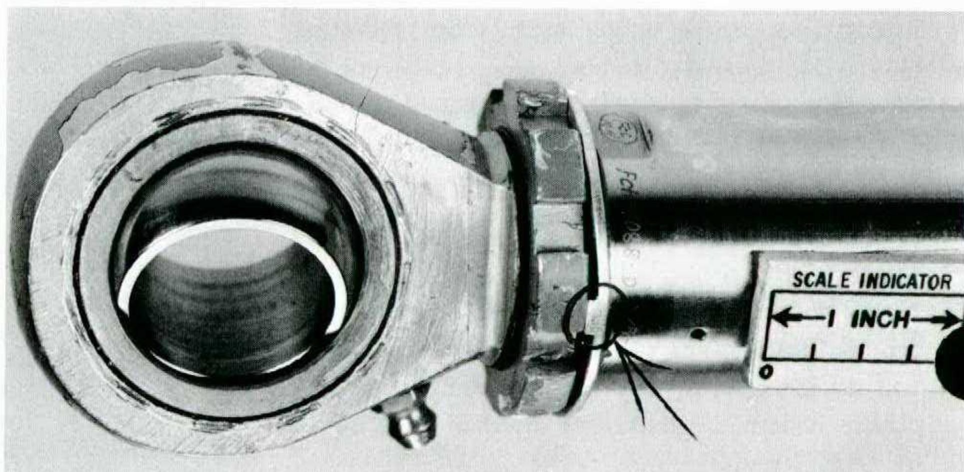
The pilot chose to land at a nearby strip rather than return to base on his remaining engine. This proved to be a wise decision because keeping the Dak flying had taken a lot out of the right engine, and it too quit - fortunately on the roll-out after landing.

Clearly FOD plays no favourites. So retrieve all those little bits of lockwire you snip off - no matter what the vintage of the aircraft.



ARGUS, NOSEGEAR HANGUP A recent incident began with an unsafe nosegear indication when the landing gear was selected down. The ensuing "up" selection provided a puzzling treat for the crew when the main gear cycled up and locked as advertised - but the nosegear moved down and locked! A member of the crew inserted the emergency pin in the nosegear and the mains were again selected down. This time they locked and the aircraft landed safely.

Investigation revealed that the nosegear actuator was in an out-of-rig condition, which caused cam follower reversal and resulted in the reverse operation. Cause of the out-of-rig condition was a tab washer used as the locking device for the actuator eye end. It had not been properly secured during the previous inspection, and eventually permitted the eye end to work loose.



Mockup photo shows improperly secured washer.

Looks like quality control inspectors will be keeping close tabs on this situation in the future.

DFS staff change

Recently we said goodbye to Maj BR Arnott of the Education and Analysis section of DFS, who has been posted to CFB Moose Jaw. His replacement is Capt CE Hansen. Capt Hansen joined the RCAF in 1956 while attending the University of Alberta. After graduation he received his wings in 1959. During his first tour he flew the CF100 at Bagotville and the CF101 at Chatham. In 1963 he was transferred to the CE section at Chatham. In 1966 he attended the Aerospace Systems Course in Winnipeg and was subsequently transferred to 408 TAC(F) Sqn at Rivers. Prior to coming to DFS, Capt Hansen was with the AETE CX-84 Detachment in Montreal in 1969 and at AETE, Uplands, during 1970.

Maj BR Arnott

Capt CE Hansen

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cont'd from page 15

Conditions at or near the surface in the vicinity of thunderstorms are often rough because the cold outflow from the base of the storm produces a miniature cold front often accompanied by gusty surface winds and heavy precipitation.

There are two facts that should be remembered. The first is that a severe thunderstorm can occur in practically any geographic area in which thunderstorms are known. The second is that no useful correlation exists between the external visual appearance of thunderstorms and the turbulence and hail within them.

Finally to repeat an old phrase - *Avoid Thunderstorms if at all Possible. Flying into one is asking for trouble.*

Comments to the editor

Otter Operations Defended

The Jan-Feb issue of Flight Comment prompts me to write. As an Reserve (SIC) member of nineteen years standing, I can assure you that each issue is devoured avidly by "Weekend Warriors" (a misnomer now unfortunately more often uttered in ignorant derision than in interest or support). Thus, may I point out to you the need for objective reporting, if such sections as "Gen from Two-Ten" are to be absorbed intelligently instead of scoffed at and thrown aside. I remember well on our vampire squadron when a fellow pilot was chided for not wrapping the brake cable around his hand after the brake lever had snapped during an aborted takeoff. It took weeks for the laughter to die, and months for the pilots of two squadrons to consider the column seriously again. In the name of Flight Safety, let us not repeat this situation.

Regretfully, it must be pointed out that several items in the Otter section of the Jan-Feb issue do little to promote informed conjecture. In OTTER, HYPOXIA, you toss in as added attractions, two broken helicopters - without comment, and two other Otter missions with failed generators - all four, as "furthermores".

The account of the two Otter generator failures was faulty and biased. You state that the pilot "pressed on...when generator failure ...rendered him ineffective", and that "rather than increasing operational effectiveness, this actually had the opposite effect". Neither statement is true.

The OTTER, UNAUTHORIZED LETDOWN item treated the ingenuous use of HF facilities in the same derisive manner, offering up only dangerous alternatives.

I put it to you that the rash of engine and generator quill-shaft failures (to name but two) on Otter aircraft in the past three years is deserving of more serious treatment than "arm chairing" the results by reference to any book.

And finally, as the pilot of those two "ineffective" missions - where my mighty Otter had been reduced to the status of a NORDO Piper Club by loss of electrical power - I would again deliver the overdue relief Medical Team and ground-party food supplies to the strip, and fly the four hours' search area on a CAVU day in sight of another aircraft should the need arise.

Furthermore, CFP (100 A). 202 says...

LCOL J. Fergus Kyle

Your point regarding CFP 100(A), article 202, is valid. Notwithstanding the orders and regulations which govern the conduct of flying operations, the captain of an aircraft is ultimately responsible for the safety of his aircraft and the personnel on board.

In this regard, it is difficult and often hazardous, while sitting behind a desk, to objectively assess decisions made by the captain of an aircraft when operating under the stress imposed by an emergency, or a potentially hazardous or rapidly changing situation.

Nevertheless, the purpose of Flight Comment is to convey information: the more timely and important the message and the more general its applicability, the better. The message in this article is that the margin of safety can be quickly reduced when the practices associated with everyday good airmanship are set aside in the interest of "operational necessity". Our conviction that this message is worth conveying is based on the sizeable sample of occurrences which this Directorate is in a position to analyze. Predictably, some readers will conclude we advocate the observance of normal safety precautions under all circumstances; this is not so.

The assertion in the Jan-Feb issue that "generator failure shortly after each takeoff had rendered him ineffective" is, as you quite rightly point out, incorrect.

In regard to the two damaged helicopters which appeared to get second billing to a HYPOXIA incident, more coverage was not possible because the investigations were still in progress. This issue carries an extensive analysis of one of these occurrences on page ten.

Unspiked Jet Fuel

Being in the POL Quality Control business, it was with great interest that I read in the Nov-Dec issue, Capt Hinton's fine article, "You can't fool the pros".

I thought that perhaps your readers could benefit from a recent experience I had during the course of a Quality Assurance visit to a contractor who had an into-plane and along-side contract to supply CF aircraft with JP4 F40 jet fuel at a civilian airport.

During that visit we found that close to 200,000 gallons of supposedly FS11-spiked jet fuel had been sold to DND. The additive was available all right - in five gallon cans stacked in a shed. Apparently due to an oversight on the part of the parent company, the distributor was supplied with a truck which did not have a special blending apparatus to dispense straight Jet B to civilian aircraft and JP4 with FS11 to CF aircraft.

It appears that many old pros were fooled at this airport. The airport was one used extensively for troop movement during the recent FLQ crises. Besides, how can the right quantity be added into an aircraft like the C130 which has single point refuelling unless it is injected in the feed line?

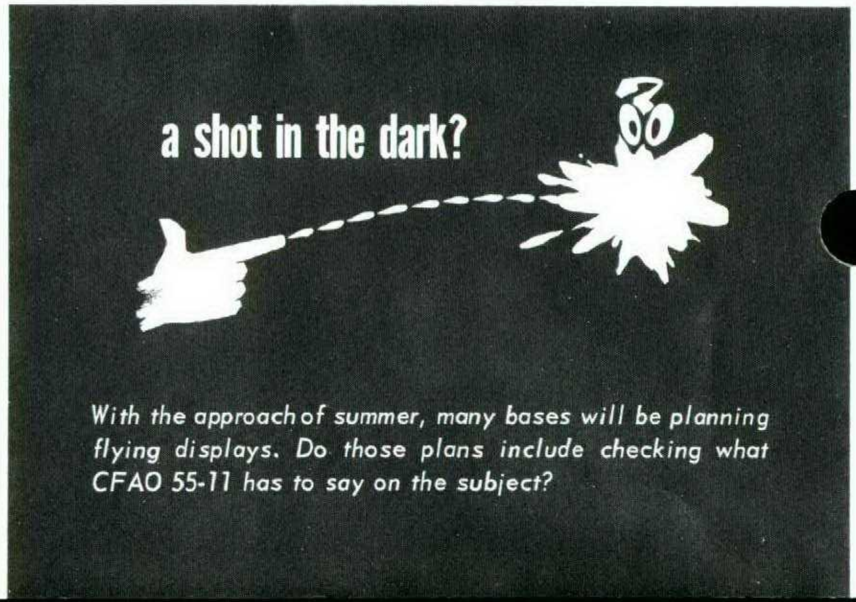
Needless to say, this unsatisfactory condition was promptly reported to the Director General Quality Assurance and the Department of Supply and Services. The contract will probably be renegociated for a possible refund; rough calculation indicates DND was short changed about $700.00 by the omission of FS11, not to mention the inherent flight safety complications.

It might only be coincidental, but the replacement contract was awarded to another firm.

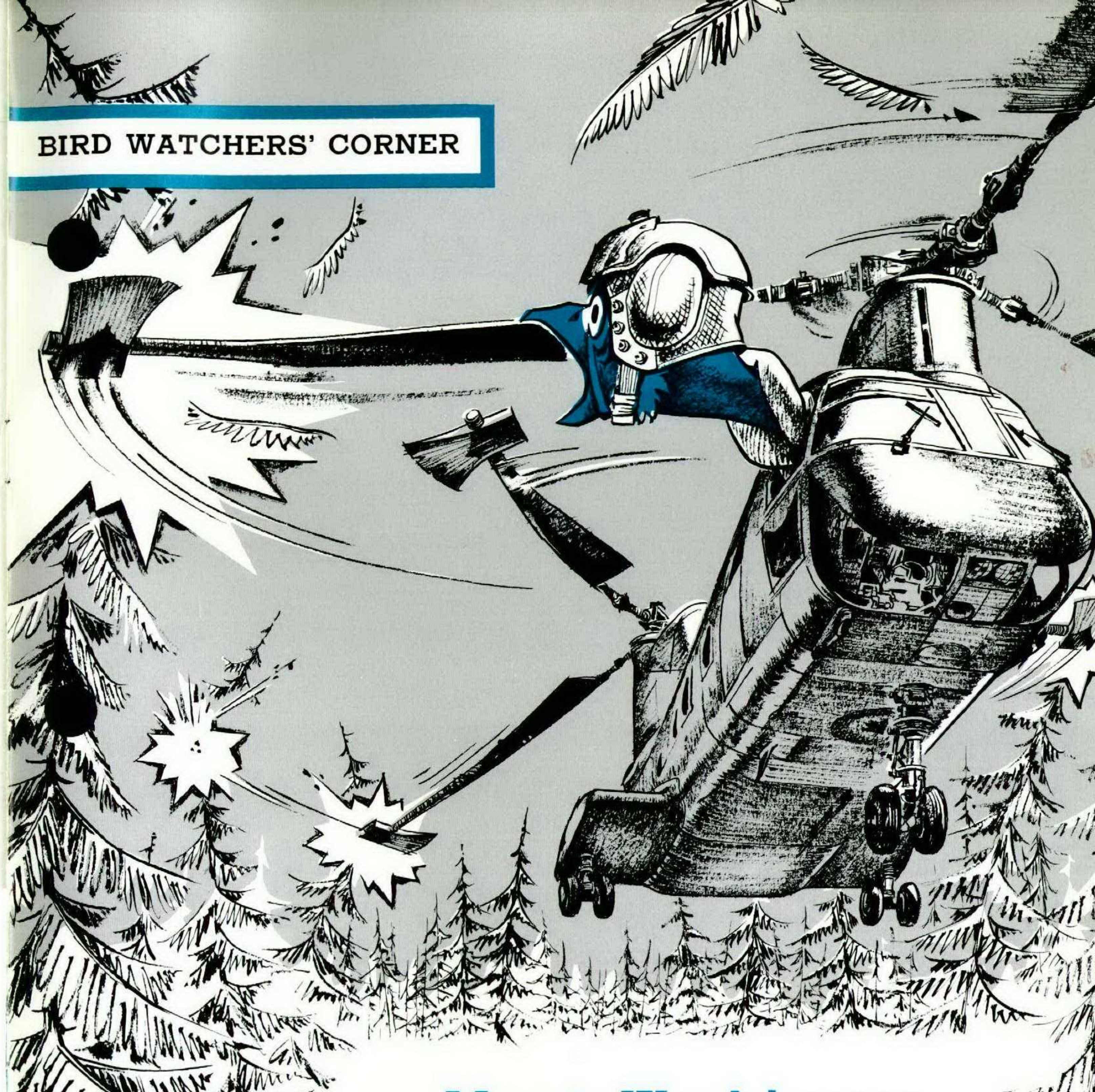
WO R. Jones
208 CFTSD

Your letter brings to light a good example of accident potential on a massive scale. There is not much the pilot can do to protect himself from this type of situation. Fortunately, we can rely on our first class Quality Assurance people to protect us from incompetent or even unscrupulous suppliers.

answers to - how's your wx? A-JT B-FC C-RI D-YR E-SA



BIRD WATCHERS' CORNER



Myopic Woodchopper

Because they are not known for their longevity, experienced Woodchoppers are nearly extinct these days. When one is about however, any birdwatcher can easily detect its presence by the staccato metal-to-timber drumming that announces its impending arrival. The experts attribute the apparent disdain for towering timbers to the Woodchopper's imbalance of faculties—limited vision and an irresistable compulsion to fly into confined areas at high speed. Birdwatchers are known to head for shelter when they hear the call:

THAT-CONFINED-SPACE LOOKS-LIKE-A-BIG-ENOUGH-PLACE

The Ambulance Down in the Valley

'Twas a dangerous cliff, as they freely confessed,
Though to walk near its crest was so pleasant;
But over its terrible edge there had slipped
A duke, and full many a peasant.
The people said something would have to be done,
But their projects did not at all tally.
Some said "Put a fence 'round the edge of the cliff,"
Some, "An ambulance down in the valley."

The lament of the crowd was profound and was loud,
As their tears overflowed with their pity;
But the cry of the ambulance carried the day
As it spread through the neighboring city.
A collection was made, to accumulate aid,
And the dwellers in highway and alley
Gave dollars or cents - not to furnish a fence -
But an ambulance down in the valley.

"For the cliff is all right if you're careful", they said;
"And if folks ever slip and are dropping,
It isn't the slipping that hurts them so much
As the shock down below - when they're stopping."
So for years (we have heard), as these mishaps occurred
Quick forth would the rescuers sally,
To pick up the victims who fell from the cliff,
With the ambulance down in the valley.

Said one, to his pleas, "it's a marvel to me
That you'd give so much greater attention
To repairing results than to curing the cause;
You had much better aim at prevention.
For the mischief, of course, should be stopped at its source;
Come, neighbours and friends, let us rally.
It is far better sense to rely on a fence
Than an ambulance down in the valley."

"He is wrong in his head," the majority said;
He would end all our earnest endeavor.
He's a man who would shirk this responsible work,
But we will support it forever.
Aren't we picking up all, just as fast as they fall,
And giving them care liberally?
A superfluous fence is of no consequence,
If the ambulance works in the valley."

The story looks queer as we've written it here,
But things oft occur that are stranger.
More humane, we assert, than to succor the hurt
Is the plan of removing the danger.
The best possible course is to safeguard the source
By attending to things rationally.
Yes, build up the fence and let us dispense
With the ambulance down in the valley.

Author Unknown