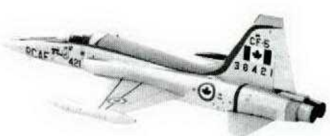
# FLIGHT COMMENT

NOVEMBER · DECEMBER · 1968



*Mobile Command*

# Comments

> This issue is the last in the 1968 series featuring the Commands. To those who created and organized the material - a warm thank you. The items attested to the extent of flight safety activity within organizations - and the degree of enthusiastic support it is receiving. Let's hear from you; your idea, criticism, proposal, beef, etc, could pack a wallop - if it appeared in print!
>
> - the editor

In the Jul-Aug issue (page 23) we mentioned an extreme hazard with the T33 parachute connector assembly. If the lanyard is inadvertently pulled, pushing it back in may stop the timer but does not reset it to zero. The resulting reduced cycling time could cause premature chute deployment on ejection and entanglement with the seat. A possible fix - a witness wire - mentioned in the article has been found unacceptable. The hazard still exists - *beware!*

We were disturbed the other day to receive a report about a technician who suffered burns to his face, neck, upper chest, forearm and hand, while fixing an aircraft. Although it was inadviseable of him to replace components with power-on when there was a likelihood of fuel being present, no one appeared to be *directly* at fault. Another disturbing aspect of this was that the occurrence was reported as "... caused by unfortunate circumstances ... No one is to blame; it is a case of the type of industrial hazard that can hardly be legislated for." In other words, the occurrence was unpreventable. We disagree. When a man is burned - it's preventable. In fact, the EO has been re-written to help prevent another man getting burned. This is what SAFETY is all about.

Supervisors at one of our bases reported finding hangared aircraft not grounded and that poor floor cleanliness, spilled fluids indicated a lack of supervision at the Senior NCO level. Without sounding preachy, chaps, we can't resist cautioning that such circumstances often precede (or accompany) a rise in accidents/incidents - our statistics show this to be a near-certainty.

Chew gum while flying? Recently, a pilot had uncontrollable coughing, chills and fever after a flight. A piece of FOD had lodged in his lungs - right, his chewing gum. He had pulled G and in the process, lost his gum. Had the wad been larger his life could well have been shorter.

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LCOL H. E. BJORNESTAD
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# SAFETY AND EFFECTIVENESS

While the readers of Flight Comment magazine undoubtedly are aware that Mobile Command is being developed as a highly mobile, integrated, land/air force, trained and equipped for duty anywhere in the world, they may not be as aware of the size and complexity of the aviation force required to provide this support.

Several hundred aircraft - including VTOL, STOL, and high-performance jet aircraft - will be employed in a wide range of roles including air superiority, close air support, troop mobility, logistics support, all-weather reconnaissance, observation and adjustment of artillery fire, armoured reconnaissance, casualty evacuation, search and rescue, and general liaison.

It will be evident that the capability of this aviation force will have a major effect on the flexibility, mobility, and firepower of the field force being supported. The development and maintenance of an effective aviation force are, therefore, fundamental to the achievement of the full operational readiness required of this command.

Because the manpower and equipment resources required are being very carefully budgeted, every loss due to an avoidable aircraft accident will cause an immediate reduction in the effectiveness of this force. For this reason, an assessment has been made of the aircraft accident potential inherent in the aviation roles and aircraft types assigned to this Command. The results indicate that, for several reasons, the accident potential is quite high. For example, many of the safeguards and facilities provided at large fixed air bases to reduce the frequency or severity of aircraft accidents, will not be available in the field environment in which this Command may operate.

Fortunately, the experience gained by other nations in the employment of tactical aviation is available and can be of great value to us. Already it has served to forewarn us of the hazards inherent in this low-level role, and it can assist us further by directing our attention and energy towards clearly identified problem areas.

There is no doubt that very high priority must be assigned to the requirement to eliminate avoidable aircraft accidents. To achieve this objective and at the same time retain the scope and realism in our training that is necessary to develop the required level of operational readiness will call for a very aggressive and professional approach to flight safety - an approach dedicated to the proposition that maximum effectiveness is achieved when mission accomplishment is combined with minimum exposure to risk.

The objective is to produce and maintain a combat ready aviation force for the support of land/air operation. In so doing we must eliminate all unnecessary risks. Each commander, staff officer, supervisor, operator, and technician has his role to play.

LGEN W.A.B. ANDERSON
COMMANDER, MOBILE COMMAND

# MOBILE COMMAND

## – *what it is, and where it's going*

**The government, in its White Paper of 1964, established a basis for realigning the defence force structure. The intent was to achieve a versatile force available on short notice to meet Canada's commitments in international situations. A result was the formation of Mobile Command (FMC) as one of six major commands of the new Canadian defence structure . . .**

Unlike the other major commands which derived from existing RCN and RCAF commands, FMC was an entirely new creation. Included in the responsibilities assigned to FMC were many of the tasks of the four former geographical commands of the Canadian Army. Although the staffs of these geographic commands were available, their structure was not suited to the requirements of FMC; consequently much basic reorientation was required. In broad terms, the responsibilities assigned to FMC are:

- defence of Canada, including contributions to Canada/US regional defence agreements;
- implementation of Canadian plans with respect to NATO ground forces commitments;
- contributions to United Nations peace-keeping forces.

In short, FMC is to provide combat-ready land and tactical air forces to meet Canadian defence commitments.

The men and equipment of the Command is comprised of most of the field force of the former Canadian Army, to which has been added a growing component of fixed and rotary wing tactical aircraft.

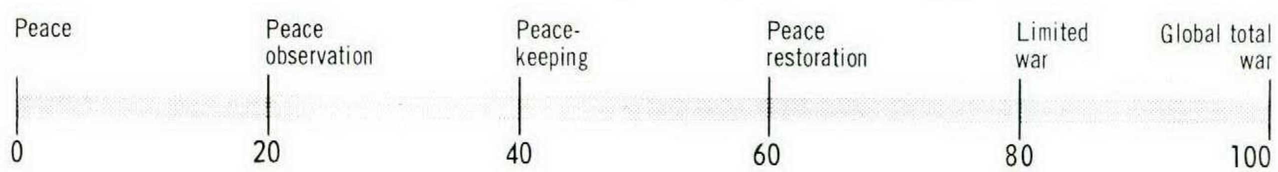
Neither the defence of Canada nor the NATO commitment necessitated immediate or significant changes in the basic force structure, however the increasing emphasis placed on peace-keeping activities required further study. This study could not, of course, be done in isolation from the other two, nor without considering ramifications that might affect other commands. An aid in this evaluation has been the concept of a *Scale of Conflict* (Figure 1) which is an attempt to delineate operational situations for ease of study. The abstract Peace is given a numerical value of zero; the equally abstract Global Total War is given a numerical value of one hundred. Between these two, is an ascending order of conflict.

Past military experience indicates that for limited war and more intense levels of conflict a great deal of information, concepts and doctrine was available - needing only minor modifications to suit FMC's requirements. Similarly, at the lower end considerable knowledge had been accumulated through UN and non-NATO experience. In the centre region, very little Canadian information or experience existed. FMC planners, applying knowledge of operations at both ends and on information from other countries acquired during their peace restoration operations, developed study situations to aid in the examination of requirements for forces which might become involved in the mid-levels of conflict.

These study situations, commonly termed *scenarios*, allowed planners to examine the various levels of conflict against a background of combinations of differing geographic, cultural and sociological environments. Thus, degrees of Canadian military involvement over a complete spectrum of situations could be assessed to provide an indication of the most probable types of forces that Mobile Command might be required to field. These varied widely in size and composition; one situation might call for reconnaissance capability, another might emphasize infantry. Possibly, the force could be restricted to logistics troops - as eventually developed with UNEF in the Middle East. The force could consist of an air element as was Canada's contribution in Yemen and West Irian. Furthermore, their tasks might range from police-type patrolling to curfew enforcement, from surveillance to border control and so-called conventional to even thermonuclear war.

Various types of units were assessed in the context of these scenarios, and their effectiveness related to tasks on the scale of conflict and categorized as most effective, fairly effective or less effective. This was expressed by curved lines - Figure 2.

Figure 1





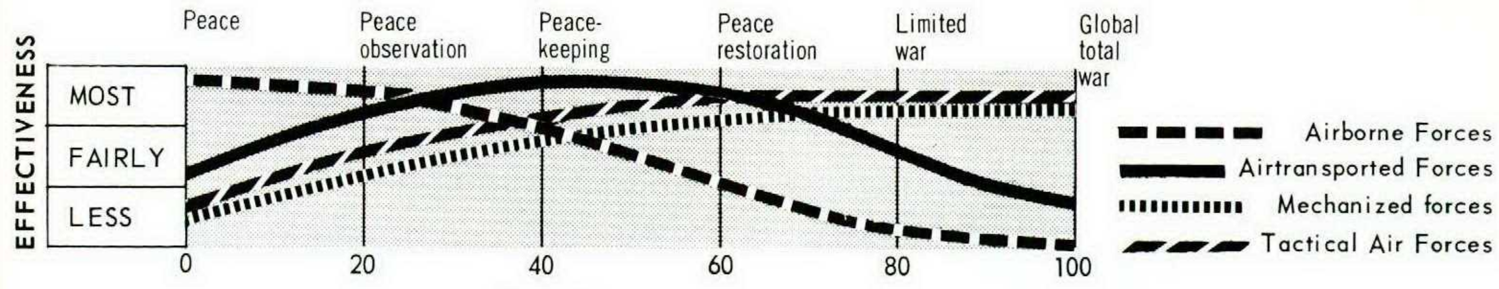




Figure 2

- **Airborne forces** would be most effective at the lower end of the scale; they are lightly equipped for quick movement by air and are suitable for operations in the most difficult of country. However, they have limited offensive capability and combat endurance; their effectiveness drops off as the intensity of the conflict increases.
- **Airtransported forces** with their somewhat heavier equipment and increased firepower are most effective in mid-intensity conflict situations.
- **Mechanized forces** with their main battle tanks, self-propelled guns and other heavy equipment are not airtransportable in current aircraft and, would be least effective at the lower end of the scale where quick response is required. These units are most effective in a limited war, and, of course, general war.
- **Tactical air forces** provide a degree of effectiveness at the lower end of the scale in terms of mobility and reconnaissance. As we move up the scale, air elements become increasingly effective, through both their light transport and close support aircraft, until their role merges with that of the mechanized forces.

A single organization, able to contend with such divergent situations - yet within Canadian resources - would necessarily depend upon a *building block* concept. Thus forces-in-being - through the simple process of grouping the blocks - would have the inherent versatility and flexibility necessary to contend with a wide range of requirements. Resource limitations precluded all components being equipped to meet all requirements. It was necessary to equip part of the force for activities predominantly concerned with upper-scale operations, and the remainder for those associated with the lower portion. A point of 60 on the scale was selected to define the organization. This meant as their primary role, part of the force would train and equip for operations involving peace restoration or less intense situations and the rest of the force, for more intense situations.

When such factors as distance and areas are incorporated into the scenarios, practical aspects can be considered. Once the size of the operational area is defined, then quantitative assessments of activities such as reconnaissance, surveillance, logistics and communications can be made on which to base equipment requirements. One problem is the necessity of moving a force from Canada to an overseas theatre. This move might be several thousand miles - beyond the capability of FMC alone. Obviously, both Air Transport Command and Maritime Command are of prime importance to FMC operations.

These scenario and unit effectiveness studies help determine the composition of the force and the emphasis to be placed on specific types of equipment, personnel and training. The elements of a force could then be drawn from the resources of the various building blocks.

The operational units - that is, the blocks - would be located on FMC bases at Calgary, Petawawa, St Hubert, Valcartier and Gagetown as well as Soest in Germany. The Canadian Infantry Brigade groups formerly located at Calgary, Petawawa and Gagetown were redesignated 1, 2 and 3 Combat Groups, respectively; the brigade in Germany became 4 Canadian Mechanized Brigade Group; 5 Combat Group is being established at Valcartier. A combat group is not an operational configuration; it is a holding, training and administrative grouping from which a force can be drawn depending on the circumstances. In addition to the combat groups, the growing tactical aviation component was designated 10 Tactical Air Group (TAG); its Commander and staff would be located at St Hubert. Elements of 10 TAG would be co-located with the combat groups, although the elements which require more sophisticated support could be located at existing air bases near FMC bases. Thus, from these resources, units could be combined as a tailer-made force to meet the requirements of a particular situation.

There has been one notable addition to FMC's land element - the Canadian Airborne Regiment, an elite parachute/commando unit based at Edmonton. As the complete unit will be airtransportable and air droppable it provides a quick-reaction force for emergency situations.

In summary, Mobile Command provides the combat-ready land and tactical air forces to meet Canadian defence commitments. To meet the requirements of widely divergent operational situations, the command is being organized on a building block concept. The recently created combat groups, along with the growing tactical aviation resource, provide the *forces-in-being* from which tailor-made task forces can be drawn to contend with a particular situation. This concept must now be tested by field exercises, training, war games and actual operations.

## Argus gets jet fuel

**While refuelling at another base the wrong fuel was pumped aboard an Argus. Orders were found inadequate, but considering the number of men involved who *should* have been more alert, it's unlikely that an order can plug that kind of gap.**

# Good Show

## CAPT D.G. McBRIDE

Shortly after takeoff in a T33 at 10,000 feet, Capt McBride intentionally flamed-out his engine for the student to relight – a requirement in the training syllabus. The engine would not relight in four attempts. Meanwhile, Capt McBride had taken control and set the aircraft up for a forced landing, continuing to attempt relights from the back cockpit. Capt McBride flew a perfect forced landing pattern, carefully controlling his airspeed to allow for his heavy fuel load, and landed the aircraft safely on the runway. An extremely uncommon materiel failure in the ignition system had made the relight impossible.

Capt McBride's handling of the situation with precision and good judgement enabled him to demonstrate to his student – under the actual circumstances – the standards of professional ability required of Canadian Forces pilots.

## LS D. MILLS and AB A. BAUMLE

As AB Baumle moved the fire bottle to the rear of the line after a normal start-up, he noted what seemed to be an erratic noise coming from the Tracker's engine exhaust. He called over to LS Mills who immediately advised the flight crew of the suspected malfunction. The crew performed the required checks but everything appeared normal. LS Mills was not satisfied and spoke to his supervisor who grounded the aircraft. A broken exhaust valve was found to be in the process of disintegrating in the engine.

The alertness and initiative of LS Mills and AB Baumle led to the timely discovery of a serious malfunction. A hazard was exposed and the engine saved from the extensive damage that would have resulted if the aircraft had been flown.

## CPL E.C. BAXTER

In an attempt to locate the cause of an abnormal high-frequency vibration in a CH113's drive train - earlier reported by the pilot - Cpl Baxter inspected the suspect areas. This inspection was important because the vibration could not be re-induced during a hovering check. In an area obscured by dirt and paint, Cpl Baxter detected a very fine hairline crack in the transmission rotor brake

Cadet D.J. Burroughs

LS D. Mills and AB A. Baumle

Cpl E.C. Baxter

Cpl A.J. Burke

mount. After removal a dye penetrant check confirmed the presence of the defect.

Cpl Baxter demonstrated a high degree of competence in carrying out this check under less-than-ideal field deployment working conditions. His timely discovery prevented an impending failure from developing into a serious in-flight hazard.

## CADET D.J. BURROUGHS

After levelling off at circuit height from a touch-and-go landing, Cadet Burroughs' left windscreen suddenly shattered from impact with a seagull. Although unable to see forward through the shattered glass and blood, Cadet Burroughs after declaring an emergency, successfully landed the Tutor although his view was confined to the side panel and the right windscreen.

Despite his limited flying experience, Cadet Burroughs demonstrated cool judgement and flying skill in returning his aircraft safely to the ground.

## CPL A.J. BURKE

During a pre-inspection run-up on a T33, Cpl Burke became suspicious of a slight vibration. He removed the engine exhaust cone for further investigation and found that one of the turbine blades had moved slightly rearward. The inspection did not call for removal of the turbine. However, at Cpl Burke's insistence, this particular one was removed; it was then discovered that one of the labyrinth seal retaining bolts had sheared. The bolt head had become jammed between the cooling



air seal and the turbine face causing several of the locking devices to be sheared from the turbine face.

Had this condition gone undetected, it would very likely have caused a serious incident or accident. Cpl Burke's alertness and persistence in tracking down the fault led to the elimination of a potential hazard.

## LT(N) B.D. BOWEN

Lt Bowen was bringing his Sea King into a hover over the water when at 45 feet and 20 knots airspeed, number one engine rpm suddenly decreased to idle. The rotor rpm rapidly decayed to 80% and the helicopter began to settle. Applying full power to the remaining engine, Lt Bowen carefully lowered the collective to conserve rotor rpm and eased the nose of the aircraft over to increase airspeed. By this time the helicopter was only 10 feet above the water and while airspeed had increased to 45 knots, the rotor rpm remained at 80%. By skilful use of back cyclic to trade airspeed for altitude and by gently lowering the collective to trade altitude for rotor rpm, Lt Bowen was eventually able to get his rotor rpm to 100% enabling him to climb away safely. The aircraft was successfully flown to a nearby airfield on one engine.

Lt Bowen's quick assessment and response to a tricky emergency undoubtedly prevented the ditching of his helicopter. In a situation calling for precise judgement he demonstrated a high degree of flying skill.

Lt(N) B.D. Bowen

LCDR D.E. Munro

Capt C.R. Gillis and Lt (N) P.A. Blanchard

AB H.B. Gillard



## LCDR D.E. MUNRO

On an anti-submarine search, LCDR Munro was hovering his Sea King above the water when number two engine suddenly failed. The light wind and high temperature gave LCDR Munro no other choice but to land the helicopter in the water. He accomplished this with no damage, but found that the engine could not be started.

Power on the good engine was increased to maximum, the sonar was cut to minimize drag and the helicopter was taxied in an attempt to do a running takeoff. As the helicopter accelerated in the water he allowed rotor rpm to decrease to a minimum of 80% and at approximately 30 knots airspeed he flew the aircraft out of the water. Once airborne, by trading airspeed for altitude and altitude for collective movement and rotor rpm, he was eventually able to regain 100% rotor rpm, and returned his craft to the carrier.

LCDR Munro, in an excellent display of airmanship and good judgement prevented the loss of a valuable aircraft.

## CAPT C.R. GILLIS and LT (N) P.A. BLANCHARD

On a routine personnel transfer flight, a few seconds after levelling off at 350 feet above ground at 75 knots, the cyclic stick snapped violently to full aft position. The pilots - Capt Gillis and Lt Blanchard - found themselves in a near-inverted position rolling rapidly to the left. With both pilots struggling against the extreme control pressures they retained the presence of mind to assess the situation as a hydraulic servo system failure. Capt Gillis turned off the servo systems; the pilots regained control and flew to an emergency landing on an island.

In a most unnerving situation both Capt Gillis and Lt Blanchard displayed a commendable presence of mind and cool judgement. In assessing the cause and taking corrective action while struggling to regain control of the runaway aircraft they displayed a high degree of professional skill.

## AB H.B. GILLARD

AB Gillard, during a routine pre-flight inspection on a Tracker, noted a minor discrepancy in the vicinity of the port elevator. A flush rivet head on the horizontal stabilizer was missing – a defect which could easily go unnoticed since the stabilizer is several feet above his head and the rivet quite small. He investigated this defect and discovered that an elevator hinge had broken; the resulting vibration had caused the rivet head to shear. Had this gone unnoticed the vibration eventually could have led to a partial or total in-flight failure of the elevator assembly itself.

AB Gillard's keen powers of observation and the thoroughness of his inspection prevented a possible accident. His was a commendable – and rewarding – act of alertness.

# Looking at the facts...

*". . . This complex array of equipment, roles and environments will present to those responsible for the prevention of aircraft accidents, a challenge that is without precedent in the Canadian Forces . . ."*

*Air superiority, close air support, all-weather reconnaissance, troop mobility, tactical logistics support, armoured reconnaissance, observation of artillery fire, search and rescue, casualty evacuation, general liaison - these are the major roles required of aviation to support the Mobile Command mission.*

*Not too surprisingly, five basically different types of aircraft are required to perform these roles:*

- *a medium transport fixed-wing aircraft - the Buffalo or CC115*
- *a medium transport helicopter - the Voyageur or CH113A*
- *a fixed-wing close support aircraft - the CF5*
- *a utility tactical helicopter - the Iroquois or CUH-1H*
- *a light observation helicopter - the Nomad or CH112.*

*At present, the L19 provides the capability for airborne observation of artillery fire, and the T33 performs the close air support and training functions that will pass to the CF5.*

*The aviation units to which these resources are assigned must train and be ready for immediate deployment anywhere in the world to provide effective air support in a land force environment.*

*This complex array of equipment, roles and environments will present to those responsible for prevention of aircraft accidents - namely, commanders at all levels, staff officers, supervisors, operators, technicians - a challenge that is without precedent in the Canadian Forces.*

*Because we are new to the tactical air support role and environment, it may appear at first glance that we will have to wait and see just what the hazards are - this is not entirely necessary. Other nations have been up this road before us and the signposts are there to guide us. Their statistical record suggests that although the accident potential is very high, there are no unknown hazards ahead and no new causes of accidents that will have to be grappled with.*

*It appears then, at second glance, that past experience in the prevention of accidents will still be of great value to us. Certainly, over the years the persistence and determination of those dedicated to increased safety has paid remarkable dividends in the conservation of our resources - the practices and principles which have been developed surely still apply.*

*Let's look back briefly over two decades of flight safety and see where it all began and what the results have been. The formation of a flight safety organization reflected a decision to include safety or accident prevention as a function in the management of the air force. This decision was precipitated by an alarming wastage of aircrews and aircraft following the large and rapid increase in the size of the RCAF. In other words, bitter experience obliged us to systematically identify and eliminate unnecessary risks, and to minimize the effects of those that had to be accepted. There followed a dramatic and welcome decrease in accident rates which has with very minor interruptions, been sustained ever since.*

*Evidence of this continuing determination to conserve our resources can be found in virtually all our activities but it is most apparent in the facilities and practices that are now commonplace safeguards against accidents - runway arrestor gear, SOAP programs, sophisticated approach lighting systems, meticulous FOD control programs, carefully controlled POL handling and storage procedures, elaborate crash/rescue equipment, meteorological services, advanced instrument approach aids, air traffic control facilities, obstruction-free runway approaches, flightline area lighting, and so on. These are simply practical safeguards against known hazards.*

*'If these facilities were removed and the practices discontinued our accident rates would increase alarmingly - and our effectiveness would proportionately decrease.*

*This returns us to the present and to the major aspect of the challenge we face. In a field force environment where mobility and concealment are normally required, many of the commonplace safeguards are either impractical or impossible. Does this mean the accident potential will be higher? Definitely - yes. Does it mean accident rates will be higher? In all probability - yes. Fortunately, we need not go back two decades and start again at the point where 10 aircraft were destroyed for every 10,000 flying hours.*

*We cannot ignore or resign ourselves to the hazards simply because yesterday's solutions now serving us so well in other aviation environments are not feasible. We must find and apply new solutions to as many of the hazards as possible. We cannot afford, for example, in the absence of elaborate approach lighting to be satisfied with flashlights - if a portable VASIS is available for purchase. Because we cannot clear the FOD from every dirt strip and clearing, our aircraft must have the best available FOD protection devices. Because we handle POL products in the field our aircraft need better fuel, oil, and hydraulic filtering systems.*

*These examples are only a small sampling of known hazards. Ignored, underestimated or accepted, they will no doubt persist, and we will have to reassess these decisions again in the near future.*

*In more general terms, the principles, standards, and practices of personnel selection, aircrew training, aircrew and aircraft limitations, air discipline, aircraft maintenance, logistics, etc, that have already yielded increased safety and increased effectiveness, are applicable in the development of this tactical air force.*

*Other agencies have learned that the accident potential in a tactical air environment is very high, and that this environment imposes serious limitations on the safeguards that can be provided. While it would be unrealistic, therefore, to expect that this command can match accident rates of other aviation environments, it is clearly in our best interests to achieve the lowest possible accident rate or at least to confine it within acceptable limits.*

*The first essential step in achieving this aim is to clearly identify the hazards. This done, the needless risks can be promptly eliminated, and provisions made to offset or minimize those that must be accepted.*

Maj J. G. Joy
MOBCOM/SOFS

Maj J.G. Joy, a native of Newfoundland, joined the RCAF in 1948 and following aircrew training joined 410(F)Sqn, flying Vampires at St Hubert. He was a member of the first RCAF F86 squadron (410) at North Luffenham, England, and the first CF104 squadron (427) at 3 Wing, Zweibrucken. He served as an exchange officer with the USAF, flying the F100 Super Sabre at Nellis AFB, and as the Staff Officer Flight Safety at 1 Air Div HQ, and ADCHQ prior to his present appointment at Mobile Command HQ.

# The Air OP Troops

Capt. R. I. Adams and Bdr. J. L. Morine

The Air OP Troops of Mobile Command are the present-day successors to the original military airborne man - the air observer. First aloft in tethered balloons, then in aircraft, he could reconnoitre and direct artillery fire better than the observer on the ground. Although the jealousy and ungentlemanly conduct of some early observer pilots led first to an exchange of shots, then air-to-air fighting - and so on - the original concept of aerial observation is basically unchanged and as vital as ever. Today, the role of the Air OP troop has become increasingly important to the ground forces. Wide battle-fronts, rapid movement of surface elements, operations in difficult sub-arctic, desert and jungle terrain, make the air observer a key man when called upon to direct fire from guns or aircraft in support of ground troops.

The primary role of Air OP Troop is to direct and control the fire of guns of a regiment. An Air OP pilot is a qualified artillery observation post officer who uses aircraft to do what his ground counterpart cannot - spot a target and direct fire at it. The pilot flies at minimum altitude into the target area avoiding detection, flying an irregular pattern at low level and climbing briefly when rounds are impacting to observe their accuracy.

Air OP Troops may be called upon to conduct visual recce, aerial photography, message pickup and delivery, line-laying, flare dropping, airborne radio relay, aerial resupply, radio direction finding, liaison, forward air controlling and limited medical evacuation. Although the pilot may fly the mission alone, on occasion an artillery bombardier or gunner makes a complete crew. The observer listens out on the radios, and does visual recce including a tail-watch lookout for enemy aircraft. A mission ideally lasts about 20 minutes although many factors alter this.

An Air OP Troop is an integral part of the Royal Canadian Horse Artillery regiments in each combat group and 4 CMBG. The troop commander is a major who is responsible to the CO of the regiment. His staff consists of three pilots, a warrant officer, RCEME maintenance supervisor, a troop sergeant and 21 other ranks. Completely mobile, the unit is equipped with VHF and UHF air/ground radio, an HF receiver (for weather info) and is capable of sustained operations independently. Occasionally, a section of the troop consisting of one of the four aircraft and a supporting element may be detached for a specific operation elsewhere.

Today's AirOP flies the L19A and L19E which have the dubious distinction of being the oldest Canadian Forces combat aircraft - they are scheduled for replacement in 1969 by a light observation helicopter. The L19 also has the distinction of being flown from the oldest military airfield in the commonwealth - Petawawa, where the Silver Dart was observed for possible military application in 1909 - and the newest Canadian military airfield recently completed at Fort Chambly, Germany.

The L19 is ski and float equipped for total versatility, and is capable of flying from very small areas such as those found close to the battle area. With no defensive armament, light structure and low speed, flying the aircraft quite close to the ground for protection is a necessity. The Air OP pilot therefore learns to exploit the terrain consistent with safety of flight. Thus, the pilot is faced with exercising constant judgement between compromising his safety from enemy action versus safety from striking the ground.

An AirOP pilot's work is supplemented by simulated instrument training, night practice, standards rides, etc, and depending on the weather and the commitment he will fly 25 to 50 hours a month. Squeezed into this schedule are courses for forward air control, flight safety, instrument qualifications, helicopter conversion, and special courses required by his corps.

Air OP work is personally rewarding; the sense of accomplishment is very high. The Air OP Troop is one of the command elements that is ready, willing - and MOBILE.

The L19 can get in close to deliver a message when other means are not available.

The L19 is BFI'd for a first-light sortie.

A message pick-up in the field.





Capt R.I. Adams joined the RCAF in 1953 and served on 430 Sqn in Air Div, 436 Sqn at Lachine, AMCHQ Rockcliffe, and 6RD Trenton before joining the artillery in 1959. Capt Adams joined 2RCHA in Winnipeg in 1960, and after the Army Flying Conversion Course in 1962, served with the guns in the Air OP in Germany from 1963 to 1967. He is presently Training Officer and Unit Flight Safety Officer of the Air OP Troop of 4RCHA at CFB Petawawa.

Bombardier J.L. Morine of Wolfville NS, joined the RCASC in 1951 and transferred the same year to the RCA and trained as an artilleryman at Shilo. Bdr Morine served in Germany with the 27th Brigade, then Petawawa with 1 Div HQ before joining the Air OP Troop of 4RCHA as a driver. After service as 2 i/c of a gun detachment, Bdr Morine returned to the Air OP Troop as a driver.

# 403 Hel (OT) Sqn

"...to train pilots to combat standards...to train qualified technicians to technical standards...to provide technical training for pilots..." Officially designated on 15 Feb 68 as 403 Helicopter Operational Training Squadron, it has just finished the phase of initial aircraft acquisition, staff training and proving lesson plans.

403 Sqn is equipped with the Bell Iroquois, commonly referred to as the "Huey" and more formally known as the Canadian Utility Helicopter, Model 1H (CUH-1H). Powered by a Lycoming turbine engine capable of 1400 shaft HP, the aircraft can carry 11 passengers (plus two pilots) while cruising at speeds up to 120 knots. The Huey can carry approximately 4000 pounds of cargo internally or slung from its cargo hook. Each pilot has an identical instrument presentation including radio aids to navigation: ADF, VOR, ILS and directional FM homing equipment. The Iroquois has proven to be an extremely versatile utility helicopter during its tenure, performing such varied tasks as:

- troop lift (section of infantry)
- cargo carrying
- medical evacuation (six litters)
- gun/rocket platform for suppressive fire support.

Based at CFB Petawawa, 403 Sqn has the advantage of being co-located with 2 Combat Group, thus providing an operational environment for training pilots in the tactical employment of the aircraft. Petawawa is a far cry from the more comforting plains of Manitoba, and its closely wooded areas and broken terrain offer more than sufficient realism for advanced flying. Expected training on the CUH-1H will include:

- basic transition
- tactical employment
- advanced instrument training.

The instructors provide the unit with a wide variety of helicopter experience, including exchange flying assignments with the US and UK forces as well as substantial operational flying within naval and air force environments. The technicians are all recently trained for the particular equipment aboard the Huey and afford the squadron highly skilled maintenance support.

Although 403 Sqn is in the work-up phase it has already proven its worth by providing local aviation support in aerial searches, aircraft familiarization briefings and demonstrations, and various reconnaissance missions.

Equipped with an aircraft compatible with its motto, "Stalk and Strike" and a training program based on realism commensurate with safety and a need to provide an operationally ready helicopter pilot, 403 Sqn is prepared to participate in Mobile Command's land force tactical aviation support.

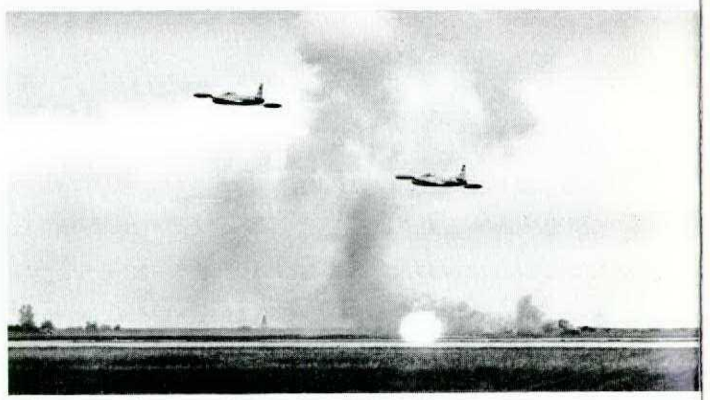
Until the load is well clear of the ground, the crewman monitors the lift-off.

# 408 (TF) Sqn

In the past, 408 Sqn gained much notoriety for its historic survey work in the North - including the Mid-Canada Line as well as the Dew Line. Pioneering in Shoran, 408 Sqn helped Canada win world recognition in both photo mapping and polar navigation. As early as 1949 the squadron began providing close support for the army but not until 1962 was the Tactical Fighter Flight born with eight T33s. In 1964 the squadron moved to its present home at CFB Rivers, Manitoba. The C119 Boxcar joined the squadron and the role was designated Tactical Support and Aerial Recce. In 1965 the Boxcars were replaced with another workhorse - the C130B Hercules.

The following year Mobile Command took over and very shortly thereafter the Hercules were given to Transport Command. In 1967 the squadron began building its T33 strength to 18 as it prepared to assist in the organization of the new CF5 Operational Training Squadron. In the past year the nucleus of the CF5 instructors stopped off in Rivers for training in the ground attack role before heading to the USA for initial checkouts.

The squadron's role still includes tactical support; some T-birds are fitted with machine guns and bomb racks. To maintain proficiency the pilots strafe, high-angle bomb with up to 500 pound weapons, skip-bomb, and drop napalm. Other aircraft are fitted for photo recce. The squadron flies low-level navigation routes covering over 62,000 square miles of Manitoba and Saskatchewan with more than 300 targets plotted to date.



408 in mock ground attack at CFB Rivers.

A 408 T-Bird over Duck Mountain, Manitoba on a low-level recce mission.





Deployment is the big word around 408. Every few weeks the Hercs come back and load up men and equipment and as they take off, the jets are right behind them. Their destination? Anywhere in Canada - wherever there happens to be a mock war. Intelligence, servicing, photo, armament - everybody gets into the act. Talk to the people who have used air support and let them tell you how effective it is!

408 is training for combat and waiting for the CF5 and with its arrival, the opportunity to flex its muscles with Mobile Command.

# 4 CMBG

The three air units of 4 CMBG fly two types of aircraft - the CH112 light helicopter and the L19. The Air OP Troop of 1 RCHA has L19s, the Helicopter Troop of the 8th Canadian Hussars (Fort Chambly) and HQ 4CMBG operate the CH112.

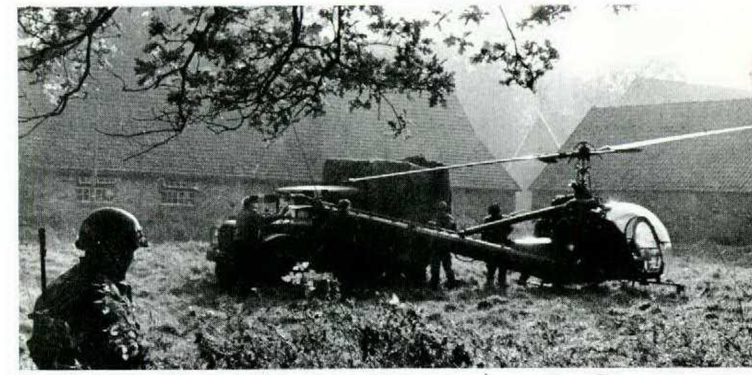
The L19s of the AOP Troop of 1 RCHA were the first to arrive in support of the Canadian Brigade in Germany - at Fort Prince of Wales, near Hemer, in Feb 1960. They still operate out of their grass airfield there. The CH112 arrived two years later.

The primary role of the CH112 with the Recce Sqn is, as the name implies, reconnaissance. This outfit are the eyes of the brigade commander during combat operations, consequently the helicopter plays a vital role in conjunction with ground recce vehicles. In order to stay out of sight and thus out of the danger of enemy fire, nearly all flying is done on the tree-tops. Unit aircraft also support special missions of other brigade units such as engineer bridging and water crossings.

Both the L19 and the recce helicopters carry trained observers as part of the crew to enable the pilot to devote as much of his attention to flying the aircraft as possible.

At HQ 4 CMBG, a CH112 is used by the Brigade Commander and his staff for liaison and recce. Due to the helicopter's speed and ability to land nearly anywhere, the brigade units are readily accessible making field visits less costly in valuable time. Air recces are much faster than on the ground; operations are thus planned more rapidly. The helicopters are also used for aerial photography, message and parcel delivery within the corps area, radio relay, and brigade area tours.

With such a key role to play, the emphasis on operational efficiency means emphasis of flight safety. It's a fact of life for those who operate in this challenging environment.



Fuelling-up for a dawn recce somewhere in Germany.

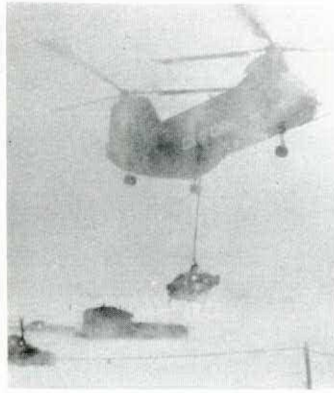
A CH112 in a typical battle setting.

**Sounds reasonable . . .**

Port main landing gear downlock was noted binding during preflight inspection. Groundcrewman removed downlock. Port main landing gear collapsed.

— Accident Report

# 450 (MT) Helicopter Sqn



CH113 creates its own blizzard on landing.

The true North strong and free!

The squadron's primary role is logistical transport support for Mobcom's ground forces by supplementing other transportation in moving ammunition, POL, rations and supplies forward to the troops. The squadron headquarters - and six of our CH113s - are at CFB St Hubert; a permanent detachment of 3 Voyageurs is at CFB Namao. The CH113's size, capacity and flexibility allow rapid switching to its secondary roles - tactical deployment of troops and support weapons, casualty evacuation, search and rescue, and recovery of downed aircraft.

The squadron is normally in the field - winter and summer - with the unit it is supporting. These roles require the aircrew and groundcrew to be alert and imaginative in overcoming environmental and climatic hazards. All maintenance is performed outdoors and the aircraft are at the mercy of the weather. During freezing rain, for example, frequent run-ups are required to prevent accumulation of water and ice in the rotor blade pockets. Lacking the equipment available at fixed bases, makes removal of ice with hand equipment a tiring chore.

When we're in the field, weather forecasting is either non-existent, too late to be of much value, or may originate from an agency having no specific information on the region. Weather info is important as all flights are VFR - there's no Nav facilities in the forward areas. Most of the flights must be low-level - 200 feet AGL - below the stiff-wings who provide the air support.

Particularly during exercises when the pressure's on and the terrain is unknown, real hazards are encountered. In Norway in 1966 for example, pilots were flying into landing sites that they knew of only from briefings. In winter, loose snow on the landing site is a hazard; since the CH113 is not fitted with skis there is always the danger of the wheels sinking in the snow and catching on rocks or other obstacles.

In early 1967 the Namao detachment, while on maneuvers with other Canadian and US forces in Alaska, frequently were confronted with fog hazards. Germany had its own special problems; smog and fog were commonplace in the Ruhr valley. With a 1:50,000 map, pilots read the contour lines for hilltops and navigated above the fog-filled valleys. Beautification laws result in German hydro poles often being placed near woods and painted green; this, in 200 and 1 significantly increases the pucker factor!

Through it all, the squadron has carried out many varied operations without a fatality or injury to the troops.

# Milestone flight for two men

By a happy coincidence (?) Capt P. Cunningham's last trip in 4-1/2 years at 4 Wing was terminated by Sgt J.J. Parades' 20,000 PAR (GCA) run at 4 Wing. Capt Cunningham has attained over 1000 hours in the CF104. A commendable record for both men.



# On the Dials

In our travels we are often faced with "Hey you're a UICP, 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. In answering these questions any can of worms opened up in the process can be sorted out for everyone's edification. 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 communications to Commander, Canadian Forces Base Winnipeg, Westwin, Manitoba, Attention: UICP School.

## How High Am I ?

How often do you fly with your altimeter in error? Would you believe - almost always? Unless you're flying in a standard atmosphere (ICAO), which rarely occurs, then rest assured that the information which your altimeter is providing is just a well-calibrated lie. Let's look at a few examples:

Example I

You are flying from Kimberly to Calgary at 13,000 feet, the MEA for Blue 3. It's winter, and the outside air temperature is -30°C. Assume a local altimeter setting of 29.92 so that no conversion to pressure altitude is required. A quick check of the computer indicates a true altitude of 12,100 feet. Then remember that MEAs and MOCAs on Canadian airways provide for 1000 feet of terrain clearance, even in mountainous areas.

Example II

This time you are on a flight from Frobisher Bay to Cape Dyer. The highest obstruction along your flight path is 6000 feet, and the OAT is -40°C. As this flight is in both the standard pressure region and a designated mountainous region, you have selected flight level 80 to provide the necessary 2000 feet of terrain clearance. Now let's assume that a low pressure area prevails, with a local altimeter setting of 29.42. Consequently, an altimeter with 29.92 set on the sub-scale will overread approximately 500 feet. Add to this the error of 1170 feet (check it on the computer) caused by the cold air, and you have a total of 1670 feet. If you did fly the trip at FL 80, your true altitude would be 6330 feet, and your assumed 2000 feet of terrain clearance over the white granite would have shrunk to 330 feet.

Example III

Finally, let's look at an approach. You plan to do an ILS at Whitehorse, where the procedure turn altitude is 7700 feet and the field elevation is 2305 feet. Since the altimeter will read correctly at field elevation, there is 5400 feet in which the temperature error will occur. Assume an OAT of -30°C at 7700 feet, and you have an error of 680 feet in your 5400 feet of affected airspace. Also, you have effectively flown the entire procedure turn 680 feet below the published figure. This becomes most impressive when you realize that letdown criteria provide 1000 feet of terrain clearance for the procedure turn area, and 500 feet from the completion of the procedure turn to the facility.

All of the foregoing examples indicate that you may be flying considerably below the height as indicated on the altimeter. All of the calculations were done roughly on a computer, and several refinements were overlooked, to keep the article from becoming too complex. However, any additional considerations would not have made a significant difference in the figures.

It's interesting to note that Canadian regulations do not require the designer of a letdown to consider the possibility of altimeter errors. However, a quick check of letdowns in mountainous areas, where these particular errors are most acute, indicates that these approaches have been *padded* with some extra terrain clearance.

When flying in mountainous terrain, especially if strong surface winds are present, remember that the precipitous terrain, downdrafts, turbulence, and the Bernoulli effect over ridges and between peaks, all induce altimeter errors. These errors are all large enough to substantiate ICAO's advice on minimum holding altitude over mountainous terrain, "... over high terrain or in mountainous areas obstacle clearance up to a total of 600 meters (2000 feet) shall be provided to accommodate the possible effects of turbulence, downdrafts and other meteorological phenomena on the performance of altimeters..."

All this positively proves what our wives have been telling us for years. We simply don't know how high we really get.

### Ground FOD

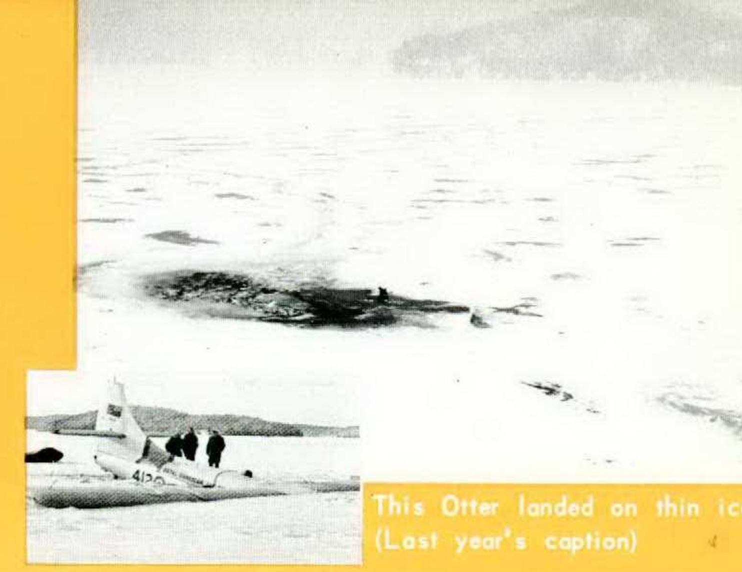
...with deteriorating and cracking runway and taxi surfaces there is an ever-increasing amount of sand, gravel, pebbles, etc, which would cause foreign object damage.

— Flight Safety Committee

Last year we published an article under this title which included photographs of what happens when the unwary fall prey to winter hazards. The message obviously didn't get across - as the accompanying photographs illustrate. The smaller inset pictures are those from last year's article; the larger ones show how we somehow managed to duplicate these accidents. The aircraft types differ in several instances but the accidents were remarkably similar. One photograph merely shows a hole in the ice, but underneath this hole lies another Otter. Can we really afford a matching set of photographs for next year's winter issue?

Whiteout over an unbroken snow-covered lake defeated this pilot.


Forty-passenger bus slid on ice-covered tarmac, striking T33.

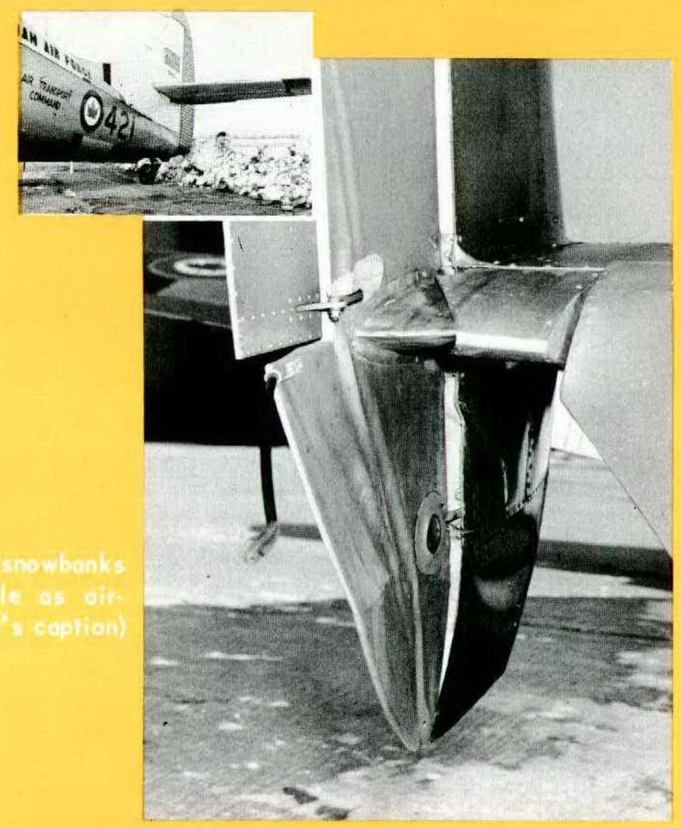


This Otter landed on thin ice. (Last year's caption)

# WINTER WOES

## *(an annual feature — No. 2 in the series)*

| INCIDENTS – ACCIDENTS | WINTER 1966/67 | WINTER 1967/68 |
|---|---|---|
| SNOW ON INFIELD | 0 - 5 | 2 - 1 |
| RESTRICTED VISIBILITY - HEAVY SNOW AND WHITEOUT | 2 - 3 | 0 - 5 |
| SNOW/ICE/SLUSH - RUNWAYS, TAXIWAYS AND RAMPS | 10 - 0 | 14 - 2 |
| ICING - AIRFRAME, ENGINE, UNDERCARRIAGE, FLIGHT CONTROLS, AND INSTRUMENTS | 22 - 0 | 20 - 0 |

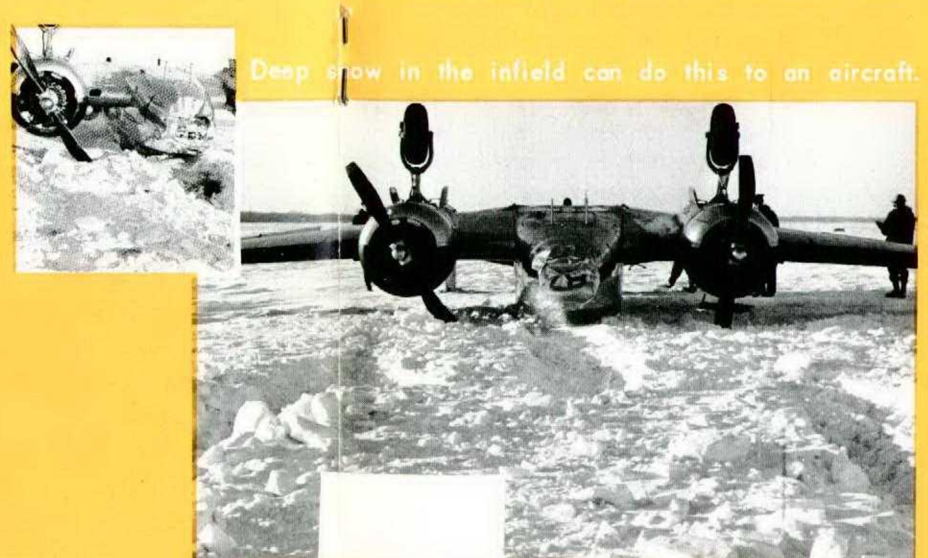


Crusty, chunky snowbanks proved as durable as aircraft. (Last year's caption)

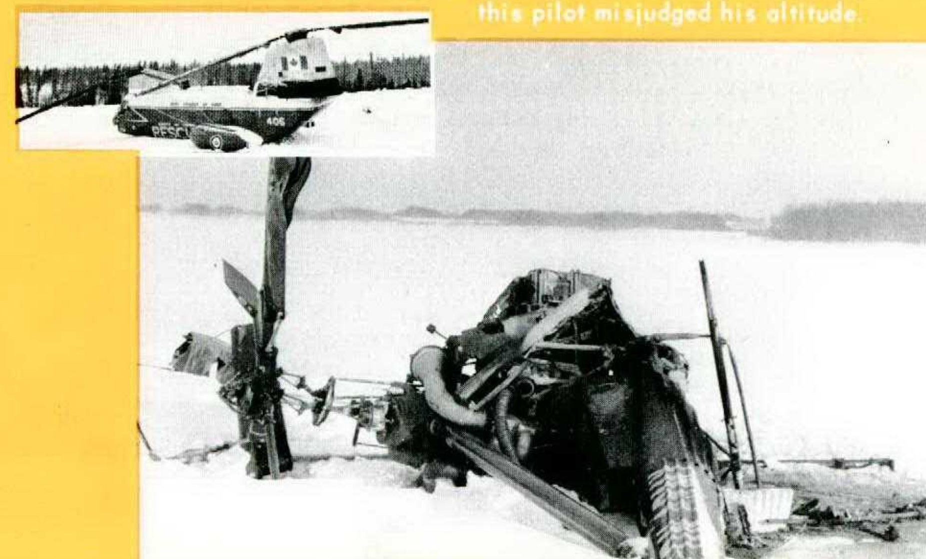
Last winter's record shows that . . .

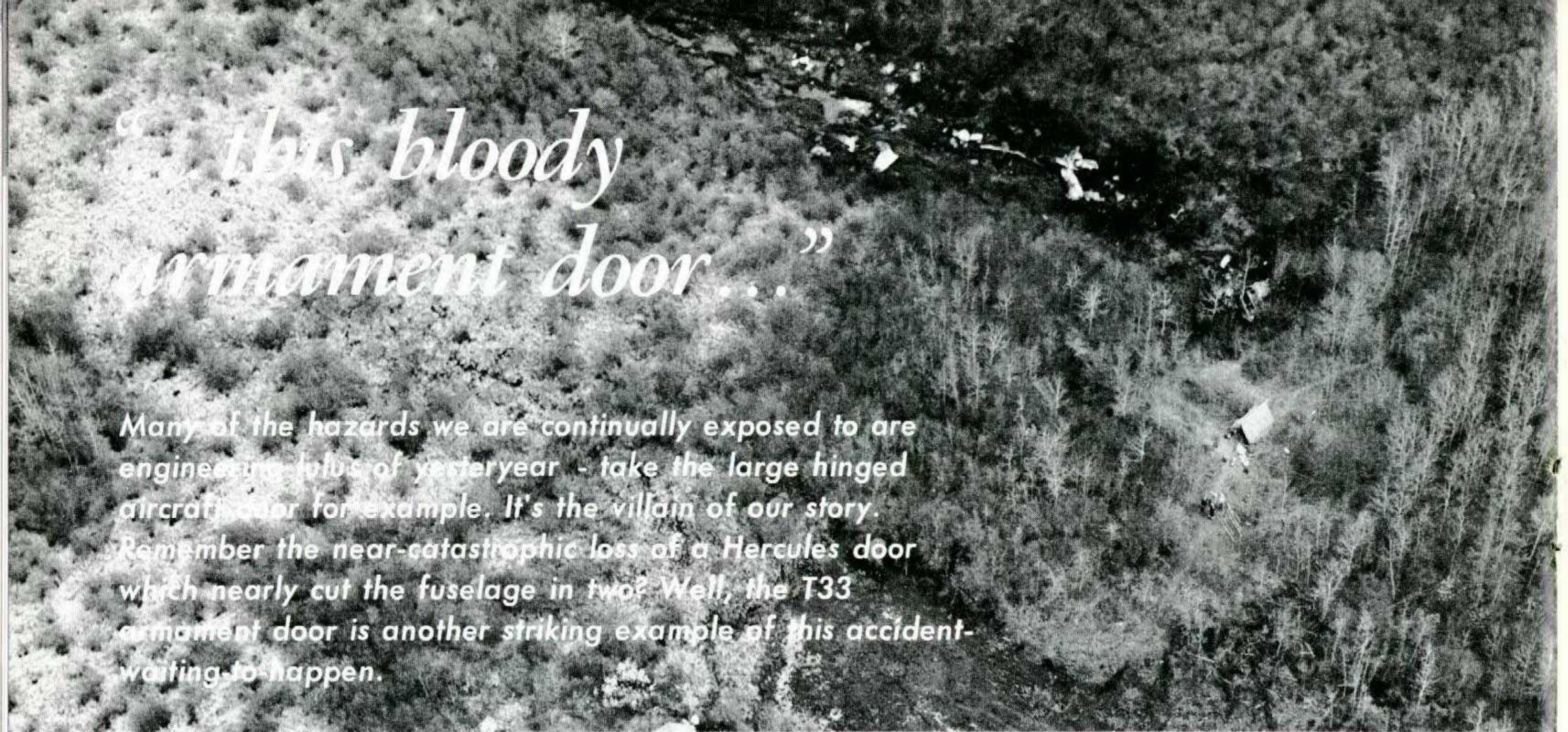
- Low flying over open, unobstructed snow-covered ice or land can be lethal.
- Helicopter autorotation practise landings over snow-covered surfaces is a loaded gun.
- Aircraft icing again accounted for more air incidents than any other winter phenomenon. Perhaps a healthy respect and continuous exposure helps aircrew cope with these situations.
- Whiteout conditions on runway approaches cause undershoots. (Vasis and other final approach aids are recommended to the threshold.)
- The snow-covered infield continues as a very real hazard; deep unpacked snow is often found bordering the runway fringe.
- Unpredictable, fickle winter weather situations were a factor in one fatal and one other major accident.
- Last winter snow and ice-covered ramps contributed to two ground accidents and three incidents in which two other aircraft were damaged to a lesser degree.

Deep snow in the infield can do this to an aircraft.



With no visual reference on flat snow-covered terrain, this pilot misjudged his altitude.





# "... this bloody armament door ..."

*Many of the hazards we are continually exposed to are engineering flubs of yesteryear - take the large hinged aircraft door for example. It's the villain of our story. Remember the near-catastrophic loss of a Hercules door which nearly cut the fuselage in two? Well, the T33 armament door is another striking example of this accident-waiting-to-happen.*

Two pilots lie dazed and burned in hospital. Lucky to be alive, they relate an incredible story to investigators. The copilot, for example, managed to walk to a nearby farm after having ejected from his stationary burning T33!

The fuse was lit earlier, on the Lakehead flight-line . . .

". . . I took my blue helmet bag out of the front section of the luggage compartment and put the red copy of the L14 back into the bag and stowed it back up in. I don't remember if I left the door propped open at that point or whether I let it close." With a full fuel load on board and a lunch at the Lakehead terminal the two pilots prepared to commence the last leg on the long-range navigation trip which had in the past day and a half taken them to the East Coast.

Why had the armament door been left open? The captain recalled, ". . . There had normally been a fair amount of shuffling of equipment and hats, the L14 and things out of the cockpit and out of people's pockets into the nose area and vice versa and I thought that my copilot may not have been finished up there". For his part, the co-pilot recalled, ". . . We always waited until everybody was out there and had all their stuff thrown in . . .".

The copilot had done the external but could not recall whether he had checked the starboard armament door for security. During the external, an interruption occurred - a friend from another base ambled over. With the copilot under the impression that the captain ". . . still had some stuff to throw in", and the conversation delaying the captain, the prime ingredient for disaster - an unlocked nose door - was casually and informally added.

The captain flew a normal takeoff and was prepared to hand over control to the copilot who was monitoring the instruments under the bag. Control was never handed over. "We still had about 1500 to 1000 feet of runway left when I realized that the right armament door had opened and decided that there wasn't enough runway to abort the takeoff." Shouting his surprise to the copilot, he quickly extended the speed brakes (recommended in the AOI) hoping to close the armament door but to no avail. "Now our airspeed was very low . . . I remember we were over the approach lights . . . and not much more than 100 feet off the ground. The aircraft would not remain airborne. The last thing I remember is the aircraft had 15-20 degrees of bank to the left and was diving toward a grove of trees . . ."

The T33 crashed into a densely willowed swamp about one-half mile off the end of the runway. Closely observing marks on trees investigators were able to fix the aircraft descent at about 15 degrees. The aircraft hit the ground in approximately a 60° left bank. First, the left wing broke off, then the right wing began to break upwards and the nose struck the ground breaking off the nose section forward of the cockpit. The aircraft then bounced slightly and carried another 35 feet, coming to rest after having traversed about 300 feet along the ground.

What remained of the fuselage with the two pilots on board was on fire ". . . The flames were all over the place and a lot of heat - just nothing but flames . . . all I could see was flames and feel the heat". The copilot recalls that ". . . I came to the conclusion that I was still alive and I knew that there was no way I was going to get out of there with these flames all around. I pulled the handles as a last ditch effort . . . I can remember the canopy going very nicely, just as per the book. I can remember squeezing the trigger and I think I was blacked out on the way up in the seat. At the top of the trajectory I opened my eyes and I could see myself above the tree-line considerably, I was surprised I was so high. I was floating through the air . . . up above the trees and could see for miles." The copilot continued sardonically that "It didn't take long to get back on the ground . . .". Miraculously, he was able to stumble to safety. This escape is without precedent; the spongy ground had cushioned the splash-down.

*(DFS comment. While not taking issue with this pilot's actions under the circumstances, we cannot overstress that the equipment must be recognized as not capable of zero-altitude ejection - at any speed. That the pilot lived through this experience in no way reflects equipment capability; it was, as the story relates - a miracle.)*

Meanwhile, with great good fortune, the captain was being assisted from the burning wreckage by two civilians who had sped to the scene of the crash by car and on foot.

Both pilots were soon in hospital for treatment of lacerations and burns - paying an inordinately high penalty for an oversight.

Few persons who know the T33 could deny that this was just one of those sooner-or-later accidents. With this awesome certainty facing the Canadian Forces it is disappointing that in 15 years of operating the T-bird no one with sufficient authority to accomplish a fix has done so. And this is hardly surprising because in recent years no real pressure has been exerted; in fact, the last Board relating to the opening of an armament door made no mention of the desirability for fixing this menace.

Since 1954 no fewer than eight armament doors opened in flight; of these, two involved fatalities. The latest Board noted "The significant feature of all these accidents is that the latching mechanism was implicated. The fact that some of the pilots involved were careless and did not ensure that the doors were secure proves that we must recognize 'to err is human'. Pilots do make mistakes despite the existence of comprehensive training programs and tremendous emphasis on doing a proper pre-flight external. The mere disruption to a normal behavior of pattern can cause disastrous results."

The Board continued, "Changing the hinge point to the front would rectify the root cause of the problem. The ramifications of pilot neglect would be minimized and the records would not show the tremendous loss in manpower/machine resources directly attributed to this basic design error."

A senior officer commented, "It is remarkable that these officers survived the crash without serious injury. It is even more remarkable that we have permitted this armament door situation to stay with us so long, especially in the light of evidence of previous accidents." That sums it up nicely; we seem to have made little progress from the Board findings in the first fatality in 1954: the recommendation was to beef up the hinges and get better clamps!

Flight safety is achieved by fixing faults and flaws. We lost an aircraft and nearly lost two young pilots, and let's face it - as long as that door is there, we're set up for more of the same.

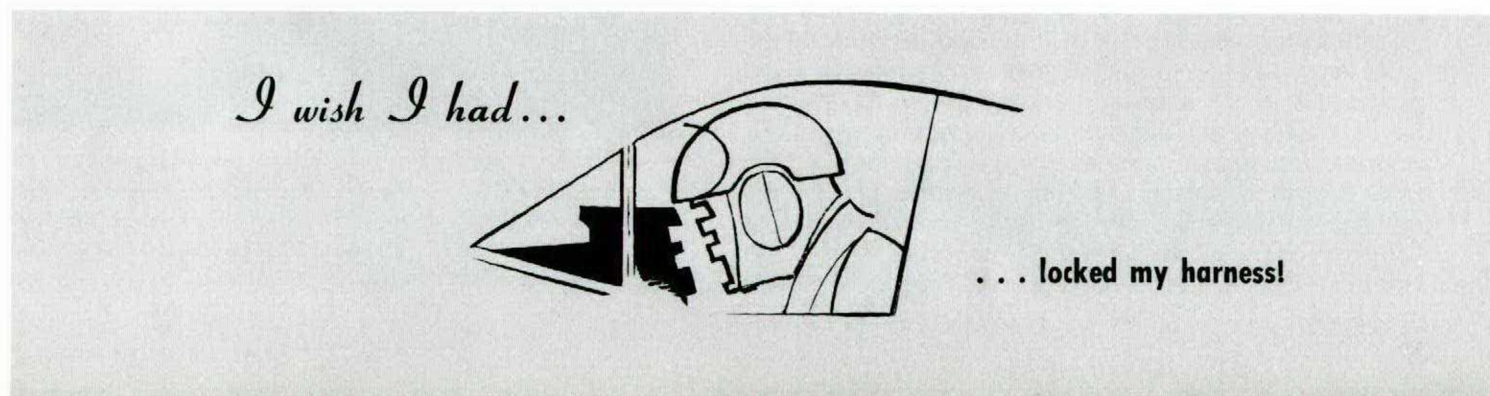
This occurrence has spurred action in several areas:

A short-term solution is an amended AOI requiring the door to be either fully closed or fully opened - precluding the possibility that this lock in its flush position may not be latched. Also, more detail will be included in abort instructions and procedures associated with doors opening after takeoff. (Had the pilot jettisoned the tiptanks he would have enhanced his chances of remaining airborne and retaining control of the aircraft. In this regard, the door opening is undoubtedly a function of the aircraft's angle of attack - a high angle of attack will result in the door opening to maximum position.)

The Board's recommendation to hinge the door on the forward portion has tempting possibilities but would require an expensive major rebuild of the nose structure.

Underway is an investigation to determine which of these are feasible:

- An aerodynamic tab to exert an inward push derived from the airflow. Unfortunately, the necessary wind tunnel trials cannot be done within the next 12-18 months; it is probable that this prevents an incorporation of this feature.
- Spring loading the door so that when unlatched it will move to a conspicuous fully-opened position.
- An additional locking device in the form of a wrap-around steel strap visible from the cockpit. This strap would spring upwards on the same principle as the spring-loaded door. The strap could not be tightened into position unless the armament doors were locked and flush.
- A microswitch activated warning light in the pilot's cockpit.



# Aircraft corrosion - *Tracker style*

**The Tracker, which entered fleet service in 1958 began to show evidence of corrosion in 1964, particularly in the lap joints where crevice corrosion became prevalent and also in some areas of the empennage where surface corrosion was found. Also, signs of corrosion at the spot-welded areas along the spar caps began to appear. This corrosion – initially just the surface type – led to inter-granular and finally exfoliation of the skin . . .**

**Major G. Vanier**

Earlier, the navy had attempted to arrest the problem by removing surface corrosion, neutralizing the area and locally touching up with paint. But by 1967 contractors reported that severe corrosion would necessitate extensive re-skinning. These reports, reaching MATCOM in mid 67, prompted immediate studies to determine corrective methods.

To better understand the nature of corrosion, one needs to know the types of corrosion and also the parts of the aircraft where corrosion has been most severe. The more common types of corrosion are galvanic, crevice, inter-granular, corrosion fatigue, stress corrosion, cracking, erosion, surface and fretting. However, we are concerned here only with galvanic, crevice, surface and inter-granular corrosion.

*Corrosion is the deterioration of a metal by chemical or electro-chemical reaction with its environment.*

Galvanic corrosion

Most corrosion is galvanic and occurs wherever two similar metals or two metallic areas of different activity are electrically coupled when brought into direct contact by salt, exhaust gas residues, etc. This forms a true chemical cell causing electrons to flow with the result that the more active member corrodes.

Crevice corrosion

Crevices are likely places for galvanic cells to develop. These may be formed with the same metal or with another metal – particularly in lap joints. A less-than-firm joint or lack of sealant between sections on the external surface results in corrosion build-up.

Inter-granular corrosion

This type of attack is a selective corrosion of the grain boundaries, and is believed to result from a potential between the boundaries and the grains of the metal. Welding and improper heat treatment may also be a cause. Insidious, it can develop with no visible tell-tale marks. Structural weakening occurs before the corrosion reaches the surface and reveals itself. The corrosion may ultimately cause separation of the laminations in a component or structure.

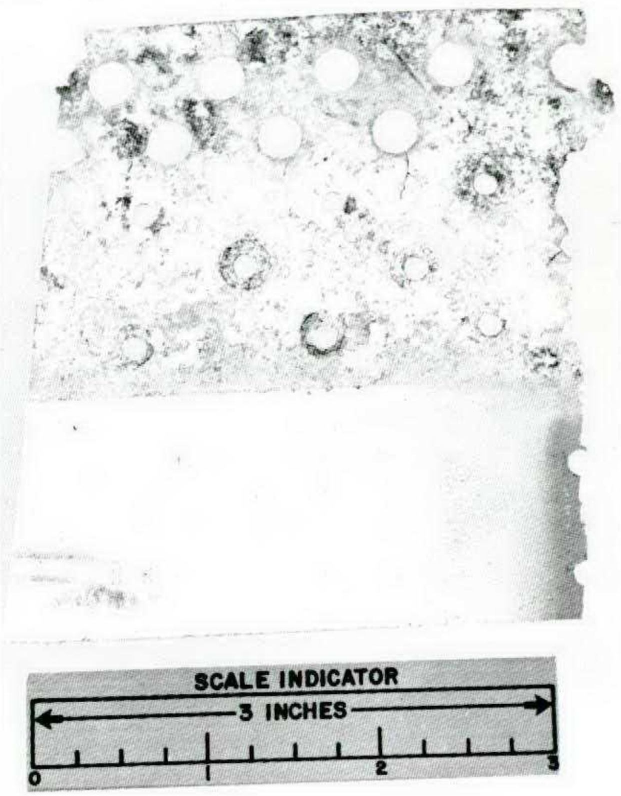



Figure 1

Figure 2

Surface corrosion

This is simply a chemical reaction and is really a form of galvanic corrosion.

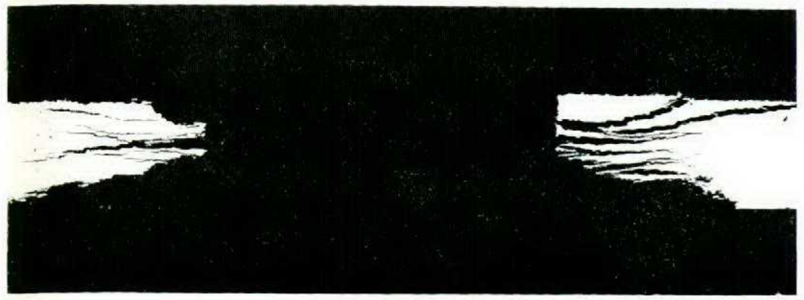


Figure 3

The most severe corrosion was in the spot-welded areas on the wings and at station 290/fuselage in the area where the aft section joins the main fuselage. Ironically, the spot welds in the wings were to facilitate assembly in the jigs. What was merely a convenience for assembling had never contributed to the aircraft structural integrity – it is the rivetting of the skin to the spars, stringers and ribs, which produces the structural strength.

As mentioned, by late 1967 sufficient evidence had accumulated at MATCOM to indicate that a substantial re-skinning program might be required. Such a program would have been very expensive – to say nothing of the extensive amount of aircraft down-time for repair. No previous serious engineering analysis had been done, so a MATCOM team visited the USN facilities at Pensacola to discuss their experience.

Some of the severely corroded areas on the wings were re-skinned and the corroded skins tested. Figure 1 shows a severe case of surface corrosion which has in some areas deteriorated into sub-surface inter-granular corrosion. Figure 2 is a cross-section of surface corrosion; as long as the alloy within the clad is untouched the structural integrity of the skin is maintained. Figure 3 is a cross-section of a rivet hole showing how inter-granular corrosion causes breakdown of metal. It is imperative to detect this kind of corrosion as the structural integrity of the metal is destroyed.

A series of tensile tests on surface corroded skins confirmed that there had been no loss of strength. The elongation as a result of these tests was also within specifications. Intensive salt-spray exposure in the laboratory provided accelerated corrosion data.

The only apparent corrosion occurred over the spot-welded areas on the wings and in the area immediately aft of the exhaust. As these spot welds are not essential to the aircraft structure, the fix for corrosion over the spar caps is to drill out the corroded areas and pop in a rivet. In inter-granular corrosion the area is drilled out and new metal applied. The USN have been using this fix for years with good results.

The other type of corrosion which must be continually combatted is surface corrosion. Recently contractors have been expending many manhours clearing away severe corrosion before applying polyurethane paint – a project underway for the whole fleet of Trackers. Another type – crevice corrosion – initially requires considerable maintenance; here again, a simple fix of cleaning out the crevices and applying sealant arrests the problem.

Corrosion on the Tracker is a major maintenance headache. The inter-granular corrosion above the spot-welding stems from the hostile maritime environment – the chloride in salt-water spray produces severe galvanic salt conditions. The situation could become very serious – indeed, the integrity of the aircraft structure could be jeopardized – if corrosion prevention were to be ignored. Concurrent with the corrosion removal and paint program, an ultrasonic detection method is being developed; this non-destructive testing will continue till aircraft phaseout.

Tracker crews can be assured that there has been no evidence of corrosion serious enough to degrade the aircraft structure. Corrosion in the Tracker is being effectively combatted by the present maintenance program. After the Tracker fleet have been painted – in approximately two years – corrosion prevention will require little more than periodic ultrasonic monitoring and unit maintenance.

## The gravity of the situation . . .

Quote from recent accident analysis: *"The failure to take off is not surprising... Pilots should be aware of the predictably constant nature of gravitational attraction."*

## "Wheelbarrowing"

Ground contact on landing in a nose-down attitude results in excessive loads on the nosewheel of tricycle undercarriage aircraft and is called "wheelbarrowing". Rolling down the runway on your nosewheel with the mains either lightly-loaded or airborne can cause dangerous directional control difficulties. This is particularly noticeable in a crosswind when the aircraft may swing quickly a-la-Harvard. During this maneuver the unloaded main wheels provide little or no braking.

The FAA reports that a number of wheelbarrowing accidents, particularly during crosswind landings, resulted from pilots flying with excess approach speeds at full flap. In this configuration the aircraft rotates little and the pilot may aggravate the situation by applying forward pressure on the control wheel to hold the aircraft on the ground.

# TIRED? *or* Sick and Tired?

**Surgeon Cdr E. R. Keirstead**

*How often have you heard a buddy say "I'm so tired I can hardly move" or "I'm sick and tired of this outfit."?*

These two friends of yours may both be experiencing fatigue - strictly physical in the first instance and mostly mental in the other. Fatigue means different things to different people and many definitions of the word have been brought forward. Although fatigue cannot be accurately defined or measured, it is a constant threat and often a critical problem in flight operations, especially in the flight safety aspect. A suitable definition might be: "Fatigue is the detrimental alteration or decrease in skilled performance related to duration or repetitive use of that skill, aggravated by physical, physiological and mental stress."

Fatigue is universal and - as the definition states - can be physical and/or mental. Physical fatigue is easily overcome by adequate rest and sleep. But mental fatigue can be of the acute variety or have a more insidious onset and become a chronic, accumulative type before the victim realizes what is happening. Although one speaks of acute and chronic, or physical and mental fatigue, rarely does one type exist without the other.

## Causes of fatigue

Fatigue causes are many and varied; most of these are known and obvious to aircrew but on the other hand, many factors are overlooked. Some of the obvious causes stem from the stress of flight itself:

- Frequent or prolonged missions which may include several takeoffs and landings, flying in dense air traffic, cramped positions in the aircraft.
- Glare, extremes of heat or cold, noise, vibration, acceleration forces, fumes, hypoxia, etc.

But other causes are less apparent:

- Poor living habits, such as inadequate rest or sleep, insufficient or the 'wrong' type of exercise, excessive use of alcohol or tobacco, overeating, indiscriminate use of drugs.
- Boredom, concentration, apprehension, anxiety, fear, responsibility, attention, personal problems at home or at work, frustration, uncertainty of future career, etc.

At this point, let's look at the factors present in the naval environment - especially on board an aircraft carrier. The first important point to remember is that the squadron is often away from home and family for long periods of time; therefore, if problems were present before the ship sailed, there is little or no way of solving them. This leads to more anxiety. Of course, this factor affects aircrew, maintenance and flight deck personnel alike, and can lead to costly mistakes. Others leave home in a happy frame of mind only to be confronted with a 'Dear John' letter or other distressing news. A great deal can be done for these people by a conscientious and sympathetic flight surgeon.

Prolonged periods of rough seas (with or without motion sickness), hot and crowded living conditions which lead to inability to sleep properly, 'Sustops' or around-the-clock flying (a great deal of which is at night), add to the possibility of becoming fatigued. Low-level flight over water which is extremely cold or shark-infested tends to make some aircrew apprehensive and anxious. Aircrew must be relaxed yet very alert for a night deck-landing after four hours airborne, as must be the men on the flight deck who direct and park aircraft in very confined spaces in the dark. Needless to say, with so many factors against them, all personnel involved in flying operations must be in perfect physical and mental condition. Fortunately, the very close contact with the ship's personnel makes the flight surgeon's task easier - if he takes advantage of the situation.

## Results of fatigue

Fatigue can lead to dangerous practices:

- violation of flight discipline,
- failing to follow checklists and clearance procedures,
- obvious warnings of obvious hazards being ignored,
- taking unnecessary chances to get home and end the flight,
- a general relaxing of all learned and usually well-practised disciplines and rules of flight.

The lack of concentration and increased reaction time, as a result of fatigue, can lead to disastrous results.

## What to do about it!

- *Adequate rest and sleep will overcome physical fatigue.*
- *Motivation can overcome most forms of acute fatigue and delay chronic fatigue.*
- *Learning (training) is beneficial - trained personnel require less concentration on the less important details.*
- *Mental adaptation to continuous unfavourable stimuli will overcome a tremendous amount of fatigue.*

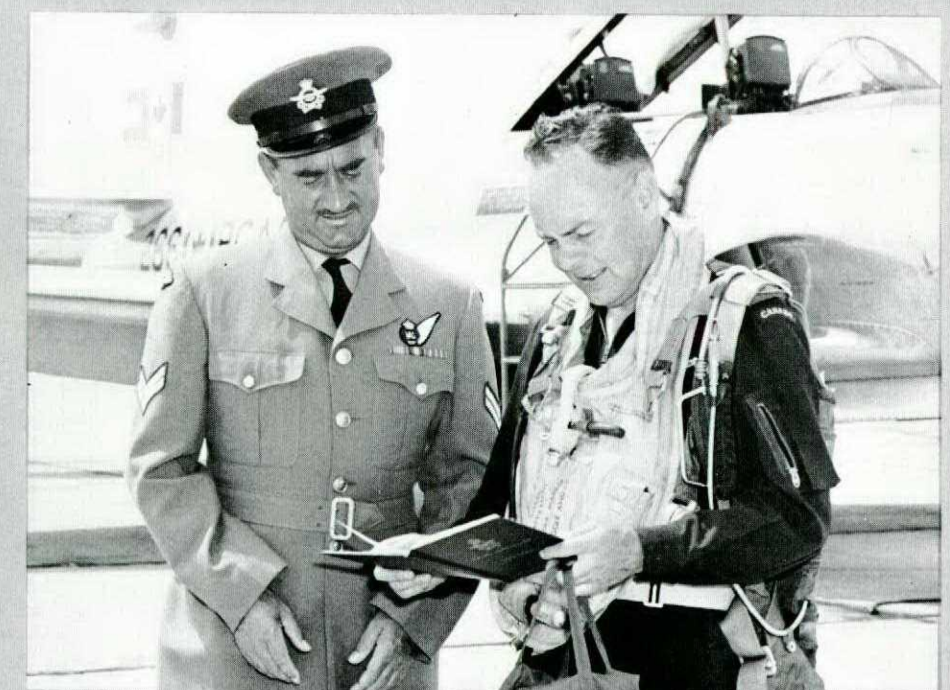
In summary, the Ten Commandments of Fatigue (from Flight Safety Foundation) are excellent food for thought and worthy principles to follow:

- It is healthy to be active and to get pleasantly tired.
- Remember that nature needs time for good repair work. You may forget about rest or sleep but nature cannot.
- Prevent fatigue by periodic health examinations. You must be healthy to be happy.
- Fatigue is the most common symptom of all disease. If fatigue persists, seek medical care and prevent further wear-and-tear.
- Choose your work according to your physical and mental powers and not according to your dreams.
- Be prepared. Cultivate a philosophy of acceptance for any crisis or failure.
- Be very careful of the physical and social environment in which you work.
- Take time to live. Don't just exist. Eat properly. Rest properly. Faulty diet can cause both physical and mental fatigue.
- Life is short. Don't make it shorter by unnecessary fatigue.
- Play and work and meditate with wonder and enthusiasm.

# 20,000th run - with ADC Commander

Cpl C.A.K. Richardson's 20,000th PAR (GCA) run was flown by Maj Gen M.E. Pollard, ADC Commander - shown here with Cpl Richardson after the flight. Cpl Richardson, who was a wireless operator/air gunner in the RAF during the war, enlisted in the RCAF in 1955. A member of North Bay's Base Flying Club, he recently obtained his pilot's license.

Cpl Richardson is the fourth member of Air Defence Command to complete 20,000 PAR runs - a noteworthy achievement.



# Sand menace

The BFSO presented samples of sand that had been spread on the ramps that morning. Stones of 1-1/2" in diameter were common. He stated that the several complaints he had received from various sections indicated an interest and effort in the FOD program... One supplier had been fired the previous day for providing sand not up to specifications.

- Flight Safety Committee

# CFP 135 *major changes in assessing accidents/incidents*

**"What you don't know won't hurt you" is the least appropriate remark for flight safety. What we don't know - does hurt...**

*The things we have been able to accomplish in advancing flight safety over the years - and will continue to accomplish in the future - depend in large part on getting the facts. And since flight safety improvements usually involve change - either to methods or equipment - the inevitable resistance to change, melts best under the scorching heat of convincing supporting data!*

*Our fact-finding derives from two sources:*

- *reports from the field*
- *statistical analysis of reports from the field.*

*Little wonder then, we're anxious to promote two sources of information mentioned above - and that's what the substantial revisions to CFP135 are all about.*

*Of particular interest is a major change in assessing personnel-caused occurrences. A "new man" has arrived on the scene - the manager. We have found that the trail leading backwards from that smoking hole in the ground could end in someone's office.*

*Almost everyone will be pleased to note the substantial de-emphasis on the negative aspects of personnel assessments; from this we hope to get more meaningful statistics on which to base preventive measures.*

*Gone is the old Special Occurrence; it is now an incident. We cannot emphasize too much the important provision of article 102.6c and 8d. Deleting the Special Occurrence (no damage) will mean increasing our reliance on the integrity of those reporting incidents.*

*We invite your comments on this publication.*

## CHAPTER 1 DEFINITIONS

### 101. APPLICATION

The terminology and categories defined in this chapter apply to all Canadian Forces aircraft and designated foreign aircraft. In the application of CFP135, these definitions supersede any other meaning or connotation they may otherwise have. The aim of flight safety being the preservation of resources, categories of occurrences and damage reflect degrees of loss or temporary loss of these resources.

### 102. DEFINITIONS – GENERAL

1. Aircraft. A manned aerospace vehicle including all integral and attached systems, equipment and armament.
2. Powerplant. An assembly which includes the engine, propeller, engine-driven components and related systems.
3. Major Components. These are:
   a. fuselage, hull, tail booms, and major sections thereof (exclusive of doors, hatches, windows, astrodomes, and aerodynamic braking devices);
   b. wing (exclusive of wingtips, flaps, spoilers, flaperons, ailerons, and elevons);
   c. wing centre section (excluding flaps);
   d. vertical stabilizer (excluding rudder);
   e. horizontal stabilizer (excluding elevator);
   f. landing gear (excluding wheels, brakes, tires, gear doors, and actuating rods);
   g. helicopter main rotor head;
   h. helicopter main rotor blades; and
   j. helicopter main transmission
4. Damage. Damage to an aircraft is defined by category:
   a. A Category. The aircraft is destroyed, missing, or damaged beyond economical repair.
   b. B Category. The aircraft must be shipped to a contractor or depot-level facility for repair.
   c. C Category. Damage to major component(s) requiring either replacement, or repair in situ with assistance from a contractor or depot-level facility, or fly-in to a depot-level facility.
   d. D Category. The aircraft can be made serviceable within base-level facilities. Powerplant(s) damage (not malfunctions), shall be classified in this category.
   e. E Category. Occurrences which are reportable under the terms of this publication but where the aircraft (including powerplant) is undamaged. Powerplant malfunction, or precautionary shut-down will be classified in this category.
5. Air Accident. An event involving an aircraft that occurs between the time a powerplant is started with intent for flight, and the time the powerplant(s) and rotors are stopped. An air accident occurs when:
   a. a person receives a fatal, very serious, or serious injury;
   b. the aircraft has A, B, or C Category damage;
   c. a person or an aircraft is reported missing.
6. Air Incident. An event involving an aircraft that occurs between the time a powerplant is started with intent for flight and the time the powerplant(s) and rotors are stopped. An air incident occurs when:
   a. a person receives minor injury, or there is a risk of injury;
   b. the aircraft has D Category damage;
   c. the aircraft has E Category damage. This includes loss of cargo or other removable equipment, precautionary shut-down, a lightning strike, or any occurrence having accident potential;
   d. there is damage to civilian or military property;
   e. there is a failure of life-support equipment, or when an aircrew member experiences an aeromedical problem;
   f. there is a Near Miss (risk of collision).
7. Aircraft Ground Accident. An event involving an aircraft when there is no intent for flight; or when there is intent for flight but no powerplant has been started, or after the powerplant(s) and rotors are stopped. An aircraft ground accident occurs when:
   a. a person receives a fatal, very serious, or serious injury;
   b. the aircraft has A, B, or C Category damage.
8. Aircraft Ground Incident. An event involving an aircraft when there is no intent for flight; or when there is intent for flight but no powerplant has been started, or after the powerplant(s) and rotors are stopped. An aircraft ground incident occurs when:
   a. a person receives minor injury, or there is a risk of injury;
   b. the aircraft has D Category damage;
   c. there is damage to civilian or military property;
   d. there is an E Category occurrence having accident potential.
9. Supplementary Report. An SR is the follow-up report to an air incident or aircraft ground incident message, and contains information not available at the time the original report was sent.
10. Additional Reports. These are reports required in addition to accident or incident reports:
    a. form CF218, Birdstrike and Bird Sighting Report
    b. Barrier Engagement Report
    c. Report of Emergency Escape from Aircraft
    d. Report of Emergency Landing on Water
    e. Flight Safety UCR (EO 00-10-1, Part 5)
11. Safety Comment. Form CF212, Safety Comment, is primarily intended to provide an opportunity for semi-official and anonymous reports relating to flight safety.
12. Significant Event. An aircraft event involving either prominent persons, or circumstances liable to create public interest.
13. Agencies Responsible. Unless unusual circumstances exist (when an interpretation will be given by DFS), these definitions apply:
    a. Command of Occurrence. The command or formation headquarters of the base at, or nearest to, the occurrence.
    b. Command of Ownership. The command or formation headquarters which controls the parent unit of the aircraft.
    c. Parent Unit. A parent unit has functional control of an aircraft. When an aircraft is being ferried, the parent unit is that unit responsible for the ferrying.
14. Injury Classification. See CFAO 24-1 for casualty reporting and administration, which is in addition to normal air accident reports. These classifications shall be used to describe the medical condition of personnel involved in aircraft accidents or incidents:
    a. Killed - red
    b. Injured - blue. The degree of injury shall be designated.
    c. Uninjured - white
    d. Missing.

### 103. DEFINITIONS – ASSESSMENT

1. Stage of Operation.
   a. Powerplant(s) stopped.
   b. Powerplant running. A powerplant is running, and the aircraft is stationary or unintentionally in motion.
   c. Taxiing. The aircraft is moving under its own power on the ground or water, or coasting with powerplant(s) stopped.
   d. Takeoff. Power is applied for takeoff until 500 feet or operating height, whichever is lower. For a deliberate touch-and-go landing, the takeoff stage starts when power is re-applied.
   e. In-flight. Between the takeoff stage and landing stage.
   f. Landing. From the final turn to the approach until the direction of the landing roll is changed to taxi, or power is re-applied for takeoff in a touch-and-go landing.
   g. Go-around. A discontinued landing, whether or not the aircraft touches the ground, when power is increased until the first power reduction. This excludes the deliberate touch-and-go landing.
2. Type of Occurrence. This classification indicates the immediate circumstances under which the event took place and should not be confused with cause factors nor with stage of operation. More than one type of occurrence may be applicable.
   a – ar (categories not included here).

### 104. DEFINITIONS – CAUSE FACTORS

1. Personnel. (See also para 2 below.)
   a. Management. Any function relating to the formulation of plans, the apportionment of resources, the creation and writing of orders and instructions, is management. This factor should be classified as to level, ie, unit, base, CHQ, CFHQ.
   b. Supervision. Those persons directly involved in ensuring that orders and instructions are properly complied with, are supervisors. This activity is normally confined to on-the-job monitoring and direction. Supervision also encompasses such activities as work scheduling, handling of personnel problems, counselling, etc. This factor should be classified as to level, ie, unit, base, CHQ, CFHQ.
   c. Pilot.
   d. Maintenance - Canadian Forces. Maintenance by Canadian Forces maintenance or servicing crews.
   e. Maintenance - Civilian or Other Servicing Crew. Maintenance by other than Canadian Forces personnel.
   f. Maintenance - Unidentified Organization. Maintenance by an unidentifiable organization.
   g. Other Personnel. Persons other than pilot or maintenance personnel; eg, flight crew, air traffic control, meteorological services, construction engineering, supply, medical or administrative services.
   h. Unknown Persons. Both the organization and persons are unknown.
2. Personnel - Sub-Sub-Factors. The personnel factors listed above require amplifying; for this, there are three basic categories: factors contributed by management and supervision, factors contributed by the individual, and others:
   a. Management and Supervision
      (1) Resources. Adequate manpower and equipment with which to properly accomplish the task, were not provided by management or the supervisor.
      (2) Information. Knowledge, skill level or experience which were not provided or ensured by management or the supervisor. Written and verbal guidance which was omitted or was incorrect or vague.
      (3) Physical Environment. Inadequacies in the human engineering of the cockpit, hangar, etc. This will include general items such as lighting, noise, job interruption, etc.
      (4) Psychological Environment. Inadequacies in the sociological environment (motivation, family, finances, etc) which are attributable to the conditions of Canadian Forces employment.
   b. Individual (Pilot, technician, other personnel)
      (1) Judgement. An error deriving from an incorrect decision or a lack of decision.
      (2) Technique. Operation or workmanship below that expected of a person with equal training and experience.
      (3) Inattention. Inadvertently did not exercise due care or fulfil responsibilities.
      (4) Carelessness. Did not exercise due care or fulfil responsibilities.
      (5) Non-compliance with orders. An omission or commission contrary to published or oral orders. However, an attempt must be made to determine the reason of the act, eg, an order commonly disregarded, or when an individual could not comply under the circumstances.
      (6) Human Factors. Recognized physiological and psychological aeromedical factors, eg, disorientation, vertigo, anoxia, emotion, etc.
   c. Other. This will include unforeseen physiological problems such as heart attacks, incapacitation, and other aeromedical problems not associated with equipment or other personnel factors.
3. Materiel
   a. Aircraft Components. Aircraft equipment failure or malfunction resulting from design, construction, or undetectable progressive breakdown (excluding personnel errors in operation, maintenance, and inspection.)
   b. Related Facilities. Failure or malfunction of equipment not part of the aircraft but related to the operation of aircraft; eg, ground vehicles, equipment employed in the vicinity of aircraft, air navigation facilities.
4. Environment
   a. Weather. Phenomena such as cloud, hail, lightning, wind - forecast or unpredicted.
   b. Alighting Area. A land or water area assigned or selected for takeoffs and landings including runways, taxiways, parking areas and unprepared surfaces.
   c. Operational. A known hazard which has been accepted to meet the commitment.
   d. Birdstrike. Unavoidable birdstrike. (If instructions on birdstrike precautions have not been followed, the assessment factor is personnel.)

5. Unidentified FOD. A foreign object that cannot be identified or the source determined. FOD originating from known sources such as personnel, materiel failure or environment should be shown under the applicable heading.
6. Undetermined. Insufficient evidence to permit a conclusive appraisal of the cause factors. Most-probable factors should be provided, if possible.

*Annex A, Chap 1*

EXAMPLES OF CAUSE FACTOR ASSESSMENT

Personnel
- Management and Supervision
  - Personnel - Management/CFHQ - Information. Approved training syllabus was not commensurate with assigned operational role.
  - Personnel - Management/CHQ - Psychological Environment. Individual with known urgent domestic problems assigned to detached duty.
  - Personnel - Supervision/Unit - Information. Unqualified driver assigned to aircraft towing duties.
  - Personnel - Supervision/Unit - Physical Environment. Technician worked long hours, outdoors, in near-freezing temperature.
  - Personnel - Management/CHQ - Resources. Adequate manpower was not provided for task assigned by the Command.
- Individual
  - Personnel - Pilot - Judgement. Pilot elected to land off a bad approach rather than go around.
  - Personnel - Maintenance/CF - Technique. Tow tractor operator applied brakes too abruptly causing the tow bar shear pin to fail.
  - Personnel - Pilot - Inattention. Pilot inadvertently selected undercarriage lever instead of flaps at high speed.
  - Personnel - Maintenance/CF - Carelessness. Technician left wrench in intake.
  - Personnel - Maintenance/CF - Non-Compliance with Orders. Technician failed to consult Engineering Orders when replacing elevator trim tab.
  - Personnel - Pilot - Human Factors. Pilot became disoriented and suffered vertigo during an instrument approach and subsequently abandoned the aircraft.

Materiel
- Materiel - Aircraft Component. Powerplant fuel pump failure.
- Materiel - Related Facility. Fuel tender brake line failed.

Environment
- Environment - Weather. Lightning strike.
- Environment - Alighting Area. FOD, when stones cut tires.
- Environment - Operational. Aircraft scrambled in below limit weather conditions.

Unidentified FOD
- Unidentified FOD. Small metal object.

A Multiple Assessment
- Materiel - Aircraft Component. Tacan antenna design.
- Personnel - Management/CFHQ - Resources. Excessive delay in approving modification to Tacan antenna.
- Personnel - Maintenance/CF - Non-Compliance with Orders. Technician failed to carry out between flight Special Inspection.
- Personnel - Supervision/Unit - Information. Pilot was not briefed on Tacan limitation.
- Environment - Weather. Unpredicted shift in the direction of the frontal movement.
- Personnel - Pilot - Judgement. Pilot failed to initiate emergency lost procedure in time.

CLOSE CALL — OPERATIONAL HAZARD — SAFETY SUGGESTION

# *A Bird?*

*From time to time very strange foreign objects have found their way into fuel systems, and birds do get into odd places when the nesting urge is on them.*

When the Hercules fuel tank was opened during a recent inspection, the remains of a bird were found with feathers partially covering the screens of the fuel pumps. Work had been done on the fuel tanks some months previously, so the bird could have been in the tank since then. (The plastic bags in the photo contain some of the bird remains.)

In addition to compliance with the caution in EOs on prevention of foreign material being left in tanks, the covering of all tank openings appears a sound recommendation.



# Gen from Two-Ten

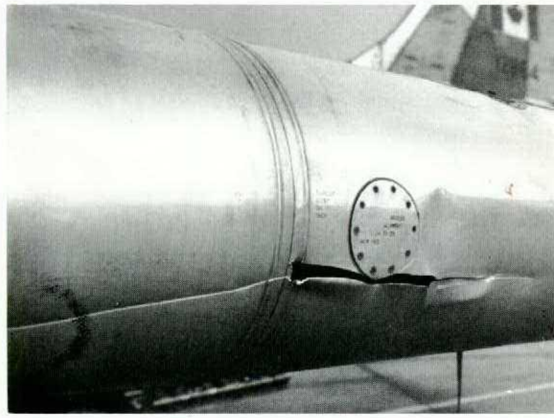
*LEARN FROM OTHERS' MISTAKES—you'll not live long enough to make them all yourself!*

CF104, FORMATION SLIDE Two pilots, confronted with a landing delay in IFR conditions decided that a formation approach on landing would expedite matters. Prior to intercepting the glidepath, the lead noted that #2 was positioned "about right". As the mains touched the runway, the lead's aircraft suddenly swung to the right and skidded sideways for 400-500 feet. Deploying the dragchute, and using nosewheel steering and differential braking, he regained control of the aircraft. Number two then volunteered that he thought his tiptank had touched lead's tiptank.

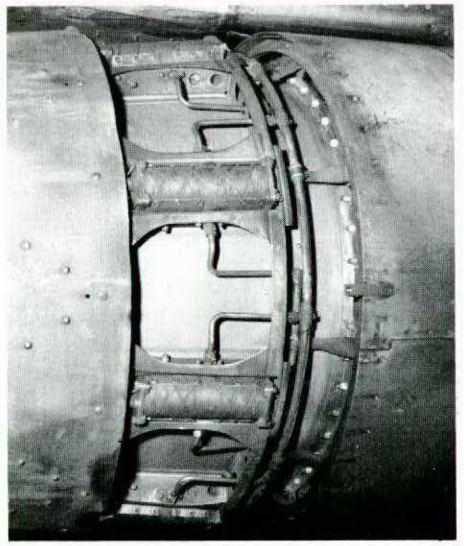
After touchdown, #2 had begun to overtake and close in on the leader; before nosewheel steering or braking was effective, the collision had occurred. He too, had swung to the right and skidded sideways about 800 feet before he regained control. Only the tiptanks were damaged!

The skid marks on the *dry* runway showed #2 to have touched down with approximately *one foot of tiptank separation*. At one point after touchdown, skid marks indicated an overlap of three feet.

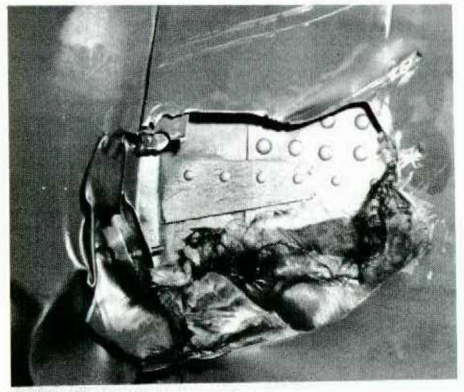
There is more to the story. Following their out-of-control sideways slide, the two pilots boldly taxied their potentially damaged aircraft back to the line!



Both aircraft were damaged.



Afterburner shroud tore loose, striking fuselage.



Hole torn in fuselage aft section.

CF101, LOST A/B SHROUD On a supersonic run, a "clunk" was heard accompanied by a slight momentary buffet as the aircraft reached 1.3 mach. There were no abnormal indications, so, thinking it to be turbulence from another aircraft the pilot completed the flight. The AI navigator mentioned later that he had heard a clunk when the buffet was encountered but hadn't told the pilot.

The afterburner shroud had torn loose, cutting a hole in the fuselage. Examination of the other shroud disclosed one screw-head sheared, one screw missing and the three remaining screws loose. The loosening and shearing of screws in the afterburner shrouds is a known problem; it is progressive, necessitating careful inspection. That this shroud was permitted to remain in this condition indicates a tightening of inspection standards is necessary.

C130, HIT WIRES ON FINAL On the approach the darkness was continually interrupted by lightning; visibility was very poor in heavy rain and cloud. The pilot of an aircraft which had just landed passed the weather as 200 and one-half.

At minimum the approach lights were spotted and visual approach was commenced. Off centre to the right the aircraft was gently banked to return to on-course and "everything appeared normal".

Moments later it became apparent to both pilots suddenly that they were dangerously low. Power for overshoot was quickly applied; in fact, the aircraft was climbed momentarily. However, as threshold lights came up, visual references permitted a normal landing. A passenger mentioned hearing a strange noise just as the overshoot power was applied as if the aircraft had hit something - and indeed it had. Approximately 2000 feet from the threshold two sets of overhead wires had been cut causing damage to the underside of the aircraft and tearing off a radio antenna.

The investigators were at a loss to explain why the aircraft had been flown dangerously low after the captain had gone visual.

Amongst other factors, consideration was given to the possibility of optical illusions due both to refraction with the heavy rain on the windshield and to a false horizon when attempting contact flight in poor visibility with no horizon. These conditions may result in the aircraft being flown much lower than it appears to the crew. Both pilots had transitioned to visual reference when only the approach lights were visible; had one pilot stayed on instruments during this stage, it is almost certain that the descent below glide-slope would have been prevented.

The serious implications of this close scrape led to a very detailed analysis of operating procedures as well as the techniques applied by captain and crew during this crucial phase of flight. Current studies on the use of a monitored approach technique should lessen the chances of a repetition.

OTTER, BROKE THROUGH ICE After selecting an area which appeared safe the pilot made a couple of touch-and-go landings on the frozen lake to check the ice thickness. No water or cracking was noted so a landing was made off the next approach. Without coming to a stop the pilot taxied back for takeoff using a figure-eight pattern. Near his touchdown point, a ski broke through the ice, then the surface collapsed. The navigator was completely dunked before reaching firm ice; the pilot was able to jump onto a large piece of floating ice and wet only one foot.

In their haste, switches were left on: battery master switch, fuel, and fuel booster pump. Fifteen minutes later, while changing into borrowed clothing ashore, an explosion was heard - it was the aircraft. It sank into 200 feet of water.

The aircraft had initially submerged till the wings lay on the ice. The crew had given no thought to escaping by the overhead hatch in the cabin; this would have enabled them to step directly from the wing to firm ice. Temporarily trapped at one of the side doors, the navigator was lucky not to have been drowned.

Ice thickness must now be physically checked before-hand; however, had reference been made to the SIPRE table on ice thickness, the pilot would have known that conditions were marginal.

CF101, WHITEOUT On completing the exercise the pilot - one of three - was directed to return singly; later, he advised tower he was VFR. That was the last word heard. He was seen on radar for another few minutes till he was within 10 miles of base. Weather conditions although good (35⦶V⦶90⊕15) were very conducive to whiteout - say, over a lake. The thin overcast caused the sun to be diffused eliminating all shadows on the ground and making height estimation deceptive.

One of the ground witnesses (two miles from the crash) said the 101 flew by slightly higher than his 40-foot barn, "...coming level and then climbed a little to clear the trees". The explosion was heard by another nearby witness who saw smoke and was first to arrive on the scene. The crew died in the crash.

The aircraft struck the surface of a large lake 17 miles from base. From the marks in the snow and other evidence, it was apparent that the aircraft hit the snow-covered surface at high speed in a 2° descent. The aircraft bounced for 400 yards, before heavily contacting the lake surface, cartwheeling and exploding.

A tragic - and quite unnecessary - loss to both families and forces.

CH112, WHITEOUT After one quick-stop landing on a frozen lake, the pilot informed his passenger he would now do a power recovery autorotation. He turned into wind and began his flare when the aircraft hit the snow-covered lake - in a descent later estimated to be over 1000 fpm! The aircraft leaned, the rotors struck the ice, and the craft wound up lying on its side. The passenger stepped forward through the smashed nose and informed the pilot that the aircraft was on fire. The pilot attempted to put out the fire with an extinguisher which ran dry after a few seconds.

The pilot attributed his misjudgement to "...loss of depth perception due to the white snow and the lack of shadow because the snow surface was rippled, plus a lack of visual references, a tree, or a shoreline". Unit instructions in helicopter winter flying point out this hazard and its prevention: select areas with sufficient visual references, such as tree lines, bare roads, fences; *avoid large snow-covered areas when light conditions may affect depth perception.*

The loss by fire was attributed to "...ineffectiveness of the extinguisher which appeared to have been previously discharged" (without breaking the witness wire). It is questionable that a fully-filled extinguisher would have sufficed anyway; this points to a larger extinguisher - located to improve the weight and balance of the CH112. It's under study.



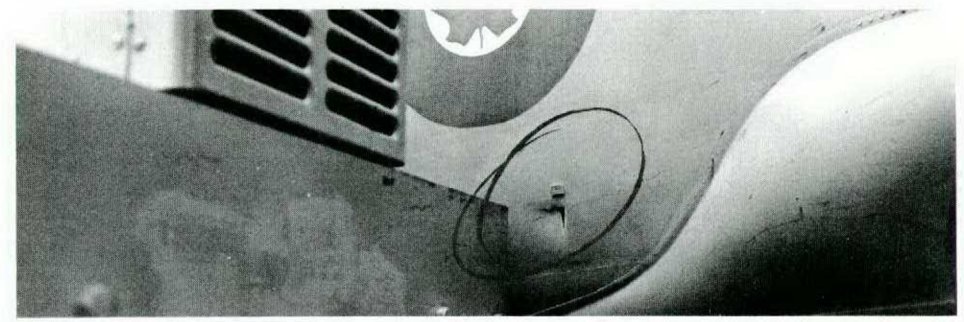
ARGUS, NOSE DOOR MURPHY On gear retraction and extension during a flight the crew heard a loud noise from the nosewheel area.

The nosewheel door actuating rod, which is disconnected after every flight, had been done up incorrectly by an experienced member of the start crew. This man was unable to explain how the forked end of the rod had somehow been installed to one side (see photo). On cycling, the pip pin – now inserted too far – caught a structural member, breaking it. Had this member not broken we might have had the first Argus nosewheel-up landing.

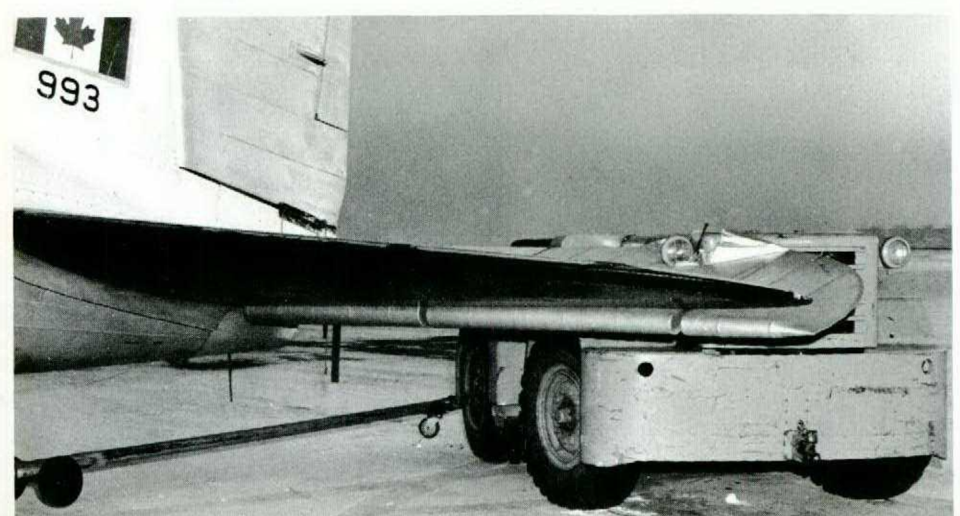
As our experience of human error expands we become increasingly convinced that the ultimate solution to this sort of mistake lies with the design engineer. Mistake-making is a built-in feature of homo sapiens – no matter how reluctantly we admit it.

TRACKER, BUMPED BY MULE The multi-place liferaft in the aircraft is installed at a height requiring a workstand. Rather than obtain such a stand during removal, a near-by towing mule was pressed into service. While positioning the mule, the corner of the front bumper punctured the side of the fuselage, although two men were present.

Squadron orders specifically prohibit a towing tractor being used for anything other than towing aircraft, and being operated so close to an aircraft. Orders protect aircraft from impacts - and technicians from the wrath of supervisors.



DAKOTA, TRACTOR SKIDDED The tractor driver's reaction to a shouted command was to attempt too tight a turn for the icy conditions. The tractor skidded, producing a jack-nife; on seeing this the NCO i/c shouted for aircraft brakes, whereupon the inexperienced tow driver instinctively applied the tractor brakes. During the skid a bare spot halted the tractor before the aircraft could be stopped, aggravating the jacknife. The port elevator struck the tractor.





Admittedly, "...a sudden shortage of more experienced personnel..." had made him the only driver available. Nevertheless, towing speeds must be at a pace to preclude ANY contingency. In this context, the tow crew was incapable of responding in time to a known hazard.

The Canadian Forces are already burdened by a high inventory of jacknives.

## Hand Signals

The CO stated that there were a few irregular hand signals from the groundcrew from time to time . . . NCOs should monitor these signals.

– Flight Safety Committee

# Comments to the editor

The letter written by MWO JW Brown of Gimli, on trouble shooting snags and engineering problems really hits the nail right on the head even though it is not mentioned outright in the letter or in the comments by the editor.

The essence of the problem is not that anyone "lies deliberately and purposefully" but that the communications between aircrew and groundcrew quite often does not measure up to the standard required of a modern professional organization. We at 4 Wing, and I am sure at many other units, have tried to overcome this age-old communications problem by having the technicians concerned debrief the aircrew immediately after shutdown of the aircraft. An excellent procedure? Certainly – but do we have a proper follow-up on the more elusive snags? The June 1968 edition of Aerospace Safety has a short article on "Togetherness" and I believe it is worth quoting in part:

"The pilot-maintenance technician relationship is unique in that the efforts of both participants have a common denominator that is so important that neither can ignore it – life itself! If either man fails to perform his assigned duties, the result could be fatal. This consideration alone should be the prime motive in performing the tasks related to each man's efforts. The relationship cannot be reduced to statistics, data runs, or verbal debates; rather, it's closer to a definition of *togetherness* cited by Mr Webster – "by combined action; jointly; in or into agreement or harmony." Unless both the pilot, who straps on the weapon, and the maintenance technician, who cures its ills, communicate and cooperate with each other, all can be lost."

Do we have the "Togetherness" required to do the job efficiently and effectively is the question that must be answered by you and I as supervisors, MWO Brown.

LCOL R.H. Annis
CO 421 ST/A Squadron
4 Wing, Baden-Soellingen

In 1966 the National Transport Safety Board found the major cause of flying accidents due to pilot error (60-70%). In the Canadian Armed Forces in this period approximately 20% of the accidents were credited to pilot error. Are our pilots that much better than their commercial counterparts, or is it possible that accident reports are being slightly tinted?

There is that persistent nagging feeling that accidents, both maintenance and flying, in the final analysis do not reflect the events as they actually happened. Realizing the deficiencies in human nature, it should be possible to interpret the factual cause even through the distortions of a vested-interested person who attempts to colour the accident to suit his subjective purpose.

The most optimistic note is that accidents in the past were well within our power to at least alleviate if not eliminate. In the final analysis it is desirable but unattainable to reach zero level of accidents. The percentage level will depend largely on how much individually and collectively - in all facets of aircraft operation - we are willing to contribute in return for a safe flight operation.

V. Latowski
ATCHQ/SOAE

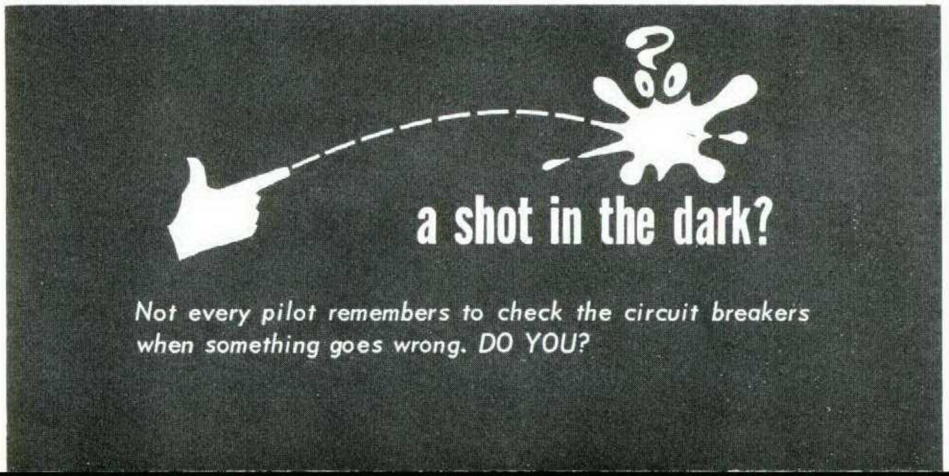
*Your question in the first paragraph implies:*

- *that civilian investigations are more reliable*
- *that our transport drivers aren't that much better - it's just our statistics that give this impression.*

*Both these propositions involve odious comparisons - nevertheless, we'll be frank and deny them both. The fact is that in 1966 Canadian Forces' pilots were assessed as cause factors in 44% of aircraft accidents. However, a comparison of CF and NTSB figures is invalid; for our multiple-cause system see page 22.*

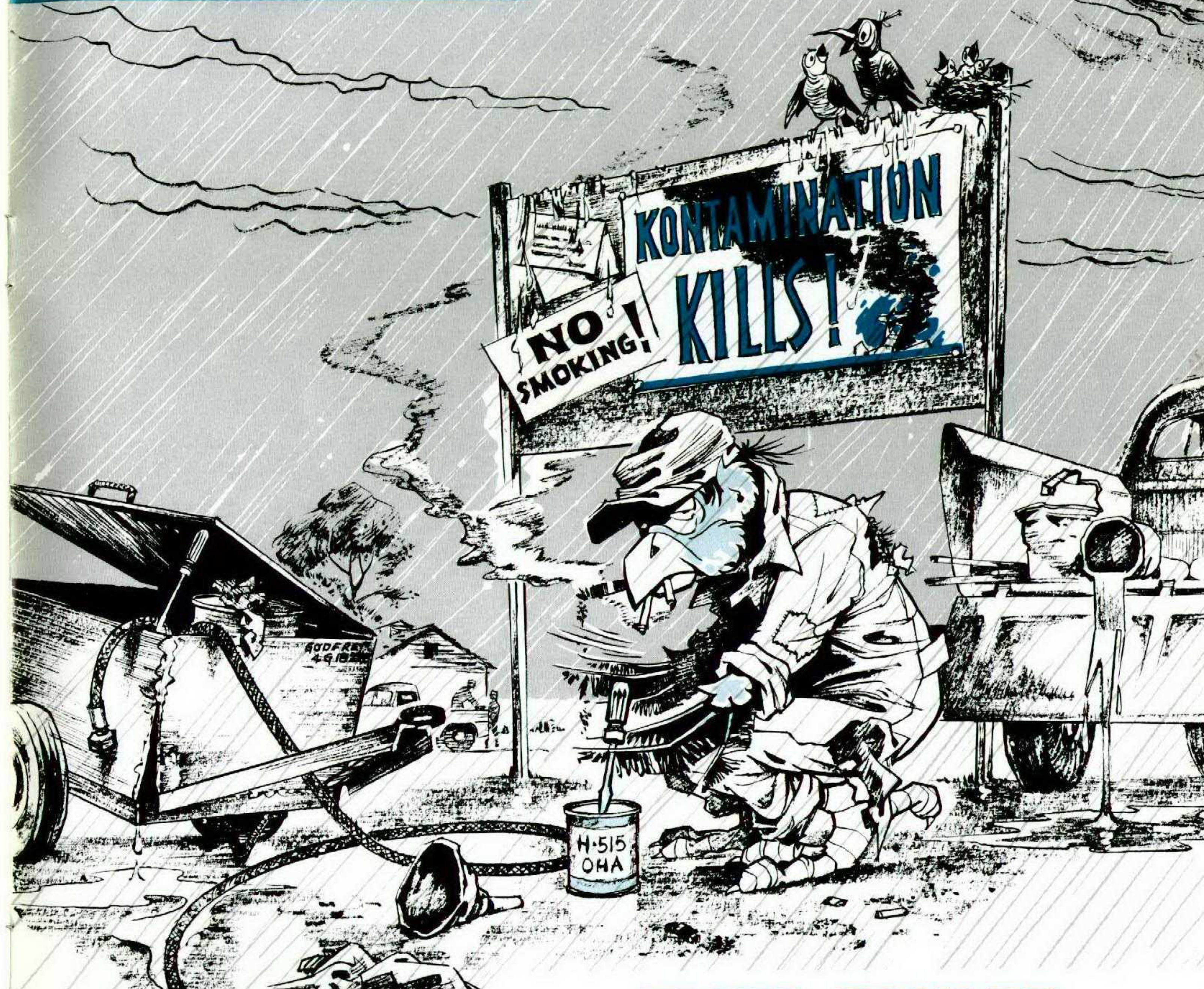
*From the investigations of accident/incidents come the reports on which we base flight safety measures. If our investigations are inadequate - so will be our preventive measures. One area that always comes in for the most soul-searching is PERSONNEL. Not only are human behaviour deficiencies difficult to define, but within our traditions of justice, they are even more difficult to employ in formal reports. But, that's life . . . we sure would be interested in any concrete proposals.*

*Your "vested interests" among the aircrew, for example, have a vested interest in their own lives - motivation enough, we feel, for the integrity reflected in most of our investigation reports.*






## BIRD WATCHERS' CORNER




# FLUID FOULER

One of the many sub-species of the family **procedurum ignorus** is the Fluid Fouler. With little to distinguish it from its basic family characteristics—unkempt plumage and disdainful grimace—the Fluid Fouler is best observed in his nesting area. Here, the Fouler casually transfers fluids from containers into machines with a primitive quick-and-dirty technique better suited to oiling locomotives. But the passing years bring change; both machine and supervisor are becoming less tolerant of fluid contamination. Although nearly extinct they may still be seen amid a jumbled array of grimy utensils chirping their unrepentant serenade:

**THEYSPEAKOFTHOSEPARTICLES ASIFTHEYWUZARTICLES**


HANDS OFF!
CDN ARMY