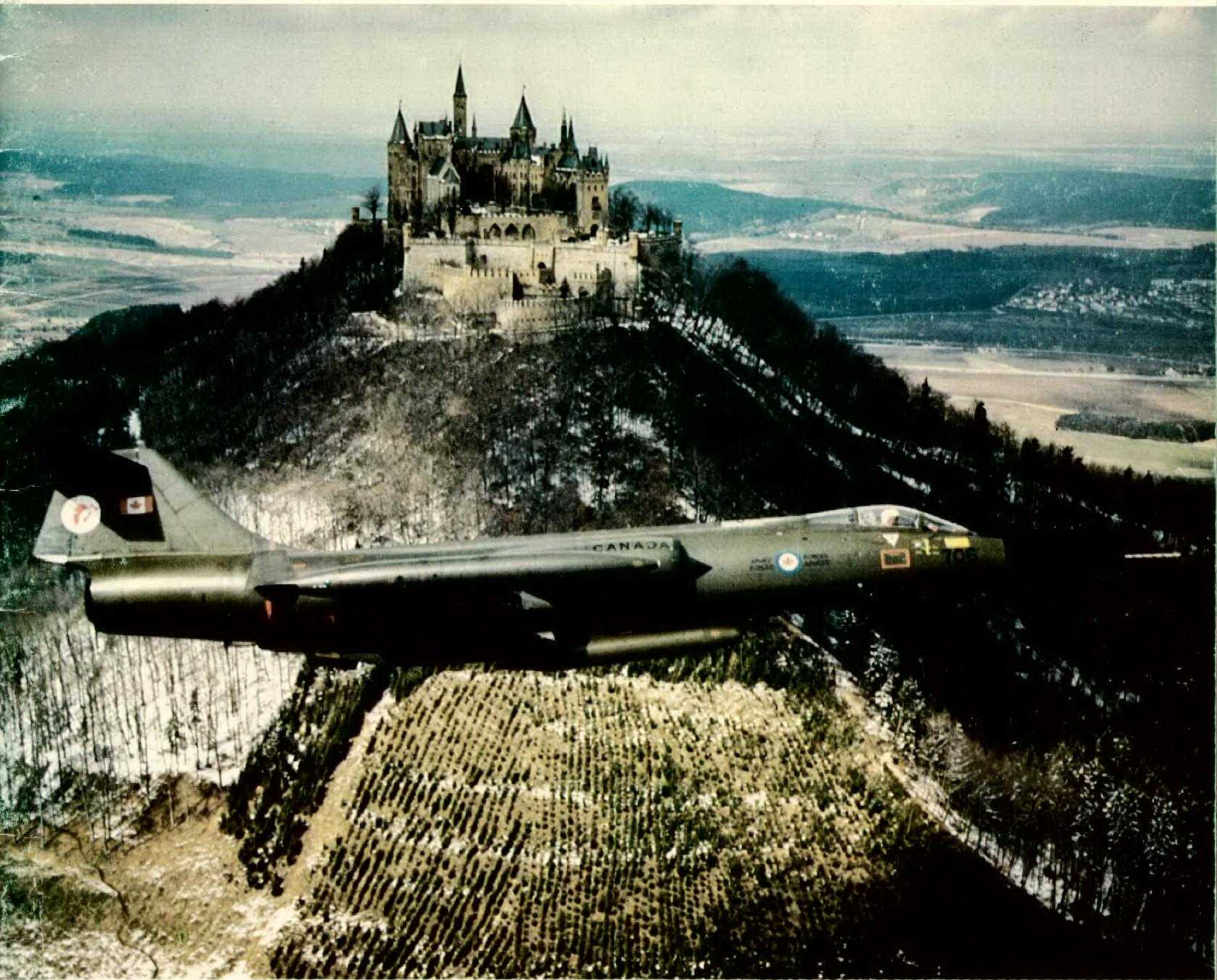
FLIGHT COMMENT

EDITION 2
1975



Comments

Most farewell speeches by pilots are preceded – and often pre-empted by the singing of "he's true blue" and the chug-a-lugging of evil mixtures from pewter tankards. However, one of the fringe benefits that goes with editing this illustrious magazine is that the editor gets to say farewell in print. This gives him an opportunity to say thank you to those people who, in so many ways, have helped produce the magazine over the years. So here goes:

John Dubord, of NDHQ Graphic Arts, has been responsible for the artwork and layout of Flight Comment for nearly 25 years. His knowledge of military history and aircraft have been of great value to my predecessors and even after all this time he can still find ways to keep the editor on his toes. My sincere thanks to John and I hope his splendid drawings will continue to appear in the magazine for many more years.

A special thanks goes to Ms Edith Boisvert, the unsung heroine of Flight Comment production. As secretary cum Girl Friday cum Jill of all trades she has contributed much to the DFS education programme and to Flight Comment in particular. She is also commended for her patience in putting up with the editor's tantrums as deadlines loomed large.

I would also like to thank everyone who sent me photos or articles as well as those who promised but never quite got around to it – hopefully the new editor will receive that bounty.

After twenty months of Flight Comment I hereby hand over the quill, blue pencil, hair shirt and other accoutrements of the trade to Capt. John Williams who was lured here from CFE by tales of the wonders of life at NDHQ. On his behalf I once more solicit your articles and ideas. The editorial staff are only the mechanism by which the magazine is produced. To be of real value in accident prevention the material should come from the field – where the action is – and not from our ivory tower at NDHQ.

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never relax

A considerable amount of time and effort is devoted to aviation accident prevention programmes which attempt, through education, to reduce the accidental loss of our resources. To achieve this aim, flight safety officers at each level make use of all the methods of communication available to them. Briefings, seminars, lectures, courses, magazines, pamphlets, posters and films are all used to disseminate flight safety information.

But how successful are these programmes? Well, the only indicator of success or failure is the number of accidents we experience in relation to previous years. An accident is tangible proof that the system system has somehow failed but we have no absolute way of measuring the number of accidents which are prevented. The important point is that a prevention programme must be a dynamic, continuing process and not just a sudden burst of energy when things appear to be going wrong. It would be foolhardy in the extreme to imagine that a decreasing accident rate means that we can afford to slack off on our prevention efforts. Rather this is the time to re-assess, update and modify our programmes to ensure that the message not only continues to reach the widest audience but also maintains its credibility and effectiveness.

COL. R. D. SCHULTZ
DIRECTOR OF FLIGHT SAFETY

Helicopter Escape ...a matter of some concern

Emergency escape from helicopters is a topic which, for obvious reasons, receives a lot of attention from rotary wing aircrew – but fling-wingers can't help feeling that they've been left out in the cold on this one. Most helicopter drivers in the CF have a fixed wing background and are used to that *secure* feeling which a strapped-on parachute gives. Flying as high as 10,000 ft without that parachute or any other means of reaching terra firma at other than terminal velocity if something catastrophic happens is the norm at present. Some US Army estimates indicate that as many as 50 percent of helicopter crew fatalities in SEA could have been prevented if a suitable parachute/egress system had been available.

The following article is an adaptation of two articles which appeared recently in the US Navy's *Approach* magazine and discusses the most recent advances in helicopter escape system theory. The Canadian Forces continue to monitor advances made in other countries so hang on to your collective – it may still happen.

Do *you* really understand all of the problems associated with getting out of a helicopter during emergency situations? As a crewman, you most certainly should, and as an occasional passenger, you should educate yourself prior to each flight. Knowledge of this sort is good insurance, and orders specify that the aircraft captain will ensure that all personnel aboard have been given a briefing on emergency procedures. Until such time that proposed methods of improved egress capability are implemented, close attention to these briefings could save your life!

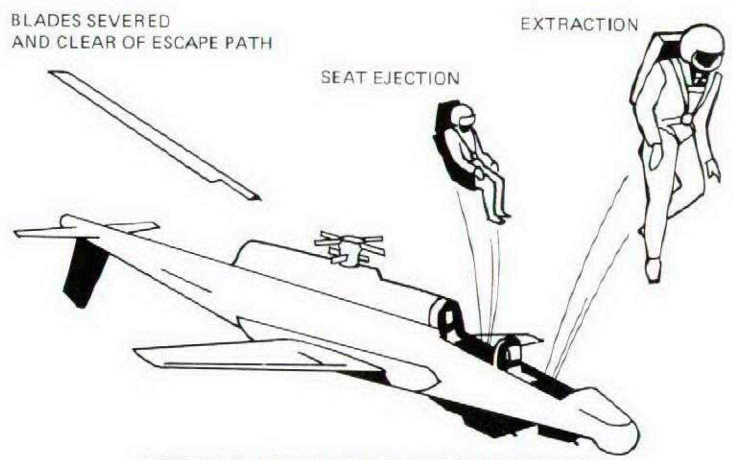
Two different concepts of inflight emergency systems are being pursued. The first one involves inflight egress from the aircraft and is only applicable to helicopters with a two-man crew. This concept has two modes, extraction and ejection.

The first mode is intended for use in the AH-1 *Cobra* helicopter and is an *extraction* system. Here's what happens: rockets extract the crewmen *after* the rotor blades are sheared, the canopy jettisoned, the gunsight stowed, and the fuel shut off, then they are recovered by individual parachutes. Technical documentation of this method has been completed, and design verification testing and qualification plans are being formulated. This system is scheduled to be installed in H-1 production models (G-J-Q) by the end of FY-76.

The second mode is a *seat ejection* system. This innovation in ejection seats for helicopters is scheduled for test and evaluation by Douglas Aircraft Company soon. This unit has been designated "MINIPAC". Sub-system components and ballistics are to be off-the-shelf items or usable from previous Douglas ejection seats. Installed, "ready-to-go" weight in an aircraft will be less than 70 pounds per seat. Its design includes safe escape from zero to 250 knots speed, from the ground up to 10,000 feet altitude, and gives the crewman an inflated parachute in about 2 seconds. This ejection system will be compatible with most existing helicopter cockpits, is self-contained, and requires no mounting of components elsewhere in the aircraft.

Another inflight emergency system concept, applicable to larger multiplace helicopters, does not involve inflight egress. This HEPS (helicopter personnel escape protection and survival) system is designed to bring the aircraft fuselage safely down to earth, after which a more or less "normal" egress can be effected.

The system consists of the following series of events: ballistic main rotor severance, tail rotor severance, *vehicle recovery parachutes* deployment (number of chutes determined by model aircraft), and retro rocket firing. Occupants are protected on the earth through the use of crash resistant fuel systems, crash attenuation bags and crashworthy seats. Flotation devices are activated for water impact.



EXTRACTION SEAT SYSTEM

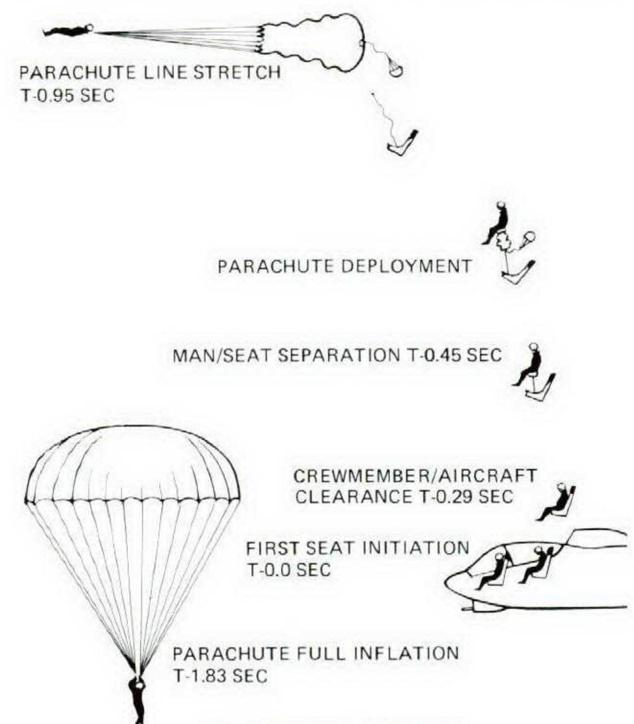
This type of modular recovery will provide a more stable situation for egress after landing. Funding for investigation and development of weight and volume reduction of the recovery system has been tentatively approved for FY-75. Funding for the other portions of the HEPS program has been held in abeyance for future consideration.

So much for inflight escape and automatic controlled emergency descent followed by "normal" egress. Another environment which presents tremendous egress problems is *underwater*. When a helicopter crashes at sea, its occupants are faced with problems that require proper equipment, training, and self-control to egress and survive. If the crash is in deep water, the aircraft will probably either break up into various sized sections or remain intact but flip inverted, fill with water, and sink.

This evolution naturally creates disorientation which, combined with darkness, would create panic in most people. To provide a better survival ratio than we now have, numerous ideas are being developed. These include hatches that will automatically be released or ballistically separated from the aircraft, the use of MDC (mild detonating cord) to create additional escape hatches in the sides, tops, and bottoms of aircraft, perimeter lighting outlining the escape routes automatically, and seatbelts that will automatically release. These systems will be dependent upon water pressure and/or timed water immersion. In all systems, there will be a manual actuation feature.

In addition, new training procedures are being generated. A Universal Helicopter Underwater Escape Trainer is being developed by the Naval Training Equipment Center in Orlando, FL. Training in this device will be similar to the fixed-wing "Dilbert Dunker" and will provide trainees an excellent opportunity to develop confidence in their own ability to survive an emergency situation. They will learn to develop a sense of direction, the value of keeping their eyes open, how to avoid being thrown around, and the importance of staying strapped in until the aircraft is completely flooded to minimize disorientation created by inrushing water.

These drills in underwater escape are intended to be an exercise in preventing panic, since successful escape from a chaotic and anxiety-producing situation, such as being trapped in a sinking, inverted helicopter, may depend largely upon reflex action. Therefore, the trainer will provide experience in manual release of restraints which are identical to those used in the aircraft. As a result of training, many aircrewmen, injured and/or in shock, have been known to perform each step (and there are several) precisely and in correct sequence. They have been recovered unconscious and later have had no recollection of how they reached the surface.



Escape Sequence – 150 Knots

MINIPAC SYSTEM

Emergency procedures should be practised, so that any sudden impact with the water will trigger correct responses rather than produce undue emotionality. The proposed Universal Helicopter Underwater Escape Trainer, called "Device 9D5", should provide the necessary realistic training.

Land crash situations present other types of problems. When the aircraft makes uncontrolled contact with the ground, it results in problems like ruptured fuel and hydraulic lines, jammed hatches, shattered glass, and seat and restraint failures. Personnel are thrown rapidly in various directions, fire can (and does) occur, and general confusion is always present. Improvements which will enhance survival probability in land crash situations are in the mill.

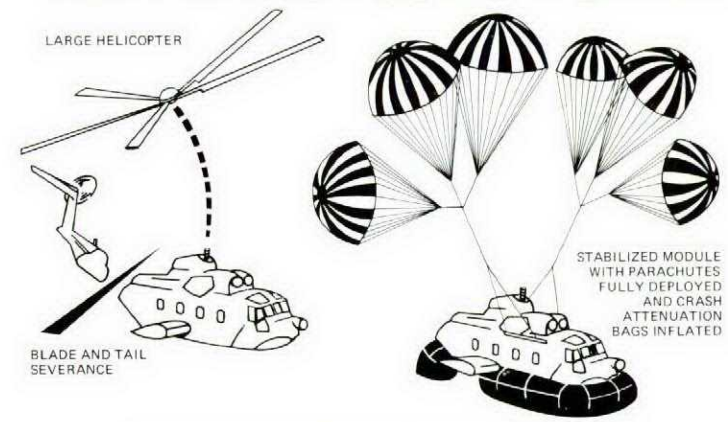
Crash resistant fuel systems have been developed which will reduce the danger of fire on impact. Crashworthy seats that redistribute body stress and remain attached to the airframe can further decrease injuries to personnel, when used, and allow them to be better prepared for egress after movement has ceased.

In an effort to reduce the tragic loss of lives and multimillion dollar accident price tags, these programs for helicopter egress are being vigorously pursued. But austerity in funding for research and development phases slows the progress at various intervals. In spite of the multitude of counter-productive considerations, these programs, with associated training and equipment, can produce a safer, mission-ready helicopter force.

With the expansion of the numbers and missions of rotary wing aircraft, the need for improved egress methods continues to increase. The need for viable systems designed to get aircrewmen and passengers safely out of helicopters in flight and after ground or water crashes is vital.

What about the use of parachutes in helicopters. Well, consider a lone helicopter flying along. Two pilots and a crewman were returning to Homeplate at 2500 feet, 170 knots indicated. Then sudden engine failure, low rotor RPM, a blade hits the flap restrainer and parts company with the airframe.

Does that get your attention fellow helo drivers?



MODULAR RECOVERY SYSTEM

Consider another helicopter flying at 2500 feet. It was a test hop, barely 3 miles visibility, and an airliner suddenly appears on a collision course. The co-pilot, being a highly motivated gent, pulls full aft cyclic and the helicopter flips over on its back. Exit co-pilot and crewman. The plane commander, who by this time is paying some attention to what's transpiring, finds himself staring down at terra firma through his rotor system. He unstraps and moments later finds himself freefalling away from the aircraft. Having nothing more constructive to do, he pulls his ripcord and joins his crew on the ground for a well deserved, albeit somewhat shaky, beer.

What a difference between the results of the two incidents described. One crew flew the next day, the other crew never flew again. Why? *One crew had parachutes – one crew did not.*

cont'd on next page

Before you read on it should be pointed out that CF helicopters, apart from Sea Kings, do not normally carry parachutes. The following reasons given by US Navy personnel for not carrying parachutes in their aircraft may well be typical of the response of CF pilots – or do you feel differently? . . . ***Ed.***

- When it's my time to go, I'll go. (Followed by a theological discussion of the doctrine of predestination that rivals Linus' ponderings on the nature of the Great Pumpkin.)
- Helicopters never fly high enough for successful parachute escape.
- Parachutes are unduly restrictive to movement.
- There is no provision for parachute storage in helicopters.

Let's take the reasons in order:

When it's my time and accompanying philosophy, rationalizations, and gestures are pretty heady stuff to the average helicopter pilot. In one easily mastered line and mannerism, the helicopter pilot emerges from the colorless mass of his aviator contemporaries and steps forward to take his place with John Wayne, Kirk Douglas, Snoopy, and the Road Runner as the folk heroes of the age. Like his partners, he draws himself erect with a snarl, hooks his thumbs in his belt, and with his read proudly erect, he contemptuously spits in the face of death.

However desirable the reputation gained by joining hands with Snoopy and the boys, our young helo heroes are playing in the wrong league. Snoopy can spit at the Red Baron all day if he wants to, but a helicopter pilot freefalling from 2000 feet without a parachute will find the wind he has been spitting into, is a very strong wind indeed.

When it's my time does not hold up under logical scrutiny. Although freefall from any great altitude might be a valid indication of time running out, a pilot who is able to exercise a silk-lined option might be surprised to find that it was his co-pilot's time that had come, not his. Or possibly the good Lord decided to eliminate a faulty airframe from a Navy inventory in answer to the prayers of a maintenance officer. You can't tell. Certainly a pilot who buys the farm because he failed to wear a parachute should look forward to some strained silences and some fancy foot shuffling as he explains his unexpected approach to the pearly gates.

When it's my time. I suspect there have been many helicopter pilots pondering the price of bravado for their last 10 or 15 seconds. Imagine yourself in their shoes and try a ground-based test of the sensation. Hold your breath for 10 or 15 seconds while you ponder on the chute you're not wearing and see if you like the feeling.

Helicopters don't fly high enough has an aura of logic about it. Helicopter pilots are infamous for getting nosebleed above 500 feet. Even so, if we trot out Newton's laws for a quick polishing, assuming that a body reaches a terminal velocity of 120 mph (176 ft/sec), we get the following results:

Time to Reach Terminal Velocity

$V = at \quad 176 = 32.2 \times t \qquad t = 5.5$ seconds

Distance to Reach Terminal Velocity

$D = \frac{1}{2} at^2 = \frac{1}{2} (32.2)(5.5)^2 = 487$ feet

In non-technical terms we have found out that a helo pilot at 500 feet has almost 6 seconds to get out and pull a ripcord. That certainly isn't much time, but motivation is a wonderful thing. Hold your breath for 6 seconds and decide if you don't think you could give a heck of a good try to departing an aircraft in that time interval if you were highly motivated. You certainly wouldn't have much to lose.

Continuing:

Time to Fall 1000 Feet at Terminal Velocity

$d = Vt = 1000 = 176t \qquad t = 6$ seconds (approximately)

Accordingly, your time to react and preflight your chute increases by 6 seconds every 1000 feet you put under your aircraft. That's about 11 seconds at 1500 feet and 17 seconds at 2500 feet. When you get to 2500, you have a pretty competitive chance of getting out successfully. A motivated pilot might make a stab at bailing out rather than twiddling his thumbs while acting as inside observer of a wild ride down.

Parachutes are clumsy and restrict motion is the first argument that is valid. It is, in fact, the governing reason for not wearing parachutes in helicopters. A helicopter pilot decked out in poopy suit, mae west, survival vest, and parachute looks absolutely ridiculous waddling to his aircraft and is immobile to the point of uselessness during flight. Add to all that the additional load of towing TacAid, maps, flashlight, hardhat, and kneeboard and one can see why helicopter pilots are willing, yea eager, to find a good rationalization for leaving the big lummox parachute at home.

Even so, rationalizations are not a good response to the bleak state of the art of helicopter parachute design. Pilots of all ranks, stations, shapes, and sizes have been trotting out the rationalizations for so long that they have absolutely convinced the non-helo types that any time or money spent on parachute hardware is better spent on something else.

The torso harness worn by pilots of standard Navy tailhookers would appear to be capable of modification for helicopter use. It is less bulky to wear than a backpack parachute. Indeed, the attached Mark 5C raft that is worn around the middle provides a very welcome support for the lower back. It might be possible to modify the harness to allow a quick-donning chest type chute. The parachute itself could be stored beside individual crew seats where it would be handy but out of the way. Such changes might alleviate a helicopter pilot's mobility problems, but the possibilities won't be pursued with any vigor until the Fleet indicates that they want it.

(By the way, I wonder if everyone realizes that the helicopter pilot's antipathy to parachutes, whether right or wrong, real or imagined, is so notorious that contractors are no longer being held to requirements to provide suitable places for parachute storage onboard helicopters. To be sure, the requirement exists, but no one feels it is worthwhile enough to enforce it. It is generally belived that helicopter pilots would not use parachutes even if stored onboard. The powers that buy aircraft have better things to do than fight losing battles for improvements that are not desired and will not be appreciated).

We have now reached the end of the spectrum of reason and rationalization behind the present state of affairs. The science of helicopter parachute design has been allowed to lapse to a point where the whole thing smacks of the classical "chicken or egg" argument.

cont'd on page 11

GOOD SHOW

CAPT G.D. ROBINSON AND CAPT R.P.E. MINERS

Capt Robinson and Capt Miners were practising night circuit work in an Otter at a civilian airfield. Several circuits were flown without incident; however, shortly after taking off on their last circuit there was a sudden and complete power loss. During two engine failure drills the engine started cutting in and out and the aircraft continued to lose height rapidly.

Capt Miners manipulated the engine controls to obtain maximum power and, as a result of this, the rate of descent was reduced somewhat although the engine was still running sporadically and sparks were coming from the top of the cowling area.

Capt Robinson and Capt Miners finally landed the aircraft without damage and are commended for their actions during this emergency.

LT J.G.R. CÔTÉ AND MCPL S.H. RICE

Lt Côté was the duty controller at CFB Greenwood when he was advised of a lost aircraft by Moncton ATC. Moncton had radio contact only with a civilian Cherokee, believed to be operating in the St. John area.

Lt Côté contacted his radar controller, MCpl Rice, and then arranged to have an Argus towed from the hangar line into position on the field. He planned to utilize the VHF/DF on the Argus to locate the bearing of the aircraft from Greenwood and thus provide steers to the base. This method was abandoned when MCpl Rice observed a target 12 nautical miles north of Greenwood.

Several radio frequencies were utilized in an attempt to contact the aircraft and finally, through co-operation between Greenwood Terminal and Moncton Centre, two-way communication was established between the radar controller and the pilot.

The pilot had a VFR rating only and was in cloud at 2200 ft. MCpl Rice issued calm, precise instructions to the pilot and vectored him to a position where a visual approach was possible.

Lt Côté and MCpl Rice are commended for their excellent response to this emergency which may have prevented a serious accident.

CPL D.T. MACPHERSON

Cpl MacPherson was towing a CF104 when he heard an unusual noise coming from the port brake. He checked the servicing records and found that a new brake unit had been installed. Because the aircraft had had only one landing since this

Lt J.G.R. Côté and MCpl S.H. Rice

Cpl D.T. MacPherson

Capt G.D. Robinson and Capt R.P.E. Miners

Cpl C.L. Carter

installation, Cpl MacPherson decided to investigate. He jacked up the aircraft, removed the tire and discovered that the brake unit had seized: a new brake unit was installed.

If this noise had gone unheeded the brake would have overheated causing the tire to blow on takeoff or landing.

Cpl MacPherson is commended for his alertness which is indicative of the professional approach which he consistently takes to his duties.

CPL C.L. CARTER

As a result of a UCR submission, Cpl Carter was examining the flaps of a CF5 aircraft when he discovered a dangerous condition in the same area. The bolt connecting the flap to the control arm had been installed backwards and it was rubbing against a series of hi-lok fasteners as the flap moved up and down. Further investigation revealed that other aircraft on the base were in the same condition.

Cpl Carter's alertness and professional approach pinpointed and resolved this unsafe condition.

GOOD SHOW

MCPL R. DRAPEAU

MCpl Drapeau was supervising the flight line dispersal and observed a CF104 which had an aborted start because of an engine fire. As the pilot had already left the aircraft, MCpl Drapeau entered the cockpit and applied CSU air to motor the engine and blow out the fire. His alertness and presence of mind prevented fire damage and the possible loss of an aircraft.

MCPL H.L. WANVIG

While carrying out a visual check of the wing attachment points on a Tutor aircraft MCpl Wanvig noticed that the position of the fibre insert on a self-locking nut appeared abnormal. MCpl Wanvig decided to carry out a torque check and found that many of the nuts were under-torqued. As a direct result of his findings a special inspection was carried out which revealed that more aircraft were in a similar state.

Although a No. 3 periodic check calls for a visual inspection only of the rear spar attachment points, MCpl Wanvig went beyond the specified requirements by carrying out a physical torque check.

Through his professionalism, keen interest, and attentiveness, MCpl Wanvig brought to light a condition that could have resulted in a serious inflight hazard.

CPL E.J. TORFASON

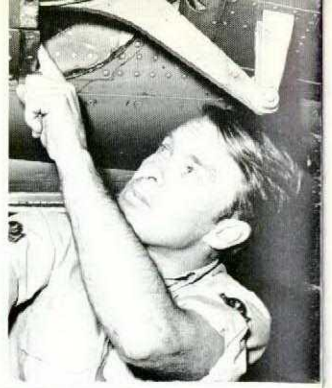
While refuelling the smoke tanks on a Tutor "Snowbird" aircraft Cpl Torfason noticed a strange odour not associated with the furnace oil normally used to generate smoke. An investigation into the incident revealed that, following a performance by the "Snowbirds" earlier in the season, one of the empty furnace oil barrels had been commandeered and filled with gasoline for the purpose of refuelling other vehicles. Upon the return of the "Snowbirds", this barrel, still full of gasoline, was replaced beside original furnace oil barrels.

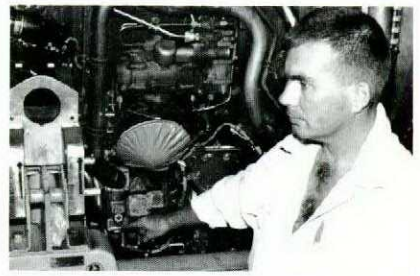
Cpl Torfason's alertness and prompt action may have prevented an inflight fire when the smoke generators were selected.

CPL J.A. BENNETT AND CPL N.F. PEARCE

Cpl Bennett and Cpl Pearce were carrying out a survey inspection on a CC137 engine when they found a crack in the fuel filter body. It was thought at the time that this was probably an isolated case, but the two technicians felt that a further check was necessary. They checked three other spare engines


MCpl R. Drapeau


MCpl H.L. Wanvig


Cpl J.A. Bennett and Cpl N.F. Pearce


Cpl E.J. Torfason


Cpl E.J. Bowen

and found that they also had cracked filter bodies. An inspection of all spare fuel pumps held in supply revealed that four out of seven held in stock were cracked or showed signs of bulging. An investigation of the CC137 fleet brought to light nineteen defective filters out of a total of twenty. If this condition had gone undetected metal particles may have entered the main fuel stream, damaging the engine fuel pump gears as well as contaminating the complete fuel system.

By their diligence and thorough workmanship Cpl Bennett and Cpl Pearce prevented the development of a serious flight safety hazard.

CPL E.J. BOWEN

While performing a battery change on a Tutor "Snowbird" aerobatic aircraft, Cpl Bowen decided to do a full electrical check on the aircraft and heard an unfamiliar noise coming from the number one inverter. Another member of the maintenance crew was summoned and the inverted checked again, but this time it seemed to operate normally. Cpl Bowen persisted in his investigation of the suspect inverter by removing it and found that it had been damaged internally.

Cpl Bowen's meticulous attention to detail and his professional attitude towards his job prevented what could have been an inflight incident.

CAPT T.G. BRUNEAU

Capt Bruneau had just levelled off at 2000 feet MSL and 290 knots after takeoff from Fort Smith, NWT, when his T33 sustained a severe birdstrike in the left windshield side panel. The bird went completely through the glass and struck Capt Bruneau on the chest and right arm. Although momentarily dazed and unable to use his right hand because of injury to his arm, he managed to climb the aircraft and assess the situation. He then returned to Fort Smith and landed safely using his left hand except for the final approach which he flew with both hands on the control column.

Capt Bruneau's calm reaction enabled him to land his aircraft safely despite a disabling injury following an extremely hazardous experience.

Capt T.G. Bruneau

Cpl D.C. Kinny


Cpl D.W. Cox and Sgt P.C. Davies


Cpl J.M.A. Thompson


Sgt T.J. Condon and MCpl K.E. Baker

CPL D.W. COX AND SGT P.C. DAVIES

Cpl Cox, a student flight engineer on a Cosmopolitan aircraft, was carrying out a routine preflight inspection. His visual scan of the fuselage detected a screw which had pulled though the skin. On closer inspection he found loose rivets and a row of screws which did not appear to have the support of the rib structure in the area. He summoned his instructor, Sgt Davies, who decided that further examination of the area was necessary. Since the weak point was at the left wing root metal technicians removed the skin panel. This exposed four broken ribs which had only been detected by Cpl Cox's prudent examination of one "pulled" screw. Although this rib structure failure had not reached a critical stage both the student and instructor are commended for their professionalism.

CPL D.C. KINNY

Cpl Kinny was chocking a T33 after helping to tow it onto the line when he noticed a driverless refuelling tender rolling backwards towards the side of the aircraft. Despite the potential danger of a fire or explosion and the possibility of personal injury, he grabbed a nosewheel chock from the aircraft and placed it behind the tender's left rear wheel. The fuel tender came to a stop approximately 18 inches from the aircraft, bending the metal chock in the process.

Cpl Kinny is commended for his alertness and quick thinking which undoubtedly prevented costly damage to the parked T33.

CPL J.M.A. THOMPSON

While performing a routine daily inspection on a Tutor "Snowbird" aircraft, Cpl Thompson noticed several cracks and loose rivets on top of the aircraft in a primary structure area. Further investigation revealed that more than one half of the fleet of "Snowbird" aircraft had similar defects.

Cpl Thompson's alertness and thorough investigation outside his trade parameters as an aero-engine technician revealed a serious defect which was repaired before further and possibly hazardous damage could result.

SGT T.J. CONDON AND MCPL K.E. BAKER

While checking the movement of the synchronized elevators during a daily inspection of a CH118 helicopter, Sgt Condon suspected that the reaction was not quite normal. He rechecked the area with MCpl Baker and both agreed that the movement was so close to normal that it was difficult to determine whether the elevator was faulty. After discussing the matter, they requested that the elevator be removed for further investigation. A small crack was discovered when the unit was removed. Elevators on two other CH118s were checked and

GOOD SHOW

three of the four were found to be defective in the same area.

Sgt Condon and MCpl Baker are commended for their professional approach and extra attention to detail which eliminated a potentially hazardous situation from developing any further.

CPL T. ZANZOW

Cpl Zanzow was carrying out a Safety System D.I. on a visiting T33 when he noticed a parachute of the type used with the T33 rocat catapult seat in the front cockpit although the aircraft was fitted with ballistic ejection seats. The only noticeable external difference between the parachutes is the type of fitting on the arming cable. Cpl Zanzow was aware that the internal delay parameters of the ballistic and rocat chute are not compatible and that an ejection could have been unsuccessful. He removed the suspect parachute, confirmed that it was definitely the wrong type, and notified the pilot that he required a proper chute to proceed.

Since inspection of the pilot's personal gear is not part of the daily inspection check, Cpl Zanzow's attention to detail and follow-up actions are particularly commendable.

MCPL G.M. McCORMICK AND CPL R. BAYLISS

MCpl McCormick and Cpl Bayliss were tasked with replacing a Boeing CC137 nosewheel drag brace assembly with a modified drag brace. After installation, a lubrication plug was removed from the drag brace to lubricate the locking knuckle. The technicians noticed that the roller which secures the brace in its "down and locked" position was just coming into view. A quick check with the CFTO confirmed that this condition was abnormal and that the strut was not locked even though functional checks indicated normal operation.

Further investigation showed that the drag strut had just arrived into unit stock from the overhaul contractor where the strut had been incorrectly assembled. This condition, if undetected, would have allowed the nosewheel strut to collapse after the aircraft had been removed from the jacks.

CPL R.S. CAMP

While employed as a member of a refuelling crew on a CH135, Cpl Camp noticed that a cargo tie-down ring assembly appeared excessively worn. Closer inspection revealed that the holes in the swivel had stretched to the point where one side had

Cpl T. Zanzow

Cpl R.S. Camp

MCpl G.M. McCormick and Cpl R. Bayliss

completely broken through. The break was on the underside of the swivel which is recessed into the floor; detection of this condition is very unlikely at a casual glance.

As a result of Cpl Camp's discovery an immediate inspection was carried out on all unit CH135 helicopters. An assembly in similar condition was found in another aircraft. Fleet users were therefore notified and a UCR was submitted.

Due to Cpl Camp's alert observation and thorough follow-up a serious hazard was discovered and rectified. Cpl Camp is particularly commended as the job at hand did not entail any inspection procedure nor was this an area in any way related to his trade.

T33 – ENGINE ACCESS DOORS ARE A PREFLIGHT ITEM –EVEN IF THEY ARE COVERED WITH SNOW

A review of last winter's incidents reminds us that a pilot was deluded by winter snow into believing that the upper engine access doors on his T33 were securely fastened. He stated that the door area was shaded by the raised canopy and was covered with approximately one-half inch of ice and snow at the time he did his preflight. The pilot did not check the doors for security and on descent to the recovery base, the doors departed the aircraft. Only 3 of 48 fasteners remained fastened in the fuselage. There was no damage to the other 45 fastener holes. This time there was no other damage to the aircraft; next time, the pilot might not be so lucky.

Major B.C. Bernet, CF

New Faces at DFS

In this edition of Flight Comment we take pleasure in introducing two officers newly assigned to duty with the Directorate of Flight Safety. It is immediately apparent from the "hero" shots included herein that both of these gentlemen have built-in helmet-holding crooks in their right arms and canopy-leaning caluses on their left elbows. These characteristics are not required for posting to DFS – but they help.

Major M.I. (Marty) Chesser joined the RCAF in 1955 and received his wings at Portage in 1957. He then completed a tour on CF100s, followed by a tour as a T-33 instructor.

After the inevitable ground tour Major Chesser completed the CF104 OTU and proceeded to 439 Tactical Fighter Squadron in Baden Soellingen, where he served as a Flight Commander and eventually Deputy Squadron Commander.

Following completion of Staff College in 1974 Maj Chesser was sent to the University of Southern California for the Aircraft Accident Investigators Course. He now joins DFS as the CF104 and CF100 accident investigator, replacing Maj Clive Loubser in this role.

Captain John D. (Jock) Williams joined the RCAF in 1966 and received his wings at Moose Jaw in 1967. He then proceeded to 414(EW) Sqn where he flew the CF100 for three years. He was then transferred to Cold Lake where he completed the CF104 OTU and was posted to 439 Tactical Fighter Squadron at Baden. Following his tour with 439, Capt Williams served as Group Flight Safety Officer with 1 Canadian Air Group in Baden.

Capt Williams, a frequent contributor to various aviation publications now joins DFS as Editor of "Flight Comment" magazine, replacing Major "Baz" Lawlor who is leaving us for Staff College.

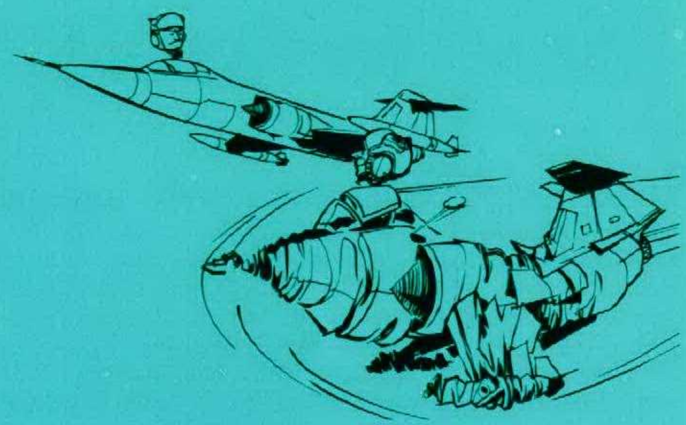
Major M.I. Chesser

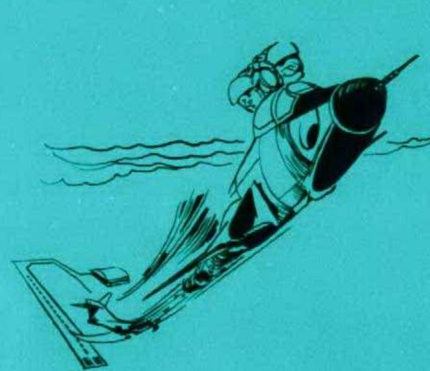
Captain John D. Williams

How Sierra Hotel are you?

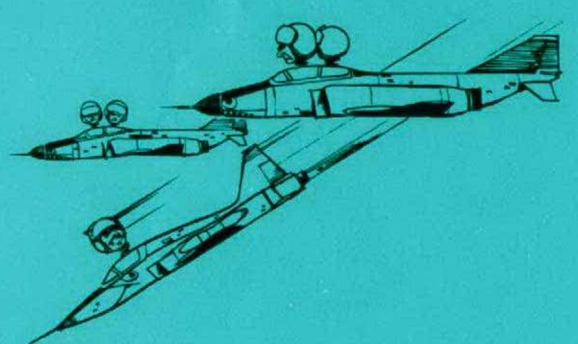
We all know it takes a special type of person to walk in the door of the Aircrew Selection Unit and stick with it until he finds himself fighting to stay on the glide slope during a night GCA. This special quality comes under many names within the trade, but can be described as dash, daring, a desire to pit skills against greater challenges and be among the best.

Then we come to a select group within this proud brotherhood who would be described as SIERRA HOTEL. In a community of tigers, the normal competitive urges are magnified, and there are those who wish to rise above the masses. So how SIERRA HOTEL are you? Take the following test and find out. Although it is slanted toward jets and carriers, with a little imagination, members of other aviation communities can make the correlation.



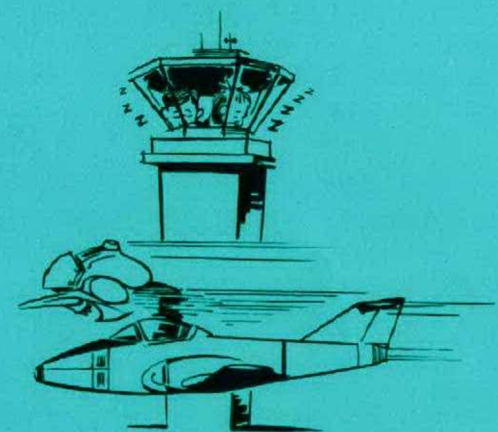


1. 10 points for a max performance takeoff; 3 if you asked tower for permission; add 5 for an unusual attitude recovery.



2. 15 points if you jumped a section of Phantoms or Lightnings; add 10 points if you won the fight (unless you were in a T33, then you get 2 points); add 10 more if you made a big thing about it; add 5 more if someone believed you.

3. 10 points for a rendezvous with 300 knots of closure speed; add 15 if you got both engines relit just as you slid into position; add 10 if you were rendezvousing on the CO.



4. 5 points for a low pass by the tower; add 5 if you were lower than the controllers; 10 points if you were so low nobody knew you did it.

5. 10 points for a 500 knot break; plus 5 if you had an accelerated stall; add 15 if you recovered and called it a tuck-under break; 5 more if anybody believed you.

6. 5 points if you were up late booming and still made your zero-dark-thirty brief; 5 more if you had a barf and a cigarette for breakfast; minus 15 if you had to catch it in your glove.

7. 10 points if you wear a moustache; add 7 if your flight commander hates it; add 15 if the flight commander then decides to grow one of his own and you shave yours off.

Rate Yourself

If you scored more than 100, you are really SIERRA HOTEL. You have people asking you to leave them your stereo and leather jacket when you smoke in. A flight violation beats no mail at all. If you scored between 75 and 100, you, too, are SIERRA HOTEL, but you manage to stay awake when the safety officer talks. Between 50 and 75, you are probably a normal red-blooded jock who shows some pizzazz, but stays within the boundaries of good sense and professionalism. If you were between 25 and 50, you are probably a major or above with a leak in your G-suit.

Watch it, though. Because if your score is too low, you just may be saddled with a squadron command.

You're probably wondering what all this means. Well, aside from the attempt at a little humor, there really is a valid test of how SIERRA HOTEL you are. How well do you perform the primary mission of your aircraft? For example, are you near the top of your squadron in CEP when you go to the ranges? Are your landings consistently outstanding? If you are a Nav, how well do you know your air intercept or electronic warfare system? Do you score high on your EO exams?

It is still important to fly with spirit and elan, and sharp breaks and flybys done in an authorized manner improve the morale of crewmembers and ground troops alike. But let's not blow it out of proportion. If you can bomb better than your CO, grease it on all the time, and know your aircraft better than any other dude in the squadron, your reputation as a SIERRA HOTEL pilot or Nav has already been made.

cont'd from page 4

But more facts must be scrutinized before the article is complete. One rationalization that has been heard among helicopter manufacturers is the argument that a helicopter rotor system is its parachute. If this is so, then the state of the art of rotor/parachute design has much for which to answer. Military specification 8501 A, the performance specification for helicopter design, requires that helicopters be designed to allow a 2-second delay time for a pilot to recognize a malfunction which requires an autorotation and lower his collective to enter autorotation. There are few, if any, helicopters in the fleet which fulfill these requirements in all regimes of flight. Some very popular helicopters have delay times of less than one second in some flight regimes. That is a trifle "scosch" for pilots with normal reaction time and adrenalin levels. If you really want to take advantage of the rotor system as your parachute, your arm had better be springloaded to the full down position.

There are, of course, some types of emergencies which occur with a fair amount of regularity which make for a highly precarious autorotation. Inflight loss of the rotor system is one that comes immediately to mind. Also, engines have been known to jam at full power in some helicopters. The aircraft will fly all day (or at least to fuel starvation), but securing the engine to enter an autorotation has resulted in the demise of the first two crews that tried it. (A technique has now been developed and the last few crews have been successful in their attempts to land.)

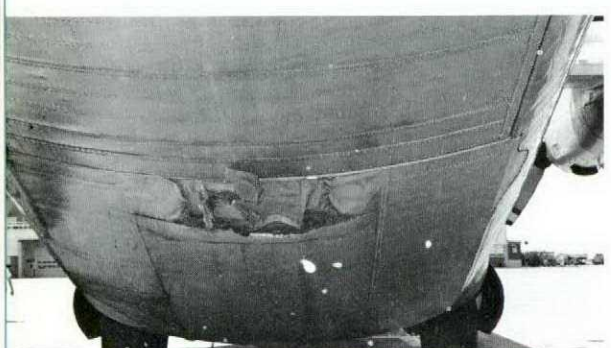
Until recently, the H-3 NATOPS manual suggested a quick preflight of your parachutes in case of loss of the tail rotor. The procedure is now open to question because a pilot (probably without a parachute) lost a tail rotor and performed a very successful autorotation. This happy result indicates the value of motivation but should not be taken as an indication of the value of sticking with an aircraft under circumstances that the contractor feels are untenable. *All in all, the argument that a helicopter's rotor system doubles as a parachute is of dubious value.*

A final factor militating against parachutes in helicopters is that squadron allowances provide for only a token number of parachutes in each helicopter squadron. One might suspect that the number of authorized parachutes has been limited because the Navy suspects they won't be used in helicopters and thus there is little benefit to be gained in storing many parachutes in the paraloft. One can only suspect that obtaining parachute authorizations would not be an insurmountable obstacle if the Fleet really wants them.

An so, comrades, the discussion ends. The OV-10 goes into combat with zero/zero ejection and the Cobras follow them with no inflight escape. P-3s fly with parachutes for all, H-3s and H-53s fly with parachutes for none. If you believe that the situation is right and just, so be it. If you helicopter pilots would like a change, let yourself be heard!

APPROACH articles by LCDR A.G. Doege and LCDR Robert B. Recknor

the '74 story

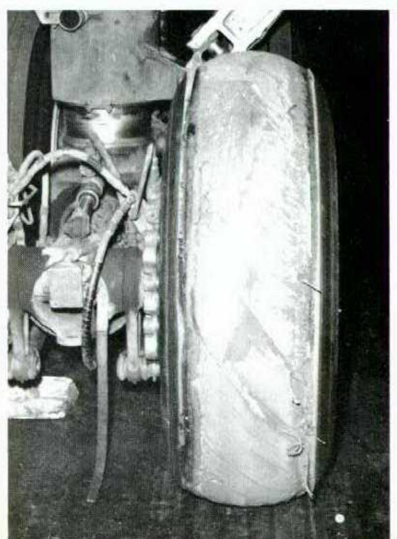


The highlights of our 1974 accident and incident record are presented here. A detailed analysis has been completed and appears in the 1974 Annual Aircraft Accident Analysis.

Milestones

In 1974

- Flying hours decreased by almost 18,000 hours.
- A MATERIEL cause factor was assigned in thirteen of 32 air accidents.
- There were 10 ejections all of which were successful. The success rate for ejections attempted within the ejection envelope has remained at 100 percent since 1969.



Air Accidents

The chart shows a total of 32 accidents – exactly the same number as in 1973. Our accident rate was 1.01 per 10,000 hours: an all time low of 0.80 was set in 1972. One E Cat air accident occurred when a loadmaster on a C130 was injured during turbulent weather: there was no aircraft damage. The Buffalo aircraft that was shot down in the Middle East is not included in the accident total.

Aircraft Destroyed

In 1974 thirteen accidents resulted in thirteen write-offs: seventeen aircraft were destroyed in sixteen accidents in 1973

Fatal Accidents and Fatalities

Four air accidents caused eleven fatalities in 1974 as opposed to ten fatalities in six accidents the previous year. Two helicopter crashes resulted in the loss of eight lives.

Ground Accidents and Incidents

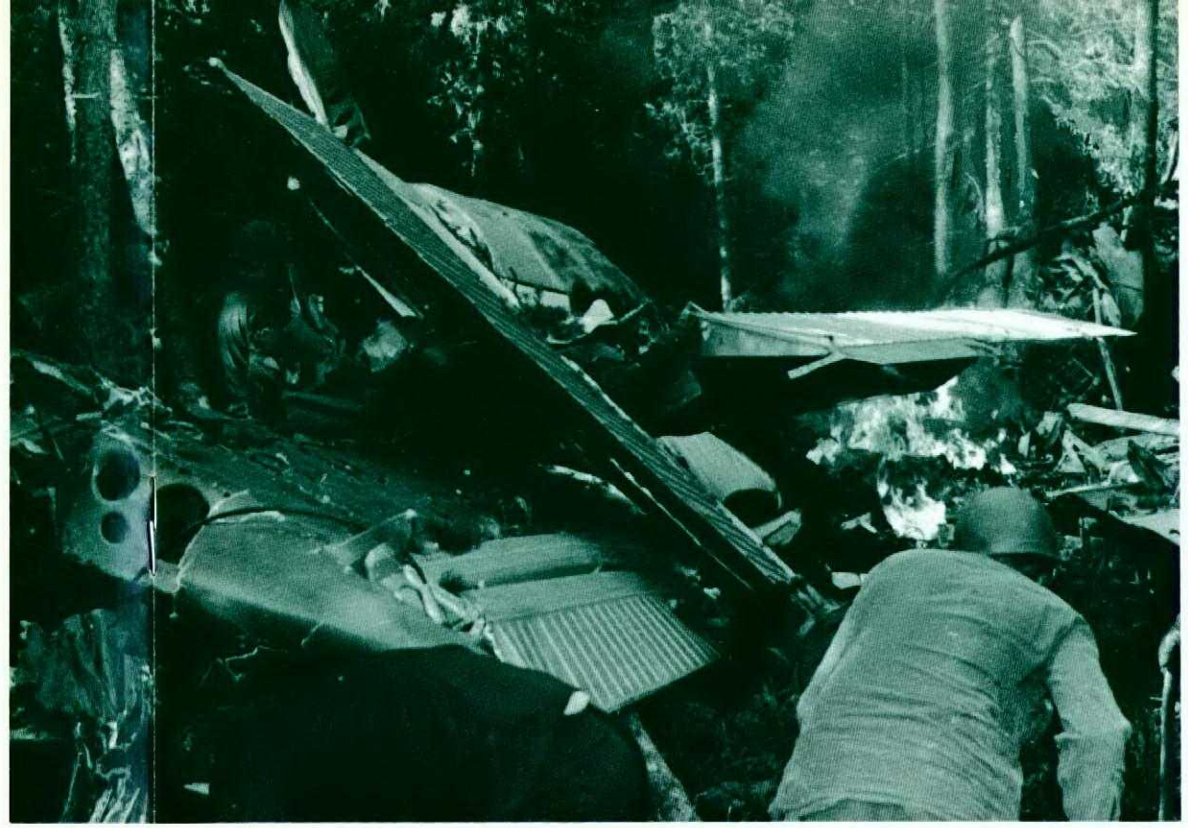
The Canadian Forces sustained eight ground accidents in 1974. This is an increase of five accidents over the previous year. Of the reported ground occurrences, which numbered 264, 138 resulted in damage to aircraft. There were no major injuries and 16 personnel received minor injuries. (There were a total of 29 minor injuries and 2 serious injuries associated with air and ground occurrences.)

Air Incidents

Although there was a substantial decrease in the number of flying hours there was little change in the total number of air incidents reported, which increased from 2353 in 1973 to 2376 in 1974.

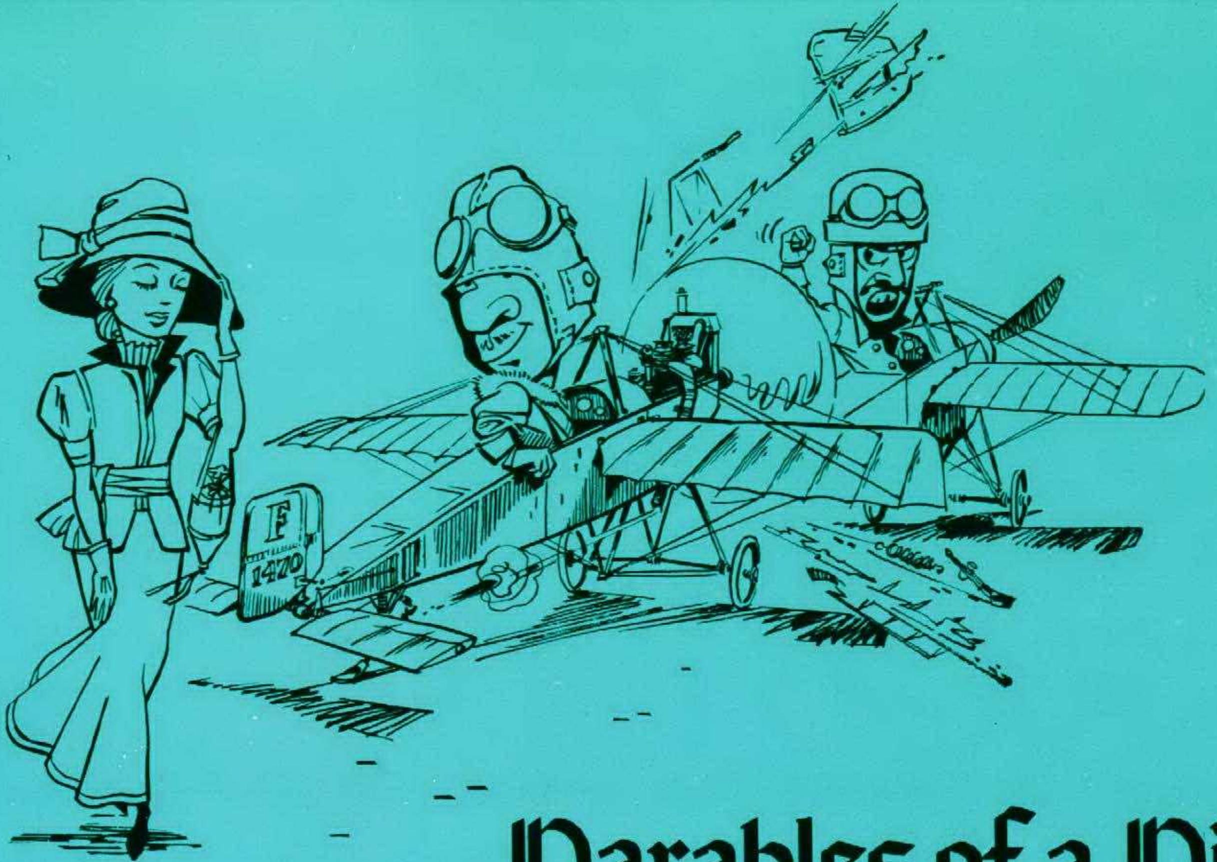
Air Accident Causes

The 32 air accidents in 1974 were assigned 63 cause factors. PERSONNEL ranked highest with 43. MATERIEL was assigned 13 and ENVIRONMENT accounted for 3. The remaining 4 cause factors were listed as UNDETERMINED.



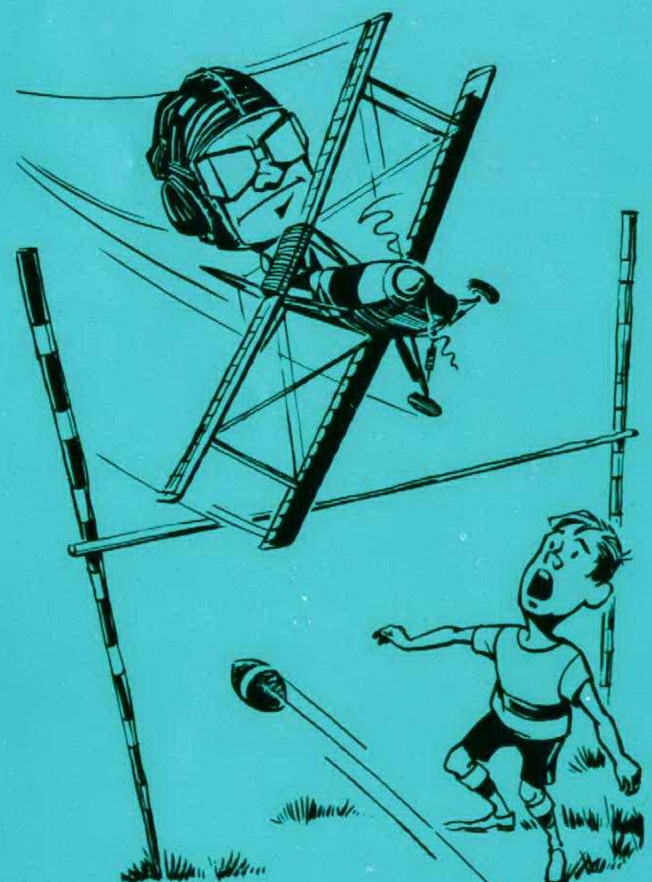
	T33	CF104	CF101	CF5	TUTOR	CH135	CH136	CH113A	CH147	SEA KING	OTTER	TRACKER	BUFFALO	HERCULES	TOTAL
Destroyed	1	5		2	1		1	1	1		1				13
B Cat				1	1					1					3
C Cat		4	3	1		1				1	2	2	1		15
All Acc	1	9	3	4	2	1	1	1	1	2	3	2	1	(1)*	32
Fatalities	2							3	5		1				11

* E Cat accident, serious injury, no aircraft damage



Parables of a Pilot

...from the Book of Experience



My sons, hear the advice of thy great grandfather and forsake not the laws of those who fly safely. For the days of my life are legion, and I have instructed much youth of the land in the ways of an aeroplane in the air.

Verily, men do foolish things thoughtlessly, knowing not why; but an aeroplane doeth nought without reason. Let not thy familiarity with aeroplanes breed contempt, lest thou become exceedingly careless at a time when great care is necessary to thy well being. A wise pilot scenteth trouble afar off and avoideth a forced landing in waste places.

My sons, obey the law and observe prudence. Spin thou not unless recovery is by a safe height, nor stunt above thine own domicile; for the hand of the law is heavy and reacheth far and wide throughout the land.

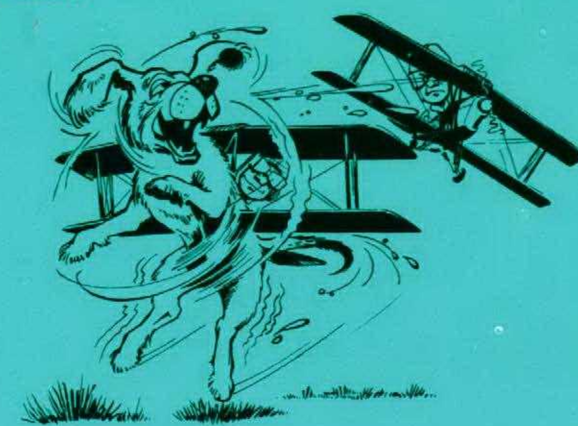
Incur not the wrath of those in authority by breaking their rules, for he who maketh the wrong circuit shall be cast into outer darkness, and whoso flyeth low over football games shall be forever damned.

As the telephone operator who giveth the wrong number, so is he who extolleth his exploits in the air. For I have watched him do his stuff on the ground. Lo, for an hour I have heard him talk of himself til he thinketh he is the best pilot ever. He is like unto a woman who knoweth not how to say good-bye on the telephone, and the truth is not in him. Though he be as honest as the day in all else, yet will he lie about his aerial adventures. His chest protrudeth and he maketh other men weary. He doth enlarge upon the dangers of his adventures, but in my sleeve shall be heard the tinkling of silvery laughter.

Let not thy prowess in the air persuade thee that others cannot do even as thyself, for he that showeth off in public places is an abomination unto his fellow pilots. More praiseworthy is he who taxieth into another machine whilst watching the damsel who has observed his prowess in the air.

Beware of the man who taketh off without looking behind him, for there is no health in him. Verily, I say unto you, his days are numbered.

My son, another student pilot shall come unto thee, saying: "Hearken not unto the words of thy great grandfather for he doteth; list to me whilst I tell how thou shouldst do so and so". But a little knowledge is oft-time of great danger and thou knowest full well that my teachings are founded on much experience.



Clever men take the reproofs of their instructors in the same wise as one will jest with another, confessing their dumbness and regarding themselves with humour. Yet they try again, profiting by wise counsels and take offence at naught that is said, for whoso hearkeneth unto his precepts shall fly safely, and shall be quite free from fear of trouble. A reproof entereth more into a pilot of sense than one hundred complaints unto a fool.

Knoweth thou a pilot who criticiseth not another's flying? I say unto you that there is not one who cannot point out another's faults and advise him what he should do.

Better is a dancing partner with two left feet, than he who laggeth behind in a formation, and keepeth not his appointed place, for his leader thinketh wild thoughts. As a wet dog who shaketh himself beside thee, so also is a pilot who usurpeth thy rightful place when landing in a formation.

As a plate of that soup is cold, yea, even as a kiss from thine own sister, so also is a flight without objective, it lacketh a kick.

As a postage stamp which lacketh glue, so are words of caution to a fool, they stick not, going in at one ear and out at the other, for there is nought to stop them.

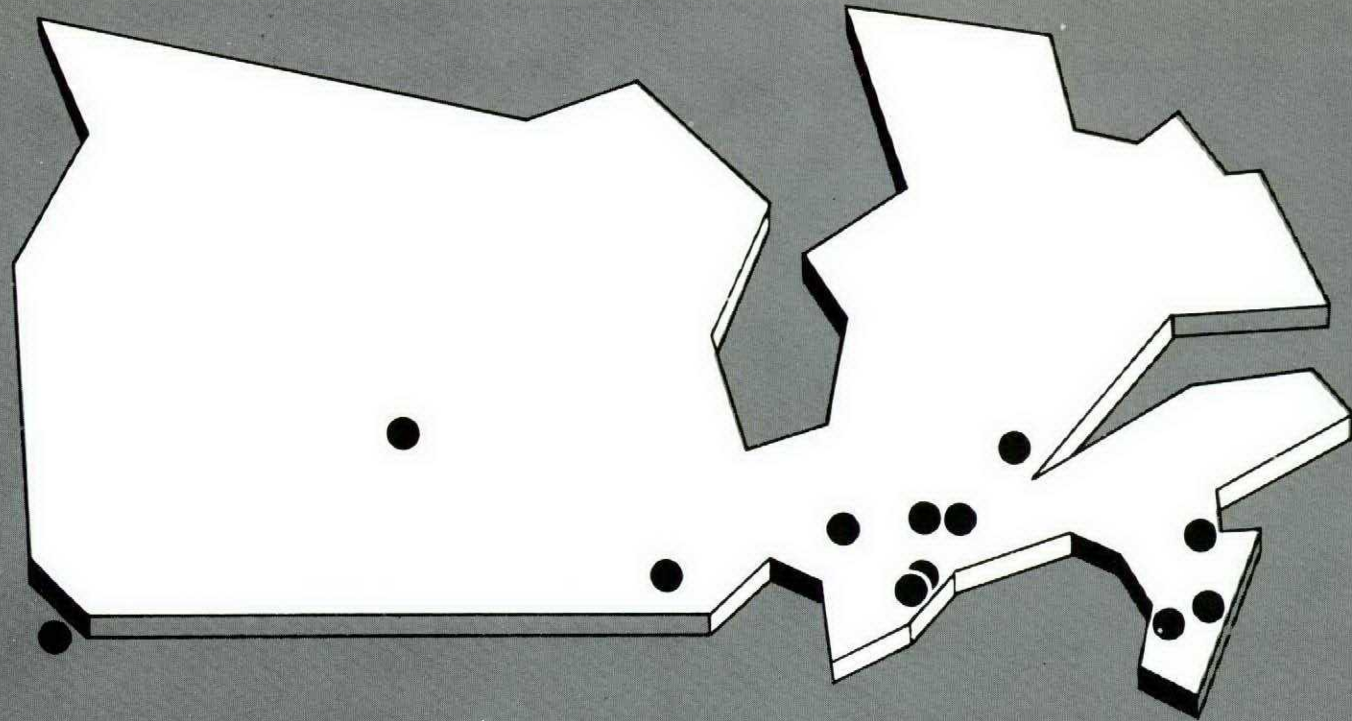
My son, hearken unto my teachings and forsake not the laws of prudence, for the reckless shall not inhabit the earth for long.

courtesy AIR CLUES

Reserves Flight Safety Course

The 1975 Mobile Command Flight Safety Conference was held at CFB Montreal (St Hubert Detachment) in early February. Flight safety officers from all FMC flying units were in attendance for the three day conference. Prior to the conference a special three day flight safety officers course was attended by selected reserve squadron pilots. In addition to formal lectures and presentations by FMC and DFS personnel the course members completed a 1 day practical exercise in the form of a flight safety survey at 1 Regular Support Unit, St Hubert Detachment.

Seated Left to Right: Maj FK Lawlor, DFS; Col JLR Lacroix, DComd 10 TAG; Maj JA Séguin, FMCHQ/SOFS and Capt RW Slaughter, 402 ARS.
Standing Left to Right: Capt JD Robinson, 401 ARS; Maj JC Haip, 402 ARS; Lt KPJ Lehman, 400 ARS; Lt WJ McClenaghan, 400 ARS; Lt KW Graham, 402 ARS; Capt P Deschesnes, 438 ARS; LCol WW Jaremko, CO 400 ARS; Lt DC Blatchford, 411 ARS; Capt OM Sweetman, 4 RSU and Capt RH Peterat, 418 ARS.



TRACEABILITY

BIH
Bureau International
de l'Heure

National Research
Council
of
Canada

QETE
Hull, P.Q.

12
Regional
Calibration Centres

Canadian
Forces
Electrical/Mechanical
Test Equipment

Precision and Accuracy

calibration of CF test equipment

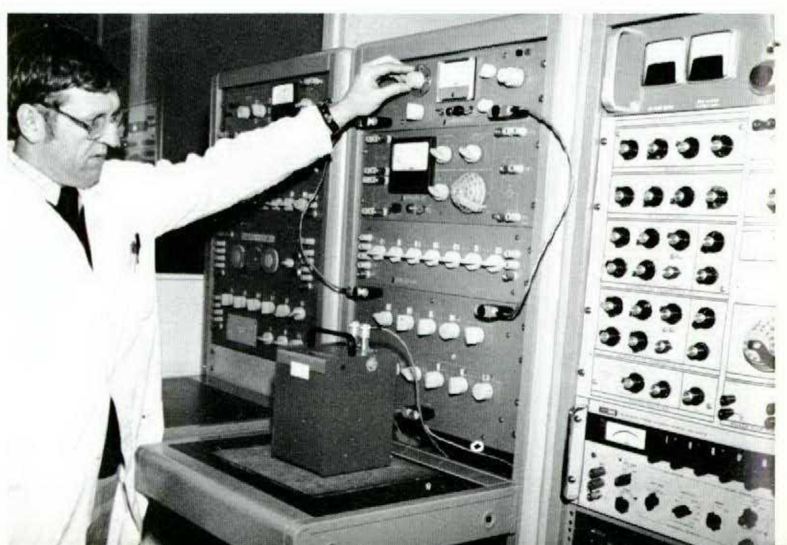
by Mr Earl Wilson
Cal Center
CFB Winnipeg

In 1955, at a highly sophisticated Armament Systems Lab. at Cold Lake, Alta., a brand new vacuum tube volt meter (VTVM) had just been delivered to the Repair Section and immediately placed in the top security test equipment cage. This item, the latest to arrive on the base, automatically became the A.C. Voltage standard. Two technicians working on permanent mid-shift would utilize the parameters of this instrument and others like it to "calibrate" the working standards of the Armament Systems Section. Precision they had! – Accuracy . . . well! That was a different matter.

Today, a highly capable chain of calibration centres has been developed to give assurance to the technician that a volt is a volt – an ohm is an ohm – an amp is an amp and a hertz is a hertz. Although all the instruments "standardized" to one instrument may have indicated the same readings there was no assurance 20 years ago that it was the right reading.

In the early '60s Logistics Command of the RCAF introduced a mobile calibration laboratory patterned after the USAF vans and travelled the breadth and width of the country bringing standards to the front door of the RCAF electronic laboratories and maintenance workshops at radar bases and flying stations. Each instrument carried by these mobile laboratories was certified and the traceability of accuracies documented every 6 months at a DND Approved Standards Laboratory. Each of these Standards Laboratories was responsible for the maintenance of standards traceable to the National Research Council of Canada which is a member of the International Bureau of Standards. Each instrument certified not only read the same but also had traceable accuracies to world standards at Bureau International de l'Heure (BIH) and for a time this immense improvement satisfied the needs of the Service.

CAE contractor technician Peter Andrychuk standardizing CAL Centre console to QETE certified capacitor.



The progression of the state of the art in electronics and the new instruments introduced into the service to maintain new radar and radio equipment soon rendered the Van Cals obsolete. The equipment required to calibrate the military test equipment became too large, both in numbers and size, to be transported for in-situ calibrations. To cope with the situation the concept of Calibration Centres was introduced resulting in today's modern up-to-date laboratories at fixed locations throughout Canada and Europe to assure traceable accuracies to the Canadian Forces. Each Calibration Centre is responsible for user units within a Regional Area who ship or deliver test equipment to the centre at regular intervals. Calibration Centres in turn have their Standards certified by QETE in Hull, Que. QETE is certified by the National Research Council of Canada and the chain is completed when the Research Council have their Standards certified by BIH.

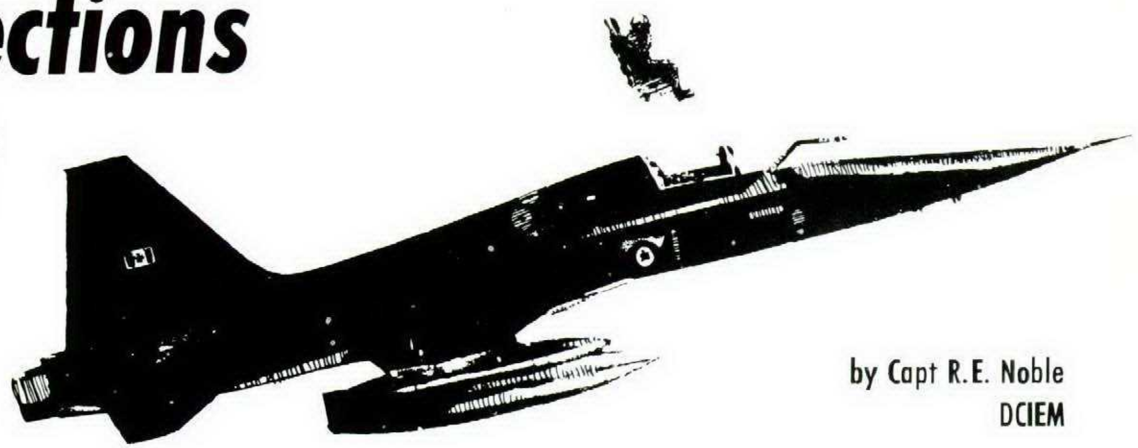
The Calibration Centres certify voltage to 5 parts per million, ohms to 20 parts per million, amps to 100 parts per million and hertz to 3 parts per trillion; all within the confines of temperature and humidity controlled labs audited by DND.

The "not-so-good-old-days" are gone – replaced by a technician with confidence in his instruments. World wide accuracy we now have!

RF power is certified traceable to the National Research Council by Ray Tuokko using portable QETE standards.

CAE contractor technician Walter Sametz varifying frequency and power of users signal generator.

Helmets and Head Protection in CF Ejections 1967-73



by Capt R.E. Noble
DCIEM

During the period 1967-1973, helmet retention and minor head injuries were significant problems in ejections from Canadian Forces (CF) aircraft. There were 73 ejections in which Canadian designed helmets were worn. Eighty-four percent of those who retained their helmets received minor head injuries.

This paper reports an analysis of helmet loss versus airspeed and Q force. Specific problems are addressed including the fitting and method of wearing helmets, and some guidelines for enhancing helmet retention are recommended.

During the 1950s, one of the chief operational roles assigned to the Canadian Forces (CF) was high altitude interception. The value of "crash hats" for reducing head injuries from impact was recognized and the use of protective helmets by jet aircrew became widespread. Initially the USN designed H-3 two-piece helmet was procured, but later the improved H-4 model became standard issue. In addition, limited numbers of contact helmets (APH-5s) were worn by CF aircrew so that user experience with this type was also gained. As a result of analyses of both types of helmets, it was decided that suspension-type helmets were best suited to the needs of Canadian aircrew. In the early 1960s the CF designed and developed the DH41 series jet helmet to replace the H-3 and H-4 types. The purpose of this paper is to report the effectiveness of the DH41-2 helmet in terms of its retention and the prevention of injuries during the ejection sequence.

Between 1 January 1967 and 31 December 1973 there were 73 CF ejections during which the ejectees wore the Canadian-designed aircrew helmet (Table 1).

TABLE 1
CF EJECTIONS WITH CANADIAN HELMETS

Total number of ejections	73
Successful	65
Fatal	8
Helmet Retentions	46
Helmet Losses	19

Of these, eight ejections resulted in fatalities (Table 2). The fatalities were categorized as:

- too low or outside the ejection envelope (6);
- fell out of parachute due to premature harness release (1); and
- man/seat collision (1).

TABLE 2 CF FATAL EJECTIONS

Number	Cause
6	Too Low
1	Fell out of parachute
1	Man/Seat Collision

Except for the man/seat collision ejection, the fatal injuries were all "multiple and extreme" and in these the helmet was not considered contributory to the outcome.

The man/seat collision fatality involved a CF104 in a pitch-up, the pilot ejecting into a severe thunderstorm at a speed of 300 kts at an altitude of 20,000 feet. His helmet apparently came off before he was struck on the head by the seat. It is difficult to assess whether or not his life would have been saved if he had retained his helmet. In my opinion, his survival would have been possible if he had kept his helmet on, because we have had other and similar man/seat collisions with no resultant fatalities.

Of the 65 successful ejections, 46 aircrew retained their helmets, whereas 19 aircrew lost their helmets. I will first discuss the 46 helmet retentions.

There were 17 minor facial injuries including bruised or burned faces, cut chins or nose bleeds. There was only one serious head injury involving a pilot who ejected at a speed of 200 kts and 12,000 feet. During the ejection sequence he held onto the seat. The man/seat separation was consequently prevented with the result that the seat struck the top front of the helmet. The helmet was forced to rotate back on his head producing a basal skull fracture. It could be argued that without the protection of the helmet the outcome would have been fatal. The remaining 28 ejecting aircrew received no injuries, despite the fact that five of them were involved in man/seat collisions during which their helmets were struck by the seat.

Turning to the 19 helmet losses (Table 3), they can be grouped as follows:

- Six helmets lost resulted from the incorporation of a breaklink (weaklink) in the chinstrap. The breaklink was designed to separate whenever the ejection forces on the wearer's neck exceeded 90 pounds. The breaklink was built into the chinstrap because the aircrew were, and in certain instances to this date are, apprehensive that the chinstrap could injure their necks in the event of a high-speed ejection. Consequently, we would expect the loss of a helmet at ejection speeds of 375 kts and upwards.
- Three helmets were lost as a result of unfastened chinstraps.
- Two helmets were lost as results of man/seat collision. The two ejections were from separate but identical types of aircraft at speeds of 220 and 225 kts, and altitudes of 1,800 and 14,000 feet. Both pilots held onto the seats which prevented the normal man/seat separation sequence from occurring. One pilot was struck on the helmet with a force sufficient to split the shell and the helmet was forced off his head. He received a very minor injury. The other pilot had his helmet pulled off the head from back to front by a parachute rigging line. It may be of interest to note that he had to cut away the entangled rigging lines from around the seat. He really had to hurry because his ejection started at 1,800 feet. He had no head injury.
- Eight helmets were lost during the tumbling phase of the ejection sequence. The aircrew stated that their helmets came off shortly after they ejected and before parachute opening. Medical and technical evidence indicates the helmets came off the head in a back-to-front direction.

TABLE 3 19 HELMET LOSSES

NUMBER	CAUSE
6	Breaklinks incorporated in Chinstraps
3	Unfastened Chinstraps
2	Man/Seat Collision
8	Tumbling – Back to Front

Our study (Tables 4 and 5) indicated that there was very little difference in the injury pattern between those who retained their helmets and those who lost them. Both groups received minor head injuries. However, in terms of percentages, 84% of those who lost their helmets received minor head injuries, whereas except for the single serious injury, only 38% of those who retained their helmets received minor head injuries. Though this is a small sample, the reduction of injury by over 50% is considered worth of note.

TABLE 4 19 HELMET LOSSES IN RELATION TO AIRSPEED AND Q FORCES (PSF)

AIRSPEED	APPROX. Q FORCE	NO. OF LOSSES	INJURIES MINOR	NIL	SERIOUS
100 – 199 kts	35 – 140	3	3		0
200 – 299 kts	140 – 270	6	4	2	0
300 – 399 kts	305 – 395	3	3		0
400 – 499 kts	520 – 850	7	6	1	0

TABLE 5 46 HELMET RETENTIONS IN RELATION TO AIRSPEED AND Q FORCES (PSF)

AIRSPEED	APPROX. Q FORCE	NO. OF LOSSES	INJURIES MINOR	NIL	SERIOUS
100 – 199 kts	35 – 140	16	9	7	0
200 – 299 kts	140 – 270	12	3	8	1
300 – 399 kts	305 – 395	12	4	8	0
400 – 499 kts	520 – 850	3	0	3	0
0	–	1	1	0	0
Unknown	–	2	0	2	0

While we believe that we have a helmet retention problem, our helmet does incorporate several retention devices including a visor, chinstrap, napestrap and oxygen-mask suspension. When all these are properly used, helmet retention is greatly enhanced. Laboratory testing indicates the helmet can be retained on the head up to and including MACH 1. Of course, the helmet must be properly worn and this includes the visor being down.

In view of the number of helmet losses, particularly those lost from back to front, a survey was conducted of 250 aircrew to assess the quality of fit of their helmets. Sixty-five percent of the aircrew were found to be wearing helmets that were too small, too large, too loose or in badly worn condition. In addition to the sizing factor, helmets were being worn too high or too far back on the head. Wearing the helmet in this manner compromises head protection from frontal impacts and also allows the helmet to act as a scoop when exposed to windblast, leading to its loss.

A helmet refitting program is currently in progress. The importance of the helmet being fitted and not merely issued is emphasized through the media of technical orders, aircrew briefings and articles published in *Flight Comment*. Three modifications have been made in the interest of increased retention; the designed breaklink in the chinstrap has been removed, the napestrap has been angled in such a way that when tightened it will not move up over the occipital bone, and an improved oxygen-mask suspension assembly is now in use, with the result that there are fewer facial injuries in our ejections. The importance of a fastened chinstrap and the visor being down on ejection cannot be over-emphasized.

Although considerable progress has been made in aircrew head protection, we still experience minor head injuries because we have not yet learned to keep a protective helmet in

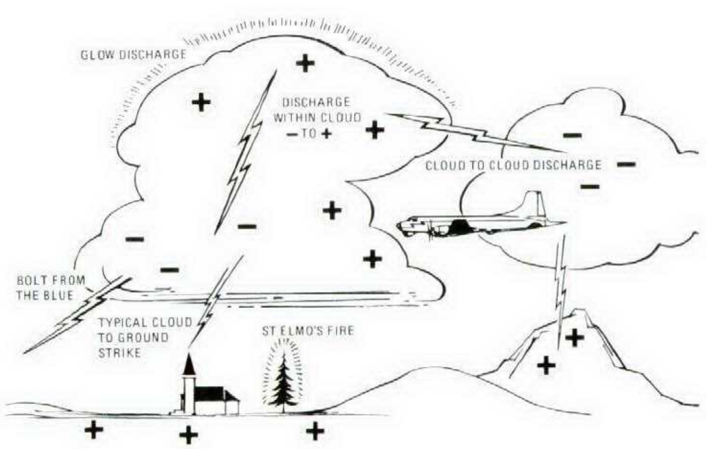
cont'd on page 22

Lightning

By J.T. Zawatsky and R.J. Mills

Man has advanced greatly in his understanding of the lightning process since that day in 1756 when Ben Franklin got soaking wet proving that clouds were electrically charged but there is still a great deal to be discovered on the subject. Old Ben probably never guessed that at any one moment 1,800 thunderstorms are raging over the face of the earth producing an average of 100 cloud-to-ground lightning strokes every second, and he could hardly have foreseen the heavier-than-air flying machines not to mention the effects that a lightning strike would have on these machines.

Since Franklin's time, studies have been conducted to determine the effects of lightning strikes on various types of aircraft under actual flight conditions. Lightning strokes are regularly produced artificially in the laboratory and experiments are conducted to determine which parts of the aircraft are particularly susceptible to lightning strikes and to find ways of combating the destructive effects of lightning. Man has even produced lightning in the atmosphere, albeit unwittingly. A 10-megaton thermonuclear device set off in 1952 created a sufficiently strong electrical field to "trigger" lightning strikes to antenna towers in the area. Modern research tools have unlocked many of the mysteries surrounding the phenomenon of lightning and the "seeding" of thunderstorms with silver iodide crystals appears to reduce its destructive effect. The total elimination of lightning as a hazard to aviation, however, is unlikely.



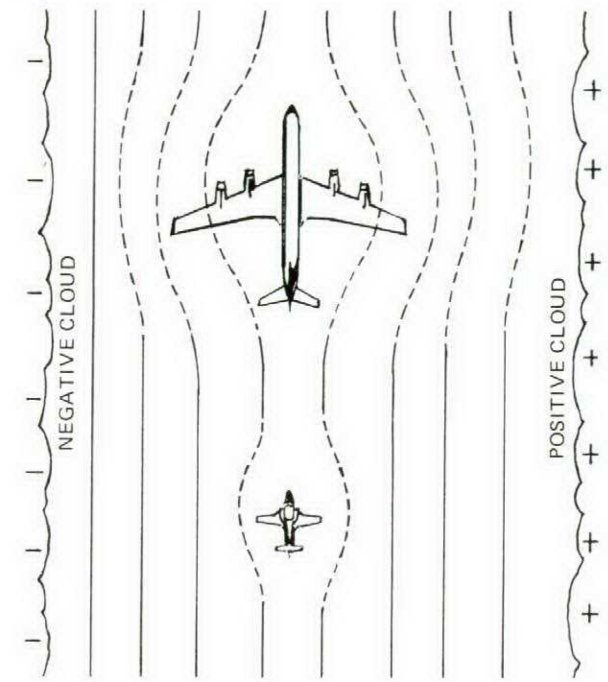
What Causes Lightning?

Many theories have been proposed to explain how the base of a thunderstorm develops a strong negative charge while the top develops a strong positive charge. It is, however, generally accepted that the charge separation is somehow accomplished by the upward transport of rain in the strong vertical currents within a thunderstorm. If a sufficiently large potential develops between the negatively charged base of the cloud and the positively charged earth surface (one million volts appear to be the minimum required although values as great as one hundred million have been recorded), a flow of electrons will be initiated from the base of the thunderstorm to some prominent object on the earth's surface. The stream of electrons fork earthward in a series of irregular steps, each about 150 feet long, as the streamers search out a path of least resistance through the poorly conducting air. The downward moving streamer finally makes contact with an upward moving positive streamer a short distance from the earth's surface thus forming a pathway for the discharge of electrons. Usually, there are three discharges down the pathway but there may be as many as fourteen before the negatively charged base of the thunderstorm is drained of electrons.

The foregoing is a simplified description of the lightning mechanism applies primarily to the typical cloud-to-ground discharge which, although it may be the most frequent type of lightning observed from the ground, is by no means the most common or the most hazardous to aviation. Approximately 90% of lightning strokes go from the negatively charged portion of one thunderstorm to the positively charged part of a neighbouring thunderstorm, perhaps as far as 5 to 10 miles away. Occasionally, a lightning bolt will terminate in mid-air some 20 to 40 miles from the originating CB. Often lightning travels from the negatively charged region to the positively charged region within the same thunderstorm producing a general illumination of the whole CB cloud known as "sheet lightning". Sometimes the whole top of a thunderstorm may give off a glow or corona discharge. When this phenomenon occurs on an aircraft in flight or on an object at the earth's surface, it is called "St Elmo's Fire" and is an indication that a highly charged electrical field is present and objects in the area are susceptible to lightning strikes.

Why are Aircraft Struck by Lightning?

Many experts would answer that aircraft are struck only because they were in, or very near, the natural path of the lightning bolt. However, this does not appear to be the whole story. On Nov. 14, 1969, APOLLO 12 was struck by lightning shortly after launch even though the thunderstorms which had been occurring in the area had either dissipated or moved off one half-hour previously. This indicates that a strong electrical field still persisted at the time of the launch and the lightning was actually "triggered" by the rocket itself. This "triggering" effect is further reinforced by the fact that discharges to the aircraft have been observed during penetration of dissipating CB's as shown, for example, by the results obtained during the 747 trials. If a sufficiently strong electrical field exists, the "triggering" effect appears to be dependent on two factors, the "size" and the "speed" of an aircraft.



Because a relatively large voltage discontinuity is necessary to initiate a streamer and a large aircraft will stress the existing electrical field more than a small aircraft, the larger aircraft would be more susceptible to lightning strikes. It is believed that a lightning stroke passing within a zone approximately twice the length by twice the wingspan of an aircraft will be diverted to pass through the aircraft. Also, an aircraft is trailed by a cloud of ions generated within the engine exhaust and, consequently, even for a high performance fighter with a trail only a few yards long, it is suspected that a lightning stroke could be "led" to the aircraft from the charged exhaust trail. Whether an aircraft actually triggers a lightning strike or whether they merely happen into the natural path of the lightning is not known at this time. However, it is known that the aircraft itself is not the terminal point of a lightning strike.

Lightning usually strikes an aircraft at some extremity such as nose, wing tip, antennae, etc., and usually leaves the aircraft through the trailing edge or opposite wing tip. The entry point for multiple lightning strokes is usually the same and this may burn a hole up to one inch in diameter. If, however, there is a voltage breakdown between strokes, a new entry point will be established and this will result in only minor pitting of the aircraft skin. Structural damage to the aircraft skin has led some scientists to classify lightning as "hot" or "cold", depending on the type of damage caused. Hot lightning involves smaller currents of longer duration and has inflammatory tendencies, whereas cold lightning has higher currents and shorter durations resulting in damage by explosive heating of moisture or air in wood or composite materials. The electrical charge in a lightning stroke is usually carried on the outside of the aircraft. When this charge comes in contact with poorly conducting composites such as radomes, there may be a rapid expansion of gases within the material itself or a rapid build-up of pressure within the enclosure resulting in explosive disintegration of the radome. If a forward-located radome is struck and explodes, debris carried aft by the slipstream may do additional damage to the fuselage, controls or engines.

The solid state circuitry of today's avionics is more vulnerable to lightning than the vacuum tubes and large components of yesterday. Lightning strikes often disrupt electrical circuits resulting in the occasional bizarre incident such as disengagement of auto-pilot or jettisoned tip tanks. The trend towards the greater use of solid state electronics, more reliance on electronic flight controls, the preprogramming of flights on airborne computers, the greater use of poorly conducting plastics and composites, and the manufacture of bigger and faster aircraft all indicate that aircraft of the future will be more susceptible to the lightning hazard.

Aircrew have noted that a lightning strike is often preceded by excessive noise on the intercom and radio transmitter, forward streaming of St Elmo's Fire and glowing or flickering marker beacon lights. When lightning does strike an aircraft, structural damage is usually minor and injury to the occupants extremely rare. Many lightning strikes go unnoticed until some evidence is revealed by a post-flight inspection. Lightning strikes have been reported by aircraft occupants to have caused a prickly sensation on the skin and to literally make their hair stand on end.

Reports of some of the more dramatic lightning strikes suffered by aircraft in flight can be quite unnerving. There is an authenticated case of "Ball Lightning", a phenomenon not fully understood, in which a ball of lightning was produced in the flight station of a large aircraft following a lightning strike. The "ball" then floated down the aisle between the seats and smashed a two-inch hole in the rear of the cabin as it exited. Only a little less disturbing but a lot less destructive is the loud "bang" that is sometimes heard by the occupants of an aircraft that has been struck by lightning. This phenomenon, too, is not fully understood but is believed to be due to a return stroke from the earth that follows the pathway of the original discharge which travelled from cloud-to-aircraft-to-ground. Another very real problem that often accompanies a lightning strike is a flash of light which may produce temporary blindness. This blinding effect may last as long as 15 seconds and may be minimized by turning the cockpit lights to full bright upon reaching areas of high electrical activity. A somewhat similar, though less intense, blinding effect may occur when St Elmo's Fire builds up on the leading edges of an aircraft.

Since lightning is a result of thunderstorm activity, it is difficult and perhaps misleading to isolate lightning from the other more dangerous flight hazards associated with thunderstorms. Turbulence, icing, hail or precipitation usually occurs in combination with lightning and to attempt to single out one particular flight hazard distorts the basic interdependence of the phenomena.

How To Avoid Lightning Strikes

The best way to avoid the destructive effects of lightning is to avoid thunderstorms; however, this is not always possible. To minimize the probability of lightning strikes to an aircraft, pilots should ensure that they receive a thorough weather briefing before flying into areas of actual or expected thunderstorm activity. Severe weather centres in the US and specially formed severe weather cells at various forecast offices in Canada are constantly on the alert for possible thunderstorm development and do a good job of separating the really severe activity from the more common and less destructive, although still potentially hazardous, air-mass thunderstorms. Weather information in the form of AIREPS, PIREPS, RAREPS, SIGMETS, weather advisories, and weather warnings provide valuable preflight and inflight guidance for pilot decision making. Radar, both ground based and airborne can be used to avoid thunderstorms. However, it should be noted that ATC radars are usually operated so that as many weather returns as possible are eliminated.

In conclusion a pilot runs the greatest risk of encountering a lightning strike when:

a. flying in or near cloud;
b. flying in precipitation and encountering turbulence; and
c. flying below 22,000 feet and within 5,000 feet and/or 10°C of the freezing level.

Changes In Weather Reports and Forecasts!

Beginning 1 Aug. 1975, aircrews will notice a significant change in the format of the hourly weather reports and weather forecasts when they visit their local Met Office. The familiar symbols of "O" (clear), "Φ" (scattered), "◍" (broken) and "⊕" (overcast) will be replaced by CLR, SCT, BKN and OVC respectively. These changes are necessary to facilitate communication equipment compatibility and will take effect commencing 0001 GMT, 1 August 1975 concurrently in both Canada and the United States.

The symbols "-" (thin), "X" (obscure) and "-X" (partly obscure) will, however, be retained.

Examples of the New Format:

OLD – 30ΦM50◍140⊕15
NEW – 30SCT M50BKN 1400VC 15
OLD – -XC3⊕1/4F
NEW – -XC30VC 1/4F

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R.J. Mills. Mr. Mills joined the Met service in 1969, following his graduation from Memorial University of Newfoundland. During his career, Mr. Mills has worked in both the military and civil environments and is presently working in a Management Development position in D Met Oc/NDHQ.

cont'd from page 19

place through the rigors of ejection. It would be relatively easy to develop a helmet that would stay on the head regardless of the forces applied. However, unless the resulting helmet is light enough and provides unobstructed vision and comfort, it would not be acceptable to the aircrew.

All of the problems of helmet retention may never be completely resolved as there are too many variables in an ejection which can produce an injury.

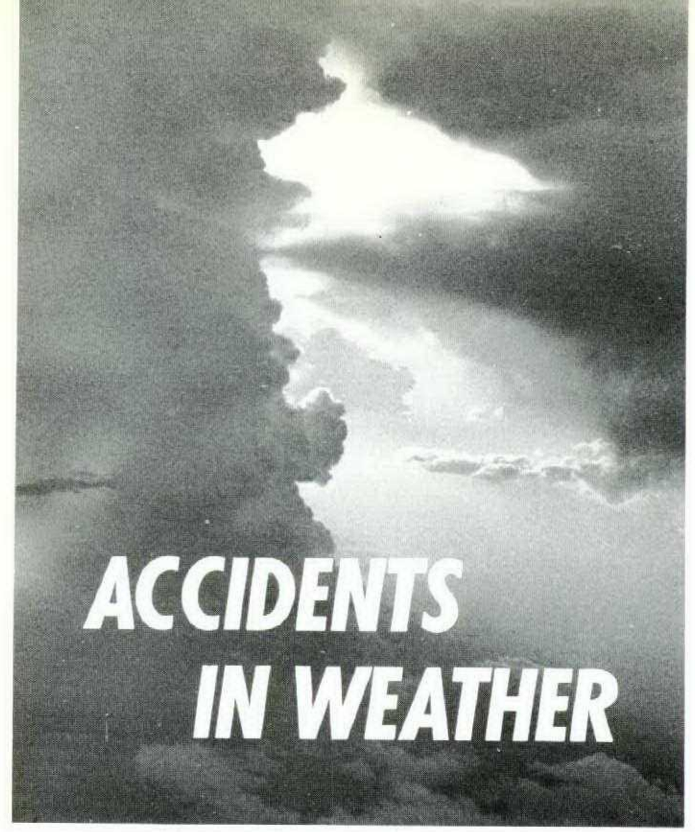
In summary, our seven-year study of CF ejections indicates that when helmets are lost the chances of injury are increased. Improved retention devices and fitting methods should increase the probability of keeping the helmet on, but the best retention devices are useless if aircrew will not use them properly. The most important of our data demonstrates that where we had head impact due to man/seat collisions, the CF designed helmets provided excellent protection. ■

Just another chip light!

Engine chip detector lights have been flashing regularly in the Kiowa fleet and most have been due to metal fuzz on the magnetic plug. However, lest complacency come sneaking up on you Kiowa drivers here's a case from Valcartier:

The engine chip detector light illuminated and the pilot landed and shut down the aircraft. Both engine chip detector plugs were removed and metal filings were found. The oil filter was removed and also showed signs of metal contamination. The plugs and filter were cleaned and re-installed. The aircraft was ground run for twenty minutes and the plugs were checked: metal filings were once more discovered. Another ground run was successful and the aircraft took off on a test flight. Fifteen minutes later the chip light illuminated again. The aircraft was eventually recovered (by slinging) to home base. The engine strip indicated that No 2 bearing had failed, leading to metal contamination and compressor damage.

The message is clear, whatever aircraft you fly: "BELIEVE THOSE LIGHTS"



ACCIDENTS IN WEATHER

The National Transportation Safety Board, finding fatal weather-involved general aviation accident rates worsening while over-all rates improved, today issued 10 safety recommendations seeking better trained pilots and improved aviation weather services.

The recommendations are contained in a special study of fatal, weather-involved general aviation – non-airline – accidents in 1964 through 1972. The study showed that since 1967, the trend of such accidents has been steadily upward while the trend of the rate of all fatal accidents has been generally downward.

The study report draws from the Board's accident statistics a picture of the general aviation pilot most likely to be involved in a fatal accident involving weather. This pilot:

- holds a private pilot's license, has no instrument rating and only a few hours of simulated instrument flight time;
- is making a pleasure flight with at least one passenger;
- receives an adequate preflight weather briefing by telephone based on forecasts which are reasonably accurate;
- crashes in instrument flight weather conditions, probably in fog or rain during daylight hours.

A total of 4,714 persons died in 2,026 fatal weather-involved general aviation accidents in the period 1964-72. No other cause was as frequently cited as weather. These accidents represented 36.6 percent of all fatal general aviation crashes, and came "with disturbing regularity despite improvements in aircraft, instrumentation, training, training facilities, the air traffic control system, weather facilities, weather services and navigational aids," the Safety Board said.

Nearly 60 percent of the fatal weather accidents involved pleasure flying. Pilots had relatively little flight time; peak involvement according to flight time was between 100 and 300 hours. About 65 percent of the accidents involved pilots who had less than 50 flight hours during the preceding 90 days.

The most frequently cited pilot causes were "operation beyond experience/capability level" and "failure to obtain/maintain flying speed". Almost 62 percent of the pilots did not file flight plans, suggesting the possibility "that there may be a relationship between accident involvement and lack of a filed flight plan", the Board said.

In the cases studied, 74 percent of National Weather Service forecasts either were substantially correct or overstated the weather problem expected. In 11 percent, weather was worse than forecast. More than 28 percent of the pilots received no preflight weather briefings, and the accident rate for every 100,000 cases in which a pilot studied weather information by himself was nearly 10 times the rate for pilots briefed by trained weather briefers.

The Safety Board had concluded in 1969 that too many weather-involved fatal general aviation accidents were being caused at least partially by "the pilot's mistaken idea of his ability to cope with certain weather situations". Despite broad-scale government and industry efforts, the Board said today it must conclude from its latest study that "the situation has not improved".

The Board urged general aviation pilots to take all possible advantage of weather flying education and experience, visit Weather Service and FAA facilities for familiarization, watch Public Broadcasting Service televised aviation weather programs, and make suggestions for improved weather service.

"Never initiate a flight without a thorough preflight weather briefing, and if there is any doubt, DON'T GO", the Board said.

The Safety Board recommended that . . .

- The Federal Aviation Administration (1) increase the 35-hour minimum of student pilot classroom instruction and specify meteorology curriculum hours; (2) examine such students for practical application as well as technical knowledge of meteorology; (3) require that a student demonstrate "competence to procure and utilize weather information"; (4) require a commercial certificate applicant to give evidence of meteorological knowledge; (5) increase the emphasis on weather, and pilot limitations in it, in the FAA General Aviation Accident Prevention Program; (6) take priority action to meet the 1976 goal for nationwide implementation of its "Flight Watch" service – updating for en route pilots by radio the preflight weather information they received; and (7) experiment, at least, with audio recording of preflight weather briefings.
- The National Weather Service of the National Oceanic and Atmospheric Administration (1) accelerate efforts to update its manual, "Aviation Weather for Pilots and Operations Personnel"; (2) speed expansion of its nationwide evaluation staff toward its proposed one-per-State complement, and include in this evaluation meteorologist's responsibilities for the quality control of aviation weather observations; and (3) accelerate efforts to "improve the presentation of aviation weather products".

from a recent NTSB bulletin

GEN FROM 210

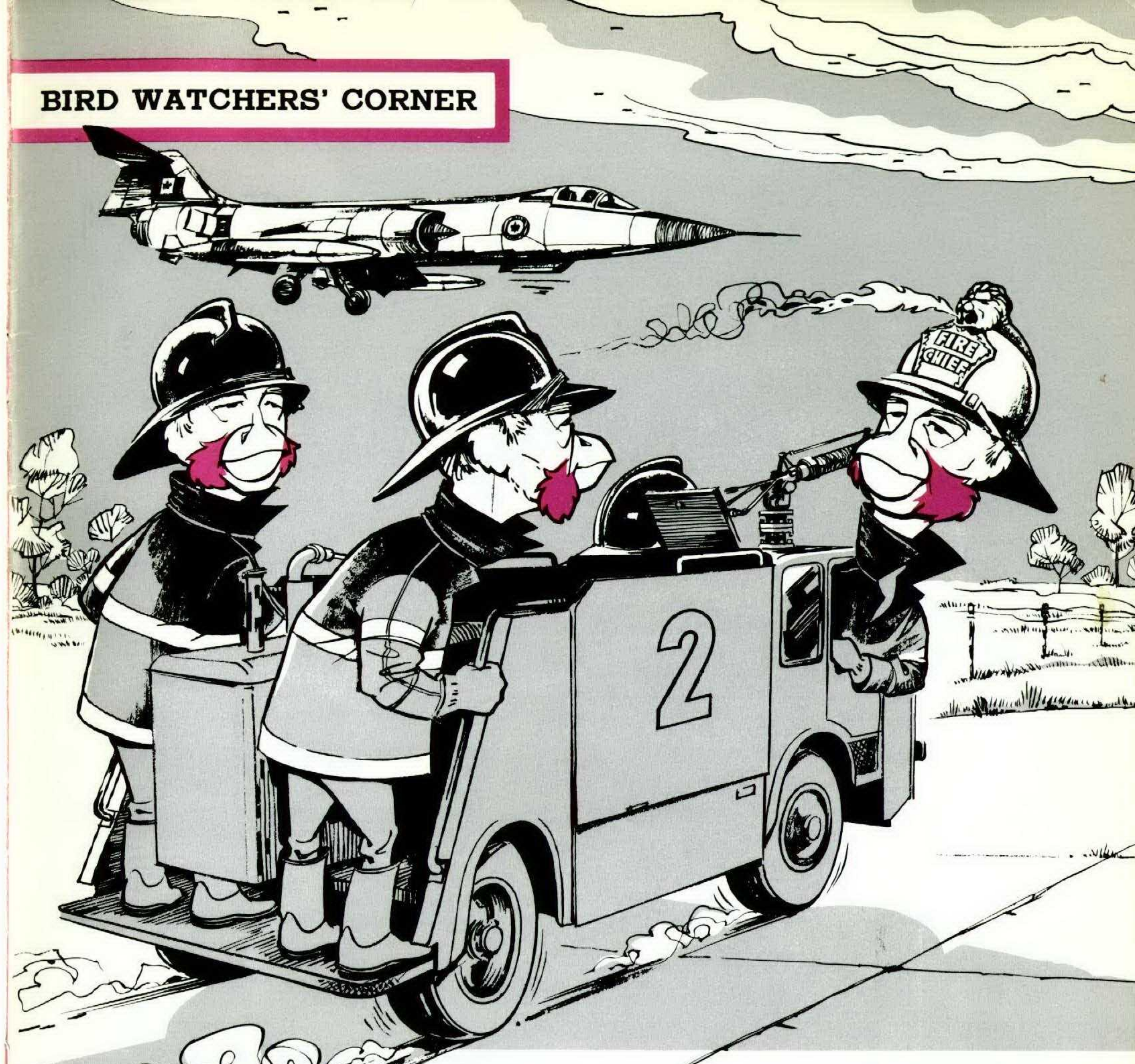
On the morning of 14 Jan 75, a navigation detail was scheduled. The detail was cancelled due to unsuitable weather and it was therefore decided to conduct pilot training. The 1st officer had already completed the external and internal checks and was sitting in the left hand seat. The pilot entered the cockpit and it was agreed that he should occupy the left seat in order to benefit most from the available time. After he had adjusted the seat he looked out and the ground crewman was standing there holding the ground safety pins. The pilot gave him the thumbs up to put them away, but on glancing at the gear and main pressure gauges, he noticed the main pressure to be slightly under the required 300 PSI. Instead of placing the gear handle to the down side and pumping the hydraulic pump handle, he inadvertently lifted the latching lever and attempted to pump the selector lever. As soon as the selector lever was removed from the neutral position the left gear collapsed rather slowly but certainly irretrievably. Switches were turned off and the aircraft evacuated. The aircraft came to rest on the left wingtip and the tip of the propeller blade. The propeller blade itself was bent as was the engine mount. Also the left wing was wrinkled just inboard of the removeable tip.

The pilot was participating in Exercise Open Challenge III and had previously flown one reconnaissance and one interdiction mission prior to the day of the accident. On 12 May 74 he was scheduled for his second interdiction mission with a proposed takeoff time of approximately 1215 local. His mission briefing was scheduled for 65 minutes before takeoff, at which time he was given a mission briefing which directed him to proceed to a Timer Reference Point via turning points, from there via his own routing to a pull-up-point from where he was to pull-up and make an attack on an equivalent target which was specified as being a bridge. He was expected to overfly the TRP to a tolerance of 250 meters and 10 seconds, and he was expected to overfly the equivalent target at a minimum of 600 feet above ground level. On completion of the run over the equivalent target, he was to proceed to the JIMMY LAKE Range where he was to conduct two bombing attacks and one strafe attack on the range targets.

The pilot arrived at mission planning, planned his route on a 1:250,000 scale map, proceeded to the flight line, signed out CF5A 116756 and took off from COLD LAKE. He started his planned mission, overflew the TRP within the tolerances required, proceeded to his pull-up-point and attacked what he thought was the equivalent target. As he passed over what he initially thought was the equivalent target, he saw the actual target out to his left at an angle of 45° – 50°. He turned the aircraft sharply to the left in an attempt to overfly the equivalent target. During this turn the aircraft was placed in a condition of flight where the nose and the left wing dropped and the aircraft began mushing towards the ground. The pilot took immediate recovery action but the aircraft struck several trees at the bottom of the pull-out and upon emerging from the trees, with the aircraft in a nose-up attitude, the pilot ejected. The aircraft struck the ground and was completely destroyed.

The safety equipment worked normally and the pilot landed in a tree covered area shortly after parachute deployment. He was hoisted into a rescue helicopter and returned to CFB COLD LAKE within one hour and fifteen minutes of the crash.

BIRD WATCHERS' CORNER



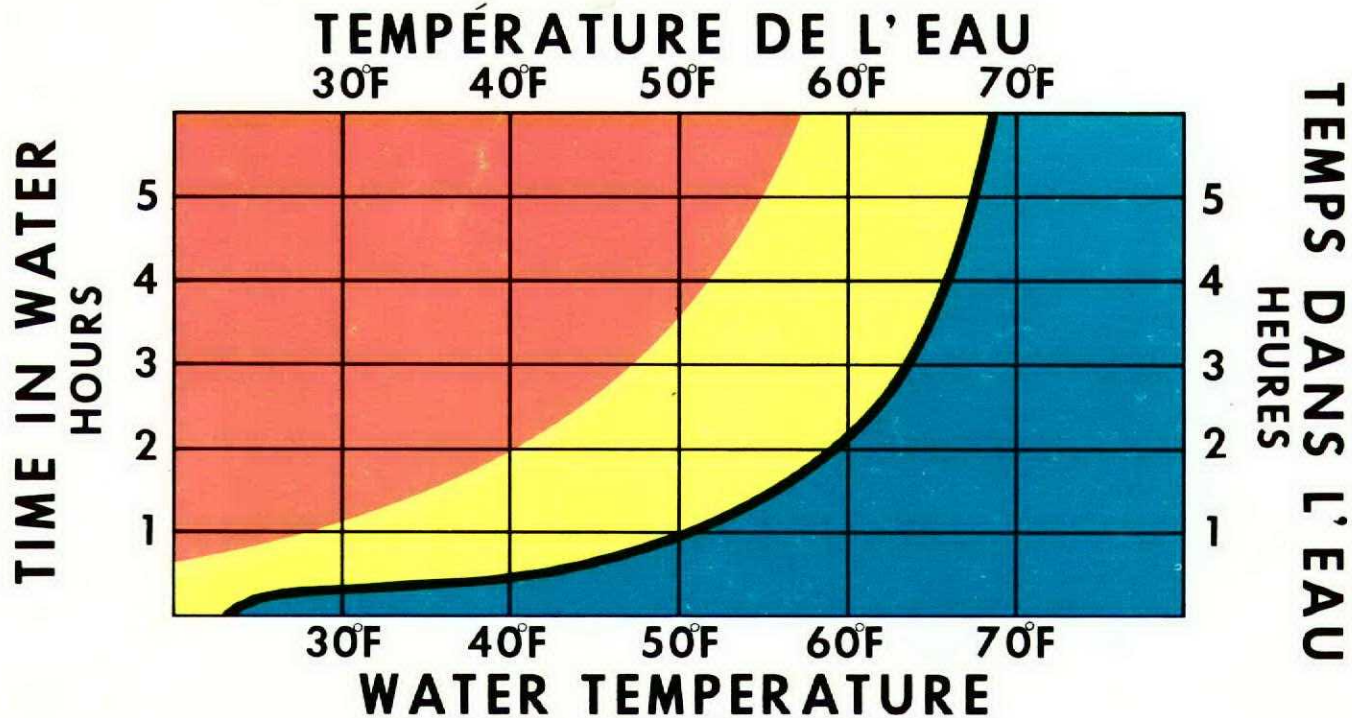
FRIENDLY FIREBIRDS

Every flying base has its own special flock of birds who usually nest close to the hangar line. These are the plucky firebirds who are ready to respond to the needs of their feathered friends at any time of the day or night. At the first sound of an alarm bell they quickly hop aboard their shiny bright red chariots and fly off to the scene of the problem. Firebirds are well trained in fire-fighting and rescue work and are dedicated in their support of flying operations. Their presence guarantees that a bird on final approach with a broken leg can be sure of immediate assistance if he singes his feathers on landing or if he develops a fire in his tail. When they are not busy on the flight line these community-minded birds will be found instructing the young base fledglings on fire safety or checking nests in the area for potential fire hazards. The friendly firebirds are firm favorites everywhere and their cheerful call is often heard:

**IF-THERE'S-FIRE-IN-YOUR-NEST
-CALL-US-OUT-WE'RE-THE-BEST**

TIME OF LIFE EXPECTANCY IN WATER WITHOUT ANTI EXPOSURE SUIT

DURÉE DE VIE PRÉSUMMÉE DANS L'EAU SANS VÊTEMENT PROTECTEUR



100% EXPECTANCY OF DEATH	**LETHAL**	(red)	**FATALE**	*RISQUE DE MORT—100%*
50% EXPECTANCY OF UNCONSCIOUSNESS WHICH WILL PROBABLY RESULT IN DROWNING	**MARGINAL**	(yellow)	**CRITIQUE**	*RISQUE À 50% D'ÉVANOUISSEMENT, SUIVI PROBABLEMENT DE NOYADE*
	SAFE ZONE	(blue)	**ZONE SÛRE**	