FLIGHT COMMENT

MAY • JUNE • 1969

Introducing our new "INFO" series of bulletins — another way of keeping you in the picture.

Comments

The Flight Safety Committee minutes for the cold weather period last winter testified to an epidemic of flying clothing delays and shortages. This perennial nuisance seems to stem from either end of the pipeline. Your job is to give the system time enough to respond to requests; the "other end" might well look into a condition which has apparently confounded military supply experts since at least, the Crimean War.

SOAP (Spectrometric Oil Analysis Program) paid off recently when a CH112 engine was removed as directed by the SOAP officer. After iron and aluminum traces in the oil were detected, the engine was examined and found to have a cracked crankcase at the centre main bearing. The oil pump housing was gouged and the scavenge gears were deeply nicked. The upper end of several outer valve springs were heavily worn, and six piston pin plugs were worn tapered. In its low-level role this is one aircraft where an engine failure could have disastrous consequences. (NDT is examined elsewhere in this issue in "NDT at the Crossroads".)

At 120°F a jet engine produces only four fifths as much power as at 60°. Here's a few rounded-off figures for safe summer flying:

Compressor Inlet Temp(F)	% Thrust Available at 100% RPM
120	81.6%
100	86.9%
80	92.9%
70	96.3%
59	100.0%

The statistics section came up with a very thought-provoking item the other day. In the periods ending 15 Jan we lost 17 CF104 aircraft every two years for 1963-64, 1965-66, and 1967-68. This figure came to light during the preparation of a ***progress*** report!

Exposure to excessive doses of sunlight during the day means less-than-good night vision that night. If you're scheduled to night-fly wear protective glasses and preserve that extra margin of acuity which may come in handy. It's a good thing to keep in mind this summer.

425 AW(F) Alouette Squadron, CFB Bagotville, plans a combined reunion and sap-sucking spree for the weekend of 20-22 June. All former squadron members are invited and urged to attend. In order to aid the planning committee in the preparation of invitation lists, etc, all interested former members are asked to contact Capt Keith Bottoms, Box 406, CFB Bagotville, Que, stating period attached to 425 Squadron and present address. Please pass this information to any former members. Personal invitations and schedule of events will be mailed to all known 425 Alumni.

CANADIAN FORCES HEADQUARTERS · DIRECTORATE OF FLIGHT SAFETY

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A SHIFT IN EMPHASIS

The final review of the 1968 accident/incident analysis has just been completed and we are again forcibly reminded that people are still the main area of concern. We have continued to make headway in reducing the number of accident causes attributed to materiel and environmental deficiencies but we have made no headway whatsoever in reducing the number of instances where personnel error results in resource losses. This is most important since in 1968 human failing is present in 66% of the air accidents, and in 65% of the ground accidents and incidents. The fact that this situation has remained relatively constant for several years demands that we do something about it now. Some of the obvious questions we must ask ourselves:

- In what areas do we err most often, and why?
- Do we analyze our errors carefully enough, and is coordinated action taken to correct or compensate for known weaknesses?
- Do we regularly review the action taken to ensure that it is still applicable?
- Do we hesitate to tackle the human error aspect because it is too complex - or worse, do we accept the old cliché "to err is human"?

I am sure that many of us will have difficulty in answering these questions to our own satisfaction since the record clearly indicates that we continue to make the same or similar mistakes over and over again.

We are examining the broad aspects on patterns of human behaviour in an attempt to establish more clearly why people make mistakes in and around aircraft. This is a long-term study involving many agencies and cannot, in the foreseeable future, be expected to provide answers to our everyday problems.

The annual review enables us to assess general problem areas; similarly, everyone associated with aircraft operations should continually assess his job. After all, it's you the individual - as well as the Canadian Forces' operational capability - that suffers when an aircraft accident occurs.

COL R. D. SCHULTZ
DIRECTOR OF FLIGHT SAFETY

NDT at the crossroads

Maj. M. Chamberland
CFHQ Directorate of Aerospace Engineering

Two feature articles within the realm of Non-Destructive Testing appeared in Flight Comment during 1967:

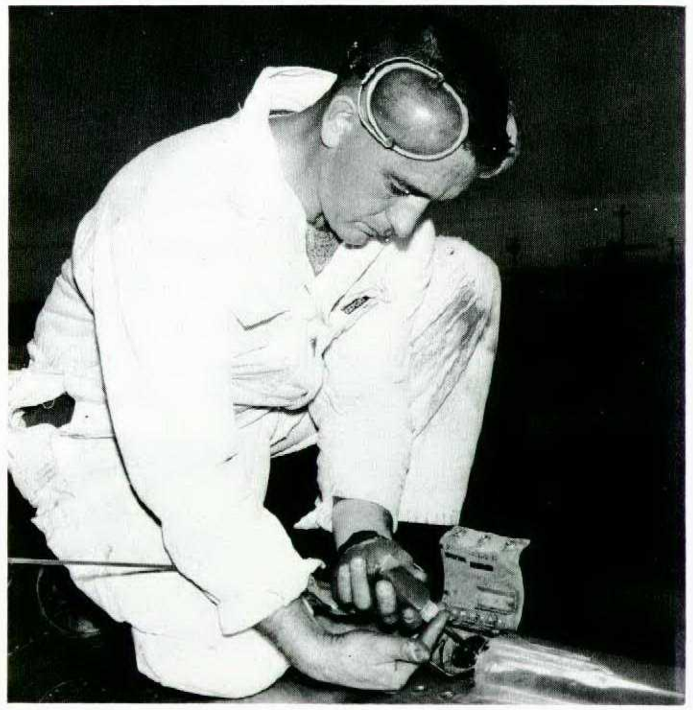
- Spectrometric Oil Analysis Program in Air Div
- Non Destructive Testing for Aircraft Maintenance

Almost two years have elapsed since these articles appeared. Let's glance back along the road travelled in the last two years as well as comment on current developments. Also, there are questions, your answers to which may have a marked influence on future growth of NDT for aircraft maintenance.

Sentimental Journey

It is rewarding to realize that four NDT Area Detachments have been established since Aug 1967 and are providing continuous NDT support for aircraft maintenance. Some of the detachments are still handicapped by lack of equipment; efforts are being made to resolve these difficulties. These detachments offer to bases and units a quick and flexible answer to NDT needs arising in connection with aircraft maintenance.

The task of education has been pursued with vigour. AMO 00-10-3 Non-Destructive Testing of Aircraft, was published in September last year. This AMO fully describes the existing NDT resources and outlines the procedure to be followed by prospective users. The NDT familiarization course for officers, given at the NDT Centre in Trenton, has played a significant role in generating awareness to NDT potential among maintenance managers. This course will be continued through 1969 as "NDT for Maintenance Managers". Six courses are scheduled with an intake of 10 per course.



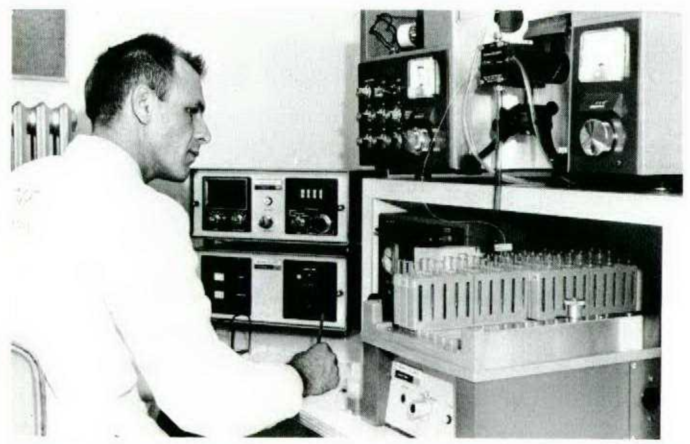
The Canadian Forces starts its full-time spectrometric oil analysis program. Seen here is Cpl J.F. Mattie, CFB Cold Lake, taking first sample in Canada.

A most important NDT milestone is the introduction of Spectrometric Oil Analysis (SOA) as a monitoring technique of the condition of engines and transmissions for aircraft and helicopters. This monitoring technique had striking success throughout the pilot scale evaluation stage for 1 Air Division (Flight Comment, May/Jun 1967). Consequently, the decision on a Forces-wide implementation was reached in Nov 1967.

AMO 00-10-14, Aircraft Spectrometric Oil Analysis Program, (SOAP) was published in Aug 1968 to describe the program and regulate its implementation. Spectrometric oil analysis means the determination of aircraft component wear condition by accurately measuring the metallic elements contained in used-oil samples. A definite correlation exists between the metallic contaminants in a lubricating oil and the mechanical condition of the mechanism which this oil serves. SOA is based on these well-proven facts:

- All elements have a characteristic spectrum which allows their unmistakable identification.
- The composition of the materials used for engine/transmission components are known and individual metallic elements expected in wear by-products can be established.
- Moving contact produces wear particles and their rate of production can be classified as normal or abnormal.
- Technology has developed instruments which are simple to operate and capable of quick accurate measurement of the elements present in the oil.

First shipment of oil samples arrives at CFB Trenton's Air Maintenance Development Unit. These samples are from the J79 engines at Cold Lake.



Technician at the AMDU spectrometric oil analysis laboratory runs all samples through an atomic absorption spectrometer. This machine can measure traces of metal in the oil down to parts per million; abnormal rates of increase in metal contamination of an engine's lubricants alerts technicians to possible trouble.

The benefits to be derived from this technique:

- A useful diagnostic aid for early detection of incipient failure - a significant contribution to flight safety.
- Reduction of overhaul and repair costs.
- Valid maintenance quality control data.
- Valid information to decide extension or reduction of overhaul life.
- Data on new systems under development, test and evaluation.
- Guide to maintenance troubleshooting.

Here's how the program has progressed. A SOA laboratory was added last October to the Aircraft Maintenance Development Unit's NDT Centre, to complement existing NDT resources. This laboratory can analyze up to 200 samples per day, and is the forerunner of similar installations at other bases as the program expands. This equipment is already or will soon be monitored by SOA: J79, J85 CAN15, J85 CAN40, CT64-820-1, CHSS2 main transmission, CUH-1H engine and transmission.

The impact of SOAP on flight safety and maintenance practices will be in direct proportion to the support it receives from the field. To quote from a previous article on SOAP, "the attitude of persons at the unit towards the program is the decisive factor determining its success because the unit is responsible for, and has control over, key factors in the program".

In closing this review of the past, I must stress the effective contribution made by other well-known methods such as radiography, ultrasonic, eddy-current and dye-penetrant in providing solutions to serious in-service problems: cracking of the J79 IGV, cracking of the Tutor spar attachment point and corrosion in the rudder hinge bracket of the Caribou.

Past achievements may be a source of satisfaction but certainly not for let-up. NDT technology is developing at a phenomenal pace, raising the challenge of evaluating new methods for future use. NDT is at the crossroads.

Peek into the Future

Sonic analyzers and vibration monitors have reached the field operational stage; commercial and military agencies use them to detect malfunctions of turboprop and turbojet engines. The mechanic of tomorrow may well find out that a microphone is his best friend in detecting engine malfunctions. Liquid crystals (substances sharing properties of both liquids and crystals) can be applied to a suspect surface to detect the extent of exfoliation corrosion or cracks under rivet heads. These liquid crystals are extremely sensitive to temperature changes; the variation of colour patterns is the basis of defect detection. Infrared (IR) thermography (measuring temperature distribution on a surface heated by IR source) has been used with success to detect heating flaws in de-icing systems. Holographic Non Destructive Testing (visual image is obtained from a sound image) can detect separations and overlap in tires. The list could be much longer but is sufficiently indicative of the challenge posed for planning future needs.

cont'd on page 24

PEOPLE '69

In 1968:

- ✔ ***of the 146 air accident causes, 96 were Personnel***
- ✔ ***543 human errors resulted in air accidents***
- ✔ ***of the total aircraft accident causes — air and ground — people accounted for 64% of the total.***

"People '69" is the name of a series of conferences now taking place at CFHQ under the auspices of the Directorate of Flight Safety. These conferences will bring together men expert in the field of human factors and behaviour. From these modest beginnings will hopefully develop a program enabling us to better understand the resource called "Personnel". The urgency of this challenge is apparent in the statistics above - clearly, a "sign of the times".

Earlier, in the Jan/Feb issue of this magazine, the editorial carried this statement:

> Advances in equipment design, reliability and technical know-how have significantly reduced the number of accidents caused by Materiel failure, but at the same time the human involvement in accidents has remained relatively constant. This now means that people account for 50-70% of the total accident cause factors - about five times that of Materiel failure.

This being the case our attention must logically turn to elusive Man.

At the opening conference there was little difficulty in achieving unanimous acknowledgement that at some time in the recent past we acquired the knowledge and resources to effectively combat Materiel problems but that no similar progress had been accomplished for the human resource. Put another way, the battle against the man-machine combination is only half won.

Here's some points that were made:

- The human presence in aircraft occurrences in the Canadian Forces is worthy of **urgent** attention.
- Better communication techniques between agencies must precede further flight safety accomplishments. For example, too often, a knowledge of hazards which is a pre-requisite of aviation planning is incomplete.
- There are few, if any, scientific techniques for analyzing specific human limitations or failures in the context of an aircraft occurrence. For example, does "inattention" by a pilot represent what the word suggests or might it really be on occasion "saturation"?
- There is no one agency or individual employed directly in analyzing the Personnel input into aircraft occurrences. This is in stark contrast to the resources the Canadian Forces apply to Materiel (today, a minority category).

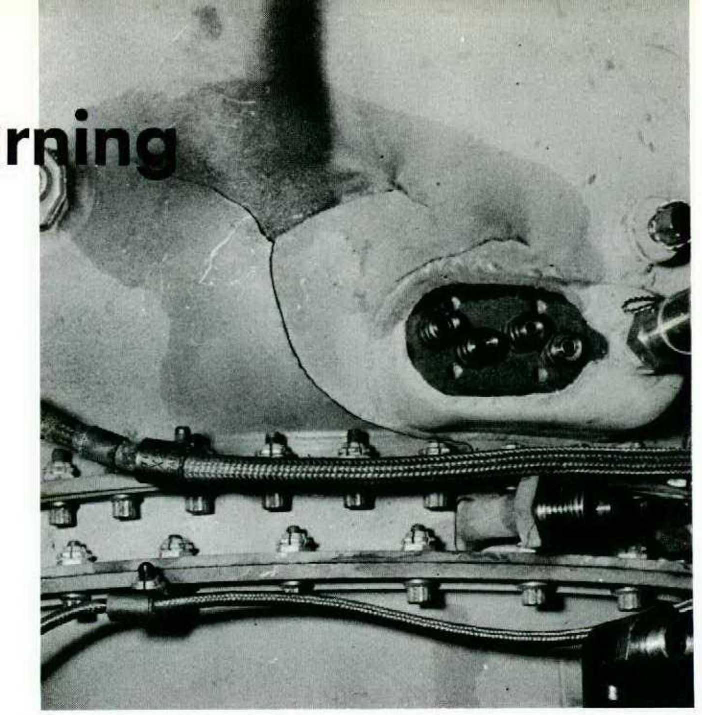
There's some tough problems and decisions ahead. Can we afford **not** to press on? Just read the statistics above - there's your answer.

Fail- *unsafe* fire warning

New mod actually works!

The CH113A Voyageur helicopter incorporates a fire detection system of a type new to the CF: infra-red sensors installed around the engine compartment are supposed to "see" flame or any hot spot and light up the panel. We were pleased with this system for a while because it seemed to be free of the old false warnings nonsense, but our delight turned to depression overnight when the system failed to detect a fire. It turned out that there were no sensors "looking" at the bottom of the engine - where the fire had been. So we installed additional sensors to give the engine all-round coverage. As luck would have it, the prototype was put to the test in flight when a number one engine developed a hot spot in the combustor casing. The light duly came on, the engine was secured and the trip aborted. The only odd thing was that even after the engine was well and truly cooled the fire warning light was burning brightly! Was it mere coincidence that the warning system apparently gave a false indication when there was a real fire? Doubt heaped upon confusion!

CFHQ called in the scientists who reported that the fire warning stayed on because the heat had melted solder in the sensor, causing it to stay excited even when the fire was out. This seems to be a failure which operates on the safe side; however, operators should be aware that this can happen. The fire *may* be out even though the light is still on; they should take action to determine the actual situation.



Fire sensor "saw" fire at crack in casing - or did it?

UASS - *you did a wheels-up!*

That's the appropriate acronym for Undercarriage Automatic Safeguard System and it's presently being considered...

The assault on belly landings has met with varying degrees of success over the years. Everything from discipline to disparagement has been tried - and we still have wheels-ups. It's not surprising therefore that fix-oriented persons have applied their inventive talents to the overlooked "down" selection.

The latest of these devices - and one we're very interested in - is the brainchild of a retired RCAF officer who observed "...although it is true that even very able and competent pilots can forget to lower the wheels and have done so, there is little real purpose to be served in seeking a reason for their action. Such seeking tends only to confirm again and again the one and only significant fact: even a highly experienced pilot can forget or be distracted so as to forget the wheel lowering action required of him".

From an investigation of 1882 pilots who forgot to lower the wheels he discovered that not one of them forgot to lower the flaps for landing. And with this common factor in mind he attacked the problem. He feels that the pilot would quickly recognize the unusual behaviour of an aircraft on a flapless approach; that's why the flaps are rarely forgotten. Why not provide for the automatic cycling of the undercarriage with the landing flaps if the undercarriage has not been previously selected?

The inventor claims that his is a simple positive system that will move the undercarriage selector to its down position after all warning devices have failed to alert the pilot. His Undercarriage Automatic Safeguard System (UASS) is simplicity itself.

A workable system of this sort would have several major advantages:

- aircraft damage costs eliminated
- investigation costs eliminated
- fewer preventive regulations and policing of them
- eliminate repetitive RT phraseology
- eliminates back-up equipment such as warning devices, etc.

We have seen the device itself and are impressed with its mechanical simplicity. It may be just what we have been looking for - for decades.

Good Show

Lt B.G. Alston

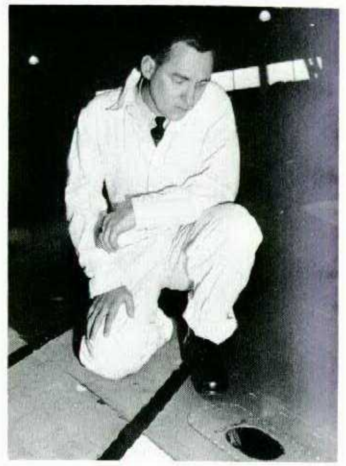
Capt J.P. McGrath

Capt F. Wagner

MWO F.G.D. Nash

Cpl R.J. Mains

Cpl R.S. Bruce



Cpl D. A. Janes

Sgt G.C. Mitchell and Cpl W.G. McAskill

CAPT J.P. McGRATH

Capt McGrath was at 10,000 feet and 3 miles from base when he intentionally flamed-out the engine for the student to practise the relight sequence. After the student had made several unsuccessful attempts to relight, Capt McGrath took control, declared an emergency, and set up the aircraft for a forced landing. On the descent, Capt McGrath continued to attempt a relight but landed the aircraft with the engine still flamed out. A broken wire in the electrical system had made a relight impossible.

In handling the emergency with precision and good judgement, Capt McGrath demonstrated a high standard of flying skill - convincing proof to his student of the standards to be attained by professional aircrew.

CAPT F. WAGNER

Capt Wagner, while hovering at 50 feet during a rappelling exercise (unloading of troops by rope descent), had a flameout in the number 2 engine. At almost all-up weight, the CH113's rotor speed fell off rapidly. Quickly - for speed was of the essence here - Capt Wagner expertly controlled the aircraft to a zero speed single-engine landing under marginal conditions.

In a situation where the slightest miscalculation could have caused serious injury for passengers and crew, Capt Wagner skillfully maneuvered his helicopter to a landing with no damage. His cool judgement and flying skill enabled him to make a noteworthy contribution to aircraft safety.

LT B.G. ALSTON

At 32,000 feet and 42 miles from base, the rear half of the T33 canopy suddenly disintegrated with a resultant explosive decompression. Lt Alston took control from his pre-solo student and carried out a slow-speed descent using all speed braking techniques. The emergency oxygen bottles were activated making speech difficult with the pressure breathing. To avoid exposing himself to the windblast in the -63°F outside air, Lt Alston leaned forward and hunched down, relying mainly on instruments for his return to the circuit.

With a heavy fuel load and an ice-covered runway, Lt Alston had an additional complication - the necessity to look out into the 150 mph slipstream which was 21° below at the time.

Had he lost control of the difficult situation the student might not have been able to complete a successful landing. Lt Alston demonstrated a high degree of skill in recovering his damaged aircraft under very adverse conditions.

MWO F.G.D. NASH

The helicopter in which MWO Nash was crewchief during a rappelling exercise, was hovering 50 feet above an opening in the trees too small to accept the aircraft. As safety man, MWO Nash was monitoring the troops descending by rope to the ground. As the first man left the ramp, MWO Nash looked outboard and found him suspended by his arms several feet below the aircraft, unable to move. The man's alpine hook had jammed the lifeline. Realizing that the man would soon tire and possibly fall to the ground, he quickly warned the pilot to maintain the hover, then with the aid of another crewman, lifted the man vertically to the safety of the ramp.

MWO Nash's fast response and cool judgement enabled him to perform a feat requiring considerable strength under difficult conditions. In saving a man from serious injury MWO Nash exemplifies the devotion of those whose job it is to ensure the safety of others.

CPL D.A. JANES

While fixing a minor malfunction on an Albatross, Cpl Janes became suspicious of the unusual appearance in the starboard wingbox extension area. Although this region was outside his trade responsibility he investigated further and determined that there was corrosion - a condition which had not previously been reported. From this discovery, other aircraft were given similar inspections in order to prevent the condition growing to serious proportions.

Cpl Janes' alertness and good sense of responsibility made possible the timely preventive measures to this hazard.

CPL R.S. BRUCE

While checking a hydraulic leak inside the tail section of an Albatross, Cpl Bruce noticed signs of corrosion in the vicinity of the rudder boost mechanism. In response to this, he extended his check to other areas and found corrosion on the rudder boost bellcrank and around the control cable attachment points. When the cables were disconnected corrosion and deep pitting were discovered in the vicinity of the attachment points to an extent that it could have caused failure of the bellcrank itself.

Cpl Bruce displayed alertness and good judgement; in following through with his original observation, he brought to light a serious corrosion hazard.

CPL R.J. MAINS

While checking a transient T33 for a reported fuel seepage, Cpl Mains decided to extend his check beyond just inspecting the connections and have a look at the fuel lines. This thorough search uncovered a chafed tiptank fuel transfer line where it passed by a bracket. It was worn to a point where a dangerous fuel leak was imminent. Cpl Mains checked the other transient T33s and found another aircraft in the same condition. Since then, Cpl Mains has found still another transient T33 with a chafed line.

Cpl Mains' commendable diligence in pressing his inspection as well as the follow-up, meant that a serious hazard was eliminated.

SGT G.C. MITCHELL and CPL W.G. McASKILL

As crewchief during towing operations, Sgt Mitchell was informed of an unusual noise in a Tutor while it was being towed. Some object or component sounded loose as the aircraft passed over the hangar door sill. Sgt Mitchell decided to ground the aircraft until the source of this sound was investigated. Cpl McAskill and crew then carried out a thorough search of the tail section of the aircraft. After much patient effort in a very cramped area, a three-pound bucking bar was discovered. This tool, used in assembling aircraft, was not of military origin.

A potentially serious hazard was eliminated by a professional follow-up of a minor clue. It took the diligence and initiative of Cpl McAskill and Sgt Mitchell to bring this hazard to light.

Sound observation

The BOpsO mentioned that on several occasions he had noticed servicing personnel working near operating turbine aircraft who were not wearing protective ear coverings. A question was asked, whether all servicing personnel have been issued the equipment and had they been properly fitted to each individual. It is essential that proper fitting be exercised to adequately protect personnel from the noise factor . . .

- Flight Safety Committee

the right (wrong) runway...

C's for CURRENCY, not quite up to scratch.
R's for RUNWAY, soaking and short.
A's for APPROACH in at-limits weather.
S is for SOUP that's near to the ground.
H is for HIGH, HOT, AND HYDROPLANING.

Let's suppose you're an experienced T-bird driver. You plan an IFR round-robin with a chap in the rear seat; he needs some practice for his up-coming ticket ride. No complications - just a straightforward flip with two good alternates and lots of fuel - like you've done many times before. However, there's a couple of unsettling aspects to being the captain for this flight today:

- your last T33 trip was 3 months ago
- the weather's at minimums, or nearabouts and not likely to get better.

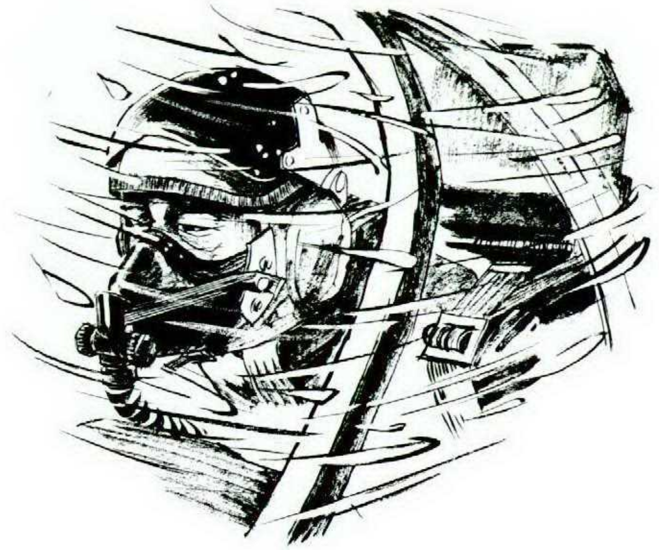
You get taxi and ATC clearance. The weather's not good; in fact the tower operator later admits he couldn't even see your aircraft - but cleared you for takeoff anyway. The operator stated later "...the weather was quite bad" and wasn't sure which runway you had used.

This last point is important. You had been cleared to takeoff on the *right* runway - a runway you knew (?) to be inactive and normally used as a taxiway. What you didn't know was that the left runway was temporarily closed and unlighted. (You hadn't noticed as you crossed the right runway on your way to the longer left one, that the right runway lights were on.)

The takeoff is normal and you proceed on an uneventful trip - uneventful, except that the weather at home is deteriorating. Approaching base, you're given 200 and 1/4 in light rain and fog.

Now, on final approach at destination with the lad in the back seat at the controls, you're monitoring what looks like a reasonably good GCA run. The corrections are small and he seems to be coping well. You're intently peering into the cloud and drizzle, looking for the strobe-light at runway's end, but it's real soupy outside and there's rain on the windscreen. (At this very moment a Met technician is observing a runway visual range of less than 1000 feet.)

About the time the aircraft reaches 200 feet you hear the controller say "Observe you in your overshoot" and you notice the aircraft starting to level off and you take control and maintain minimum altitude. Moments later you see the runway threshold going by. Having the runway centreline in sight you quickly descend, pop the speedbrakes, retard the throttle to idle, and prepare for the landing.



You're intently peering into the cloud and drizzle...

This time, you have the right runway which is only 6200 feet long - and wet. Unaware that this is the case, you attempt a landing from where you first glimpsed the ground. You are particularly distressed at the lack of braking action. You rapidly reach the point where you realize that with a barely-noticeable deceleration rate, you're no longer in command of things.

The aircraft continues into the mud and after a few mild gyrations comes to a stop 300 feet into the rain-sodden field beyond the overrun. You still can't make out where you are. Nothing looks familiar; even the route followed by the truck taking you back bewilders you.

And if your landing had been on the longer main runway? You would have almost certainly run off that one too - and into a row of formidably constructed approach-light pylons. Things would have been different then...

You keep asking yourself: could this have been avoided? You still have confidence in your ability to fly to minimums but with the wisdom of hindsight you admit it might have been better to have done a missed approach. At least that would have given you time for a slightly more critical assessment. You now know that whenever you let yourself get boxed in - there's no way out. ■

A fitting example...

It was pointed out that the CFB____ clothing stores are now open, on a permanent basis, at all times during normal working hours including lunch hour.

Flight Safety Committee

20,000 talk-downs

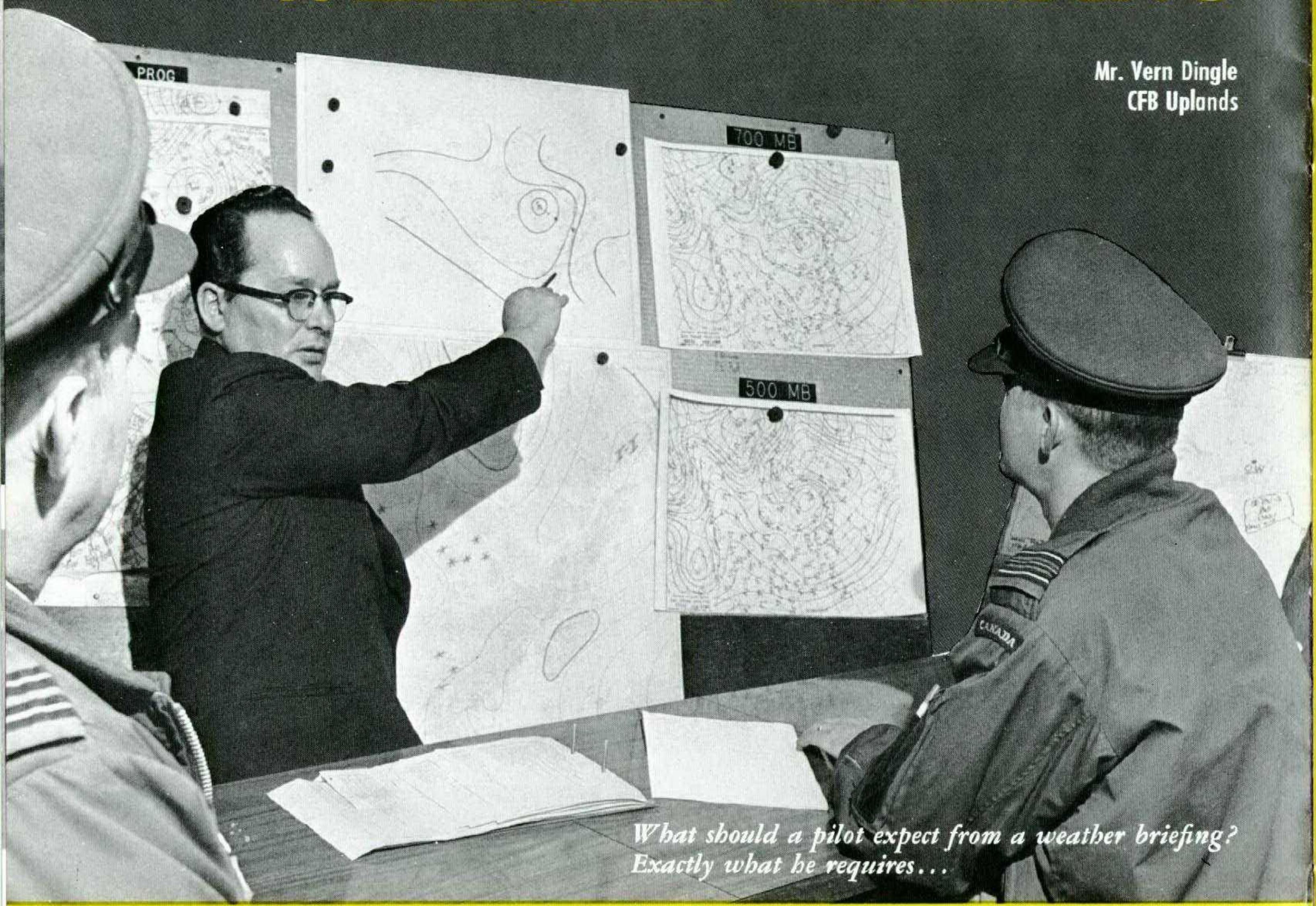
Sgt Murray Palmer of CFB Cold Lake, set aside his microphone recently after talking down the base commander, Col W.H. Vincent. It was Sgt Palmer's 20,000th radar approach - a milestone accomplishment for a radar controller.

In the RCN from 1943 to 1951, Sgt Palmer joined the RCAF in 1953, serving at Halifax, Summerside, 4 Wing, and Trenton before transferring to Cold Lake in 1967.

Sgt Palmer looks on as Col Vincent, CFB Cold Lake Base Commander, makes a congratulatory endorsement in Sgt Palmer's logbook. Major J. Carpenter, BATCO, accompanied Col Vincent on the flight in a two-seat CF104.

getting the most from a WEATHER BRIEFING

Mr. Vern Dingle
CFB Uplands



What should a pilot expect from a weather briefing? Exactly what he requires...

The author, briefing an aircraft crew.

A pilot may request anything from the behaviour of a single weather parameter (eg, temperature) to an integration of several parameters from the surface into the stratosphere, and from coast to coast or continent to continent. It's readily seen that *Weather-Wizard Willie* has quite a problem; however, to minimize the complexities, standard weather briefing formats have been evolved. Briefings as given by the Met-wan generally consist of three distinct parts:

- a short statement on temperature, moisture and pressure advection fields (general synopsis),
- a professional interpretation of takeoff, in-flight and landing weather,
- possible deviations (or complications) that may arise from the *unknowns* that exist in the weather situation at hand.

The knowledgeable reader will see there's a "lot between the lines" in the above paragraph. Meteorology - even in the space age - still has many *inaccuracies* both from the point of view of observation and prediction. To illustrate, consider the hourly aviation weather report; the weather parameters of temperature, dewpoint, wind and altimeter setting are objectively measured by means of accurate instruments. In some instances, however, the ceiling and visibility which are of utmost importance to the pilot are *subjectively* measured, their accuracy depending largely on the talents of the weather observer. Other weather parameters that concern the pilot are turbulence, icing and vertical cloud structure. These phenomena are subjectively and randomly observed by aircrew; their accuracy depends on the weather-observing talents of the aircrew. Consequently, for a pilot to minimize the complications that may arise from the errors inherent in the "raw" data, he must know what the weather is and, of course, some of the reasons for its behaviour.

Since weather for the most part follows a well-ordered pattern, various three-dimensional models have been designed to help explain the whys and wherefores of weather occurrences. The simplest of these atmospheric models is the Norwegian air mass and frontal model; this is one used in all pilot training schools. Due to its simplicity a pilot can attain a firm and basic understanding of the weather. And it's with this model as a background *Sly Soothsayer Sam* states his case.

Starting with a simple synopsis he creates a mental picture of what the weather is and was, and parlays this into a prognostic. Most Met-men will present a stereotype synopsis which makes for a monotonous monologue; however, it need not be, as long as it is brief and to the point. The meat of any aviation weather briefing is takeoff, landing and in-flight conditions. The weather briefer must be emphatic, choosing his words carefully in order to instill confidence in the forecast. At times, this is exceedingly hard to do, because official aerodrome and significant weather forecasts are basically the opinion of the issuing forecaster. And human nature being what it is, personality conflicts are bound to arise.

Generally speaking, in-flight conditions that the forecaster expects the pilot to encounter are the result of years of experience in studying weather systems affecting certain geographic areas. As a result, these forecasts have a statistical base which can be improved upon by augmenting the statistical data with pilot and radar reports. The importance of pilot reports as an adjunct to the basic raw data necessary to produce a forecast, cannot be overstressed. Admittedly, there is a limited use of the pilot-to-forecaster frequency in Canada, and pilot reports pass through several stages of communication. As a result, reports are subject to amplification or editing rendering their value sometimes questionable. However, any pilot report is better than none at all.

Radar reports, graphically displayed, are an excellent aid in any weather briefing. On occasion it may be possible to arrange for the pilot to observe the radar screen so he can get the "feel" of the weather.

Basically, aviation weather forecasting is probability prediction in the subjective sense. As a result, a second set of predicted values may be assigned to the various weather elements. These possible deviations should be discussed with the pilot in the event that the official forecasts break down so that he can take evasive or abortive action if necessary.

Since weather forecasting is both an art and a science, personalities are part-and-parcel of prediction. The experienced pilot has probably typed weathermen (as they ponder pressure patterns in advance of a moisture-laden warm front) into three distinct personality types:

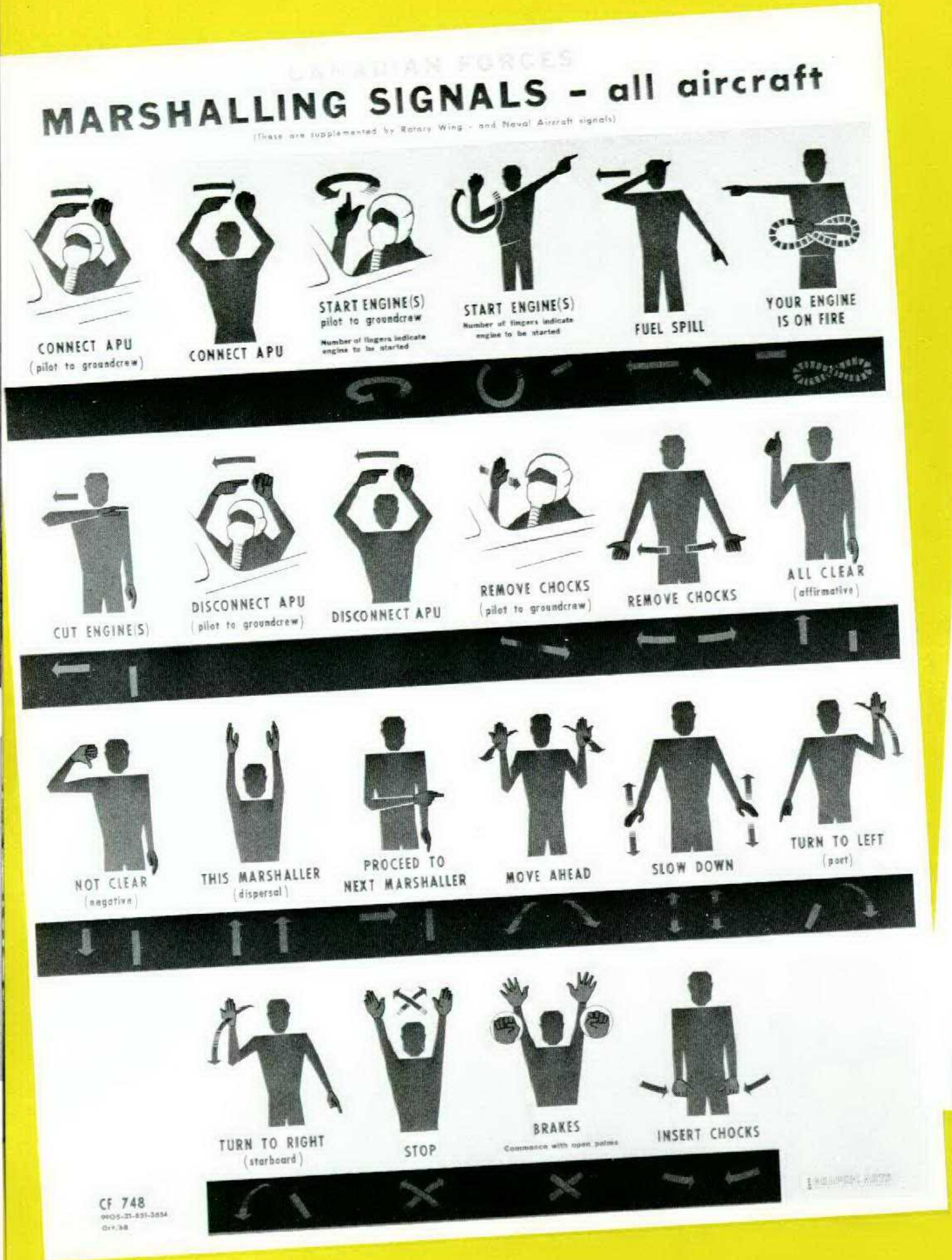
Pessimistic Pete
who will predict "Zero-Zero" in rain, drizzle and fog.

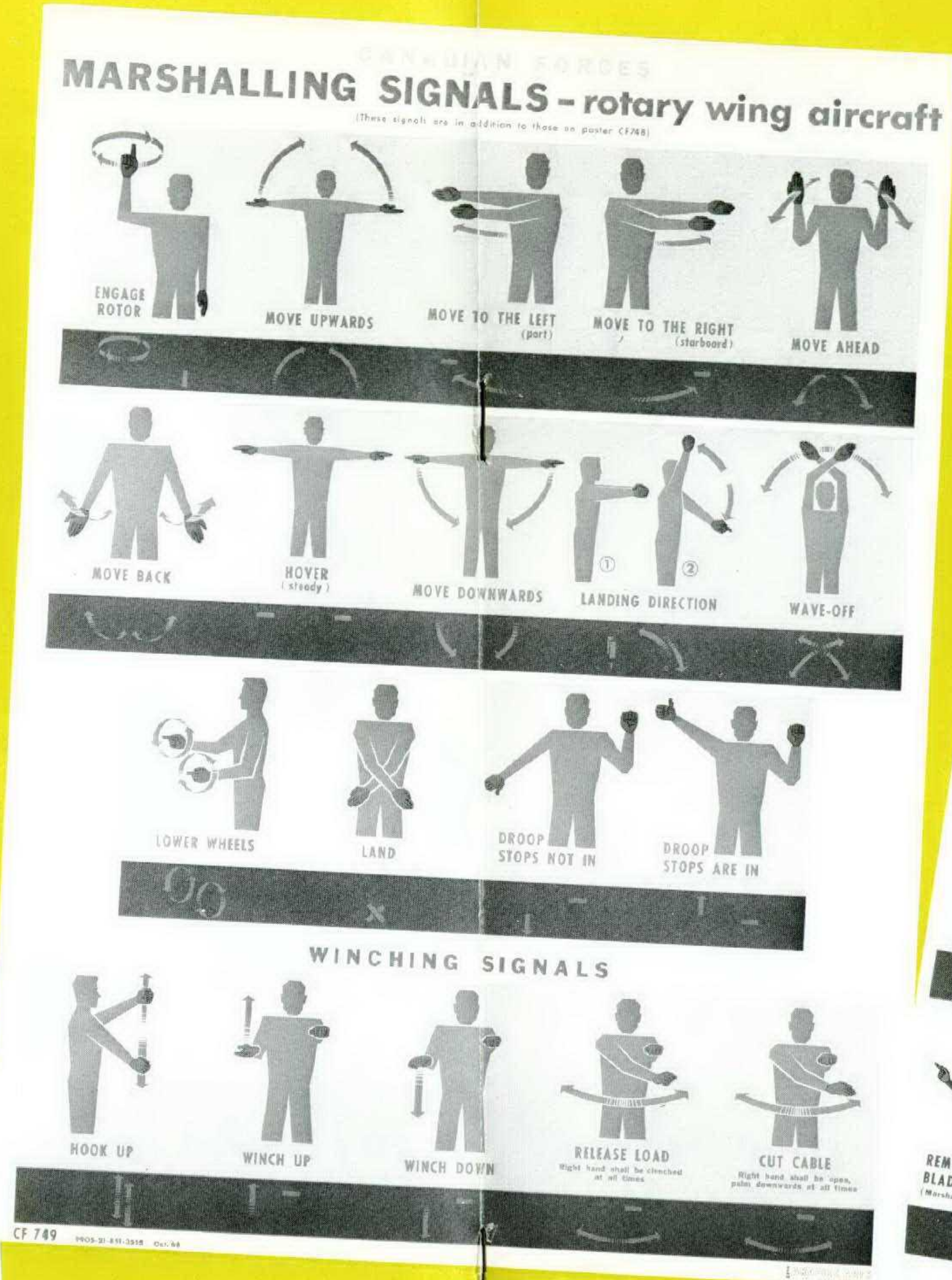
Optimistic Orville
who always hopefully looks on the better side of things, comes out with 3⊕3/4R-F.

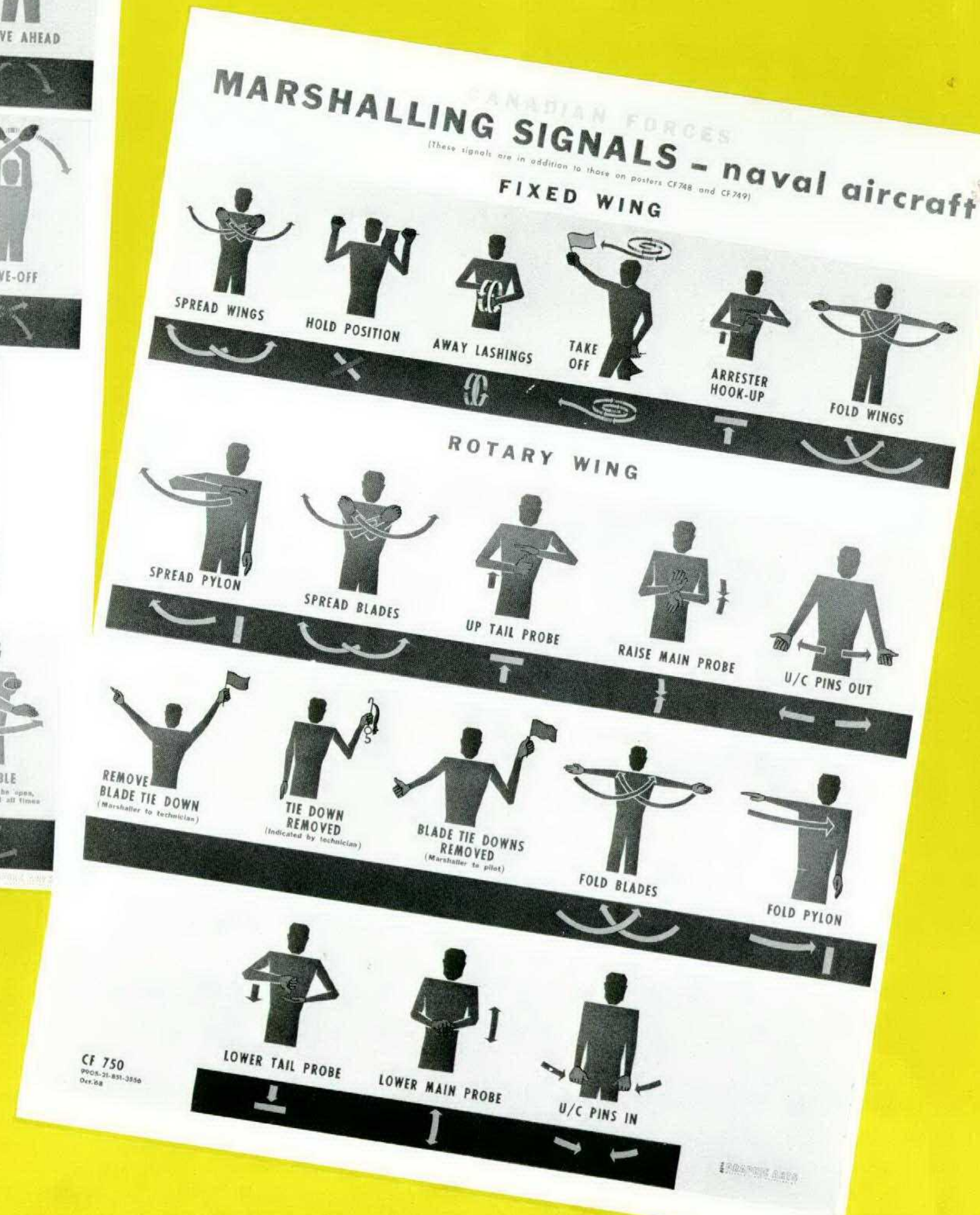
Hedger Harry
a realist who will not be tied down, issues 2⊕3/4R-F variable to 1X ¼R-L-F.

For optimum efficiency in weather briefing services the pilot should know weather and the weatherman. Similarly, the Met-man should know the pilot and his aircraft capabilities. That way, the two participants will get the most from a weather briefing.

Vern Dingle is a forecaster at CFB Uplands Meteorological Section. After graduating from the University of Manitoba with an honours degree in Science, Mr Dingle served from 1952 to 1955 at Rockcliffe. He was at Goose Bay from 1955 to 1958. Since 1958 he has been at Uplands in Ottawa.

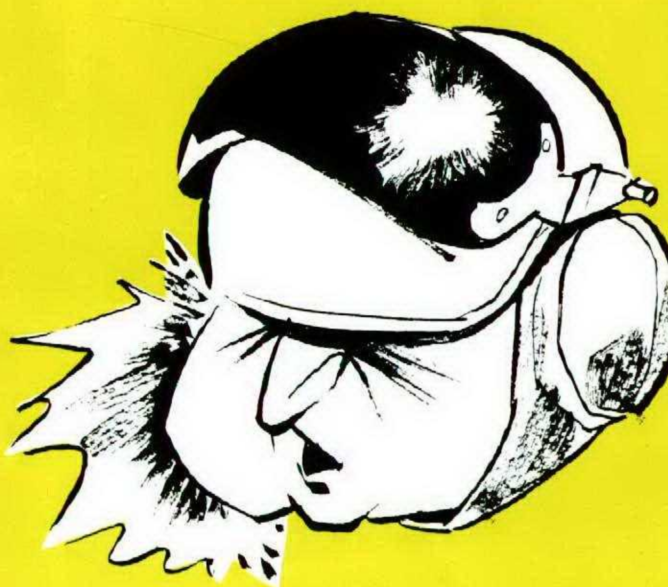

CANADIAN FORCES
MARSHALLING SIGNALS - all aircraft
(These are supplemented by Rotary Wing - and Naval Aircraft signals)
CONNECT APU
(pilot to groundcrew)
CONNECT APU
START ENGINE(S)
pilot to groundcrew
Number of fingers indicate engine to be started
START ENGINE(S)
Number of fingers indicate engine to be started
FUEL SPILL
YOUR ENGINE
IS ON FIRE
CUT ENGINE(S)
DISCONNECT APU
(pilot to groundcrew)
DISCONNECT APU
REMOVE CHOCKS
(pilot to groundcrew)
REMOVE CHOCKS
ALL CLEAR
(affirmative)
NOT CLEAR
(negative)
THIS MARSHALLER
(dispersal)
PROCEED TO
NEXT MARSHALLER
MOVE AHEAD
SLOW DOWN
TURN TO LEFT
(port)
TURN TO RIGHT
(starboard)
STOP
BRAKES
Commence with open palms
INSERT CHOCKS
CF 748


CANADIAN FORCES
MARSHALLING SIGNALS - rotary wing aircraft
(These signals are in addition to those on poster CF748)
ENGAGE
ROTOR
MOVE UPWARDS
MOVE TO THE LEFT
(port)
MOVE TO THE RIGHT
(starboard)
MOVE AHEAD
MOVE BACK
HOVER
(steady)
MOVE DOWNWARDS
LANDING DIRECTION
WAVE-OFF
LOWER WHEELS
LAND
DROOP
STOPS NOT IN
DROOP
STOPS ARE IN
WINCHING SIGNALS
HOOK UP
WINCH UP
WINCH DOWN
RELEASE LOAD
CUT CABLE
CF 749


CANADIAN FORCES
MARSHALLING SIGNALS - naval aircraft
(These signals are in addition to those on posters CF748 and CF749)
FIXED WING
SPREAD WINGS
HOLD POSITION
AWAY LASHINGS
TAKE
OFF
ARRESTER
HOOK-UP
FOLD WINGS
ROTARY WING
SPREAD PYLON
SPREAD BLADES
UP TAIL PROBE
RAISE MAIN PROBE
U/C PINS OUT
REMOVE
BLADE TIE DOWN
(Marshaller to technician)
TIE DOWN
REMOVED
(Indicated by technician)
BLADE TIE DOWNS
REMOVED
(Marshaller to pilot)
FOLD BLADES
FOLD PYLON
LOWER TAIL PROBE
LOWER MAIN PROBE
U/C PINS IN
CF 750

dental problems at altitude

A toothache anywhere is bad news but a toothache while you're flying is trouble you can do without...



Given our high standards of dentistry and considering the number of hours aircrew fly, this doesn't happen often. When it does, it can be extremely painful and sometimes incapacitating.

(USN Approach/Nov. 68)

Toothache at altitude, known medically as aerodontalgia, usually represents an acute flare-up of subclinical symptoms. Reduced barometric pressure is the precipitating factor, either in flight or during a pressure chamber run. Some years ago, the cause was thought to be simply expansion of gas trapped underneath fillings. More recent thinking is that changes in atmospheric pressure aggravate the impaired circulation in irritated or diseased tooth pulp. Reduced barometric pressure usually does not affect normal teeth or teeth with open cavities.

Generally speaking, toothache at altitude occurs during ascent and begins at 5000 feet. Some persons have only one episode of pain with no recurrence. In other cases, the toothache shows a consistent pattern occurring at a specific altitude and disappearing at the same altitude when direction is reversed.

If pain occurs during descent, the tooth is probably non-vital, perhaps one in which the nerve has been removed. If pain occurs during ascent, the tooth is usually vital.

A less frequent source of toothache during ascent is an abscess at the root of the tooth. Such an abscess can generate a small amount of trapped gas which causes severe pain on expansion. In other cases a chronic abscess can cause dull pain on descent which can persist on the ground for several days.

When toothache strikes at, say 14,000 feet, the only thing you can do about it at the time is descend but this is not always immediately possible. On completion of the flight or chamber run, get in touch with your flight surgeon or dental officer. The offending tooth may turn out to be one which was recently filled. It usually requires 48 to 72 hours for the dental pulp to quiet down after dental treatment. In some cases, a new filling causes symptoms for several weeks and then as tissue changes stabilize, symptoms no longer occur. Deep-seated silver fillings without underlying base materials or insulators, mechanically imperfect fillings and inadequately filled root canals, can be troublemakers when barometric pressure is reduced.

In some cases when a tooth hurts at altitude the trouble is not in the tooth itself; it hurts because of pain referred from some other source. Pressure in the maxillary sinus during descent can cause pressure on the tooth nerves of the upper jaw which, in turn, causes the teeth to ache. If dental examination fails to reveal abnormalities, the possibility of aerosinusitis should be checked out.

Another source of referred pain is inflammation of the gum around a partially erupted tooth. Unerupted or impacted third molars or wisdom teeth can also cause referred pain. Sometimes the diagnosis of the source of trouble in toothache at altitude is complicated by referred pain from a blocked ear. (Although not related to toothache at altitude, it should be noted here that some ulcers of the mouth and lips can become painful in flight if the oxygen mask causes pressure on them or if oxygen is flowing over the area.)

Flying right after dental surgery can be hazardous. Besides general discomfort, a number of factors enter into dentists' and flight surgeons' advice to postpone flying for a certain period:

- Variations in barometric pressure can bring about secondary hemorrhage. This can also occur after gum treatment if there is still some active infection present.
- Some patients experience dry socket or loss of blood clot after extraction.
- The maxillary sinus is sometimes affected.
- Pain and other symptoms occur as late as the fourth post-operative day in some patients.
- Medication given dental patients can compromise aircrew efficiency and safety.

Some experts are of the opinion that clinical experience indicates that flying should be routinely restricted for 48 hours following tooth extraction and that the patient should be re-examined before return to duty. It is for these reasons that dentists and oral surgeons will recommend grounding of a pilot or aircrewman for 48 hours following a surgical procedure.

Now for a few words on how you get dental cavities in the first place. Research on the cause of tooth decay is a continuing process. However, there seems to be general agreement that the chief factors are mouth bacteria, food, dental plaque and susceptible tooth surface. Bacteria break down food debris in the mouth and produce acid. The dental plaque on the surface of the teeth collects the acid and holds it. (Oddly enough, in some persons dental plaque neutralizes the acid.) Then depending on the tooth's susceptibility to decay, the acid works on the tooth until the acids are neutralized by the saliva. One dental authority has stated that acid production in the dental plaque is intermittent rather than continuous lasting 30 to 45 minutes after meals or snacks containing fermentable carbohydrate.

Bacteria in the mouth build acid up rapidly after you've eaten carbohydrates. Sticky solid carbohydrates such as candy bars are said to lead to more cavities than those consumed as liquids such as soft drinks. Most dentists will advise you to cut out those sweet between-meal snacks altogether or replace them with raw fruits or vegetables, cheese, eggs, unsweetened milk, nuts or lean luncheon meat. Even if you can't brush after every meal or snack, you can get rid of some of the food debris by rinsing your mouth out with water or swishing it around in your mouth before you swallow it. Dental floss or a toothpick will dislodge bits of food between your teeth.

Granted the irregular schedule inherent in aircrew jobs often makes conventional "proper oral hygiene" next to impossible. However, try to brush after meals and snacks or at least rinse out your mouth. Schedule your dental appointments regularly and once you've scheduled them, if at all possible, keep them. And, finally, as in all aeromedical matters, good general physical condition and sensible eating and drinking habits are good preventive medicine. Your good health and good oral hygiene, plus the ministrations of a skilful dentist when required, should keep dental trouble at altitude to a minimum. ■

Crises create crunches

Accidents often arise when something abnormal occurs. Here's how things can snowball...

- Landing during very heavy rain a transport ran off the side of the runway - the field's *only* runway.
- A ground recovery snafu caused the aircraft to block the runway for several hours forcing several aircraft to divert.
- Anxious to continue his flight from the diversion field, a captain pressed for immediate refuelling; this necessitated using fuelling units which had been in dead storage for a long time.
- Refuelled, the captain taxied out and applied 100% for his takeoff - a takeoff which he had to abort when he noticed power reduction on the roll. The fuel contained water beyond the level permissible for use.

...how close can one come to catastrophe? Staying alive's the bonus for the professionally prudent.

- Flight Safety Foundation

Lightning... The BTSO requested that everyone be made aware that refuelling will not be carried out during lightning storms.

- Flight Safety Committee

a pilot's signature...

...on the Aircraft Maintenance Record set

AMO 00-15-2

When a pilot signs in and out, does he know what it's all about?

The pilot's signature after landing certifies that he has made appropriate minor defect or unserviceability entries.

It is mandatory that the pilot declare his state on landing.

The pilot is required to scrutinize all forms in the folder. His signature signifies that he has read the forms and accepts the aircraft in its present state.

The "Checked By" column of the blue (minor entry) sheet must be signed off opposite a minor entry or the aircraft is considered unserviceable. Only the servicing section may sign this column at the parent base. The captain, flight engineer or technical crewmember may sign when operating away from home base.

The person placing an aircraft unserviceable will ensure appropriate maintenance personnel are informed wherever practical.

The person placing the aircraft unserviceable must print his name.

It is the pilot's responsibility that unserviceabilities found in flight are entered.

At isolated bases where Canadian Forces servicing is not available, the captain in conjunction with the technical crew member, may sign off major entries that have been satisfactorily repaired. If rectification of an unserviceability not affecting the airworthiness of the aircraft cannot be done at an isolated base, the deferred repairs may be entered on the minor sheet and the captain may sign the "checked by" column.

Only the commanding officer of a squadron, or his delegate, may impose or remove operational restrictions on form CF339 (Aircraft Information Record). A signature is required.

When a pilot returns to his home base with a travelling set he must sign in in both green sheets; ie, the servicing form and the travelling form.

Confusion

The BFSO pointed out that when a mod had been implemented, then suspended, and then reinstated, some confusion on its status should be anticipated.

- Flight Safety Committee

On the Dials

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

Rules of thumb

Through the years, unidentified thinkers have developed some shrewd formulae which can be applied to the field of instrument flight. We're publishing some of them in the hope that you'll commit them to memory for use at every available opportunity.

Approximate Bank Angle Required for Rated Turns

To put this little goodie to work, you need to know your TAS, and to apply it in the following way:

> The approximate bank angle required to achieve a standard rate turn (3° per second) is equal to one-tenth of your TAS plus seven. A half-rate turn is equal to one twentieth of TAS plus seven.

So, if cruising along at 300 KTAS, the formula would give:

Rate One $= \frac{300}{10} + 7 = 37°$ bank

Rate Half $= \frac{300}{20} + 7 = 22°$ bank

Rate of Descent to Fly a Glidepath

When performing either a PAR (GCA) or an ILS approach, the pilot must achieve a rate of descent to maintain the glidepath. Rather than just guess at a figure, use this formula - bearing in mind that it requires *groundspeed:*

> The rate of descent for a 3°GP equals one-half the groundspeed plus a zero. A 2½° GP equals the same basic formula minus one hundred.

Here they are in action, with a groundspeed of 110K:

3° GP $= \frac{110}{2} + 0 = 550$ feet per minute.

2½° GP $= \frac{(110 + 0)}{2} - 100 = 450$ feet per minute.

Pitch (Attitude) changes

For this area, let's deal first with the high-performance people, who have a Mach meter on their panel. Their basic rule reads:

> 1° of pitch change will produce a change of vertical velocity equal to one thousand times the Mach number.

For example, if cruising along at .8:

1° pitch change = .8 x 1000 = 800 fpm climb or descent. The "Low and Slow" world don't need to feel neglected, since they can arrive at the same answers by realizing that:

> 1° of pitch change will produce a change of vertical velocity equal to miles per minute times one hundred.

Again, to make it live with figures, say you're cruising along at 180K which just happens to equal three miles a minute. This gives us:

1° pitch change = 3 x 100 = 300 fpm climb or descent.

Once you have either of the above working for you, it's only logical to start feeding in the required rates of climb or descent and working back to find how much of an attitude change to use to achieve them. Putting values into the formula again, let's assume we're doing two miles a minute, and want a 500 fpm rate of descent for a glidepath:

Would you believe a 2½° downward attitude change?

To Intercept a TACAN Arc from a Radial

Groundspeed should really be used in this one, but TAS won't produce a violently different result, so use either. First decide on the rate of turn which you want to use, and proceed:

> Start a rate-half turn at a distance equal to one percent of your speed prior to intercepting the arc, or a rate-one turn at one-half of one percent of your speed.

Assume then, a TAS of 300K, running toward the facility, to fly along the 15-mile arc. The turn should be started at:

Rate Half = 1% of 300 = 3 and this becomes 18 nm.

Rate One = .5% of 300 = 1½ and this becomes 16.5 nm.

To Intercept a Radial from an Arc

As you just might suspect, the "one-in-sixty" rule finally rears its head, and provides us with:

> The number of radials of lead for the turn equals sixty over the DME of the arc, times the appropriate percentage of the TAS.

With a 200KTAS, flying around the 15-mile arc, we get:

Rate Half turn $= \frac{60}{15} \times 2 = 8$ radials

Rate One turn $= \frac{60}{15} \times 1 = 4$ radials

Here's an obscure one! If you're ever faced with the prospect of computing how far you will travel in flying an arc, resort to:

2 pi r times $\frac{X}{360}$, with X equalling the number of radials being flown in the arc.

Travelling, then, through 90 radials on a 15-mile arc, you traverse

$(2 \times 3.1416 \times 15) \times \frac{90}{360} = 23.562$ nm

How's that grab you, Sport?

The invisible white Falcon

High-speed, small size, and a white paint scheme make the Falcon an extremely difficult bird to see. Pending possible installation of strobe lighting - a good sharp lookout is needed wherever this aircraft operates.

CF cargo carrier – Inferno in the sky

A witness called it "a huge flaming torch in the night sky". Little is known at the moment except that a Canadian Forces cargo aircraft loaded with vehicles, crashed near this town during a military exercise. Investigating officers stated that no clues have yet been found although it is apparent from witness reports that the entire aircraft was on fire before the crash.

It is rumoured that fuel from the vehicles could have ignited causing an aircraft fire which the crew were unable to control.

This small town was awakened early this morning by a rumbling explosion which brought people running to th crash sit

fire and fuel

That ominous fictitious news report could happen; in fact, some recent occurrences should have everyone very concerned.

To give you an idea what we're up against, this page contains some of the recent occurrences having high-hazard potential. We're not saying specifically how to reverse the trend - that's up to the operators - but the fact remains that orders and procedures ignored or feebly applied can spell disaster.

FMC has issued instructions on dangerous cargo handling; there's also definitive coverage in CFP117. But publications can only go so far; we all know that no publication can be so comprehensive as to preclude accidents, neither can the provisions of such publications legislate for every possible circumstance. This means that those handling dangerous cargo must be pessimists at heart. From this attitude will come vigilance and caution - lacking on occasion, as the accounts on this page show.

We're convinced that much of the problem stems from lack of familiarity with regulations. During an exercise in Nov/Dec 1968 when land forces were deployed in ATC aircraft there were no fewer than five incidents in which either vehicles or containers leaked sufficient quantities of gasoline to hazard the flights. One aircraft was forced to land at the nearest suitable strip and the others were obliged to proceed at lower altitudes in order to make their destination. On the same exercise, there was an anxious moment when smoke was seen coming from a vehicle on board an aircraft. Imagine what would have happened if there had been fuel leaks as well.

Another problem plaguing operators is the limited life of the average jerry can. Rough handling and interior rusting weaken these cans making them unable to withstand the differential in pressure associated with altitude. What is needed, of course, is a can designed for air transportation.

Where do the problems exist? The HAZARD examples show where the problems lie...

HAZARD

Several jerry cans in 2½-ton truck leaking gasoline to a degree that aircraft was diverted.

Cause:
Both supervisor and loading team failed to ensure load integrity as required by CFP117. CHQ authority to move dangerous cargo was not obtained.

HAZARD

Strong odour of gasoline. Fuel found leaking from jerry cans in canvas-covered trailer.

Cause:
Both supervisor and crew failed to establish load integrity as required in CFP117.

HAZARD

Smoke from vehicle on board aircraft caused by shorting of electrical wires in vehicle caused insulation to burn.

Cause:
Both supervisor and loading team failed to ensure vehicle battery disconnected as required in CFP117.

HAZARD

While taxying for takeoff a jeep loaded in the ramp position was noticed leaking large amounts of fuel.

Cause:
Loading crew supervisor didn't make sure that vehicle was positioned properly in aircraft.

HAZARD

On climbout gas was noticed spilling from 2½-ton vehicle. Tank showed level of fuel four inches below top of filler neck - too full.

Cause:
Both supervisor and crew failed to ensure fuel tank contents was within permissible limits.

HAZARD

Strong odour of gasoline 45 minutes after takeoff. Loose engine primer line found; after tightening the leak stopped.

Cause:
Vehicle maintenance carelessness by delivering vehicle for airlift in dangerous condition.

HAZARD

Fuel found venting from vehicle causing fumes so concentrated that aircraft was depressurized. Suspect fuel tank seam leak or tank over-filled.

Cause:
Both supervisor and loading crew failed to ensure load integrity prior to flight.

HAZARD

Climbing through 10,000 feet a fuel leak from a ¾-ton truck could not be stopped. Flight returned to departure point. This truck had very long flat fuel tank; climb attitude of aircraft could force fuel out through overflow.

Cause:
Both supervisor and loading crew failed to ensure condition of cargo.

Uncontrolled airports are hazardous

"During an airevac flight into an uncontrolled airport at Kelowna, BC, the local unicom frequency 122.8 was contacted to determine any traffic in the local area. The reply was that two light aircraft were doing touch-and-go landings on runway 15. The airevac aircraft made an uneventful landing on runway 15 and proceeded to the new terminal off the button of runway 33 to pick up the patient. Due to very low wind condition, we decided to use runway 33 for takeoff to expedite getting the patient to hospital. The local unicom frequency was used to determine local traffic and to notify them of these intentions.

As the run-up was completed and the aircraft proceeded onto the runway, a faintly discernible movement was observed at the far end of the runway and the airevac aircraft beat a hasty retreat onto the taxi strip. Moments later a light aircraft was observed flying overhead. At the same time a voice transmission was heard that both the light aircraft would clear the area to let the Albatross depart!

Due to the layout of the field there are two accesses to the runway without any parallel taxistrips. Also, the runway has a slight centre rise; from either end it is almost impossible to see any light aircraft parked or taking-off from the opposite end.

This is the second almost identical situation that the writer has been involved in in the past few months at the same airport."

Unicom frequencies are obviously of value but only for VHF-equipped aircraft. There's little that we can do about this kind of hazard except to continue to caution pilots about the great care needed at these uncontrolled airports.

Mule/Tutor/UCR *mélange*

After dropping off a pilot at his aircraft, the driver with an APU in tow started off again, whereupon the pilot "...heard a noise and looked around and saw the right side of the mule had struck the pitot head".

The driver stated, on proceeding to move off he noticed that the gas pedal was stuck to the floor; he braked but was unable to stop before hitting the pitot boom. However, had the throttle been stuck to the floor before moving off, the engine noise at full throttle certainly would have been apparent to the pilot who heard only the noise of the mule striking the aircraft. The driver was attempting to pass between the wingtips of two parked Tutors; it would appear that when he noticed he didn't have enough clearance and attempted to brake, the throttle may then have stuck.

Problems on the D6 throttle jamming prompted a UCR about five months earlier. In addition, all D6 drivers were briefed on this hazard.

Such accidents (without the assistance of a sticking throttle) continue to be a problem. However, as this one *might* have been avoided, the slow response to the UCR is pertinent. Five weeks after the UCR was sent to the manufacturer, he advised us that the mod kits required certain engineering drawings. Ten weeks later, the trial mod proved unsatisfactory on tests. After another four weeks the unit reported another throttle jamming; their request to install parts from another manufacturer to rectify the problem was approved on an interim basis. Five more weeks - and the mod kits are *still* not available from the contractor. Of all the users of this type of tractor, only this unit has reported any instances of throttle jamming. But when the kits are delivered, all D6s in the Canadian Forces will be modified.

We were fortunate that the damage was minor and that there were no injuries. Actioning a UCR does take time - especially when passed to some manufacturers.

CH113 menace

A crewchief moving about inside the cabin during a landing, lost his balance and fell into the open area containing the external cargo hook. He dislocated a shoulder and suffered cuts - the punishment of the unwary.

Gen from Two-Ten

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

CF104, SCRAPES TIPTANK The two-plane formation, having overshot the first approach in below-VFR weather, was back on final. Then things seemed to have come unstitched.

The lead's earlier TACAN unreliability was believed rectified, therefore radar (its precision unserviceable) passed only one heading change on final, putting the two aircraft out of position. Number 2 sighted the field first and called that he would complete his landing, whereupon lead said he would overshoot.

Then lead announced that he too had the runway in sight; he fell in behind #2 for a stream landing. It turned out to be a *slipstream* landing: "...the result of turbulence did not seem sufficient to cause the tank to strike the runway". Nevertheless, the tank was holed having been dragged along the runway and with it, both fins.

Lead's determination to stay in the lead with a poor TACAN (he wanted the practice) compromised good judgement and airmanship. The last-minute maneuvering plus the unplanned formation changes could have had more serious consequences. A review of the various formation stream-landing techniques has been initiated.

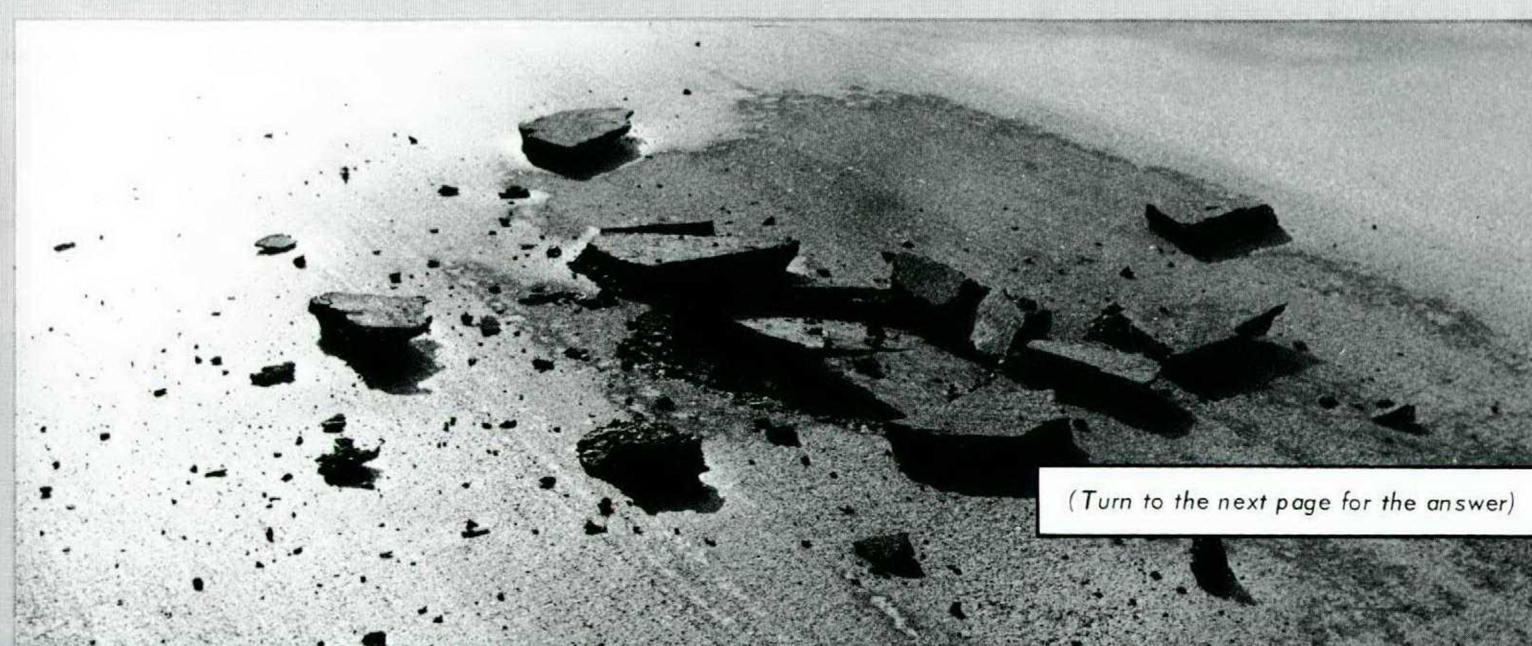
CH113, RESCUE HAZARDS During the recovery of a lost boy suffering severely from exposure, it was necessary to land the helicopter. The flight engineer directed the pilot in setting the aircraft down in a very confined brush area. The FE had noticed a small willow tree less than one inch in diameter in front of the helicopter which might be hit by the front rotor bladetips but he thought it too small to cause damage. After the flight, the bladetip cover caps and metal covers for the de-icer blankets were found damaged, as well as distortion in the tip covers of the three blades.

Despite the urgency of the situation the FE should not have accepted a hazard which he could have easily and quickly eliminated. Had his judgement of the tree hazard been in greater error, the damage would have prevented the completion of the rescue. Rescue missions require the weighing and acceptance of certain risks - more than in most other peacetime operations. However, those hazards which can readily be eliminated should not be disregarded in the urgency of the moment.

cont'd on next page

Investigators' quiz

You are asked to investigate an extreme hazard on the runway. You're told that no aircraft or vehicle was involved. What would you report?



(Turn to the next page for the answer)

CF104, SHEARPIN AGAIN The driver had slowed almost to a stop as the aircraft reached its parking position on the sloping ramp, when the towbar shearpin broke. The brakeman in the rear cockpit was unable to stop the aircraft despite his all-out tromping on the binders. Hastily dodging the runaway 104, the tow driver yelled at the wingman to grab the towbar and attempt to steer the nosewheel. He was partially successful; his intervention converted a three-plane collision into a two-plane affair. Both aircraft had considerable damage; the wing of the runaway passed under the other's tail before coming to a stop.

Direct wheel braking in the dual CF104 is available only from the front seat - a vital detail that was missing in the EOs and consequently, in other towing orders. (Although, if properly serviced, full braking is also available from the rear cockpit.) Worn and fatigued shearpins continue to cause ground accidents when they fail under normal stress. Seven of the nine towbars at the unit had shearpins with signs of stress and wear. Two of the seven were on the verge of failing. The record of failed shearpins goes back to 1963 in which damage to aircraft, vehicles, and near-injuries were the outcome.

The shearpin cannot, of course, be dispensed with as it protects the nosewheel gear from overstressing during towing. Nevertheless, a timed replacement program is the obvious inexpensive alternative to expensive accidents such as this, particularly as bases are faced with rough and undulating surfaces.

CF104, U/C COLLAPSES After receiving takeoff clearance and opening up to 100%, the pilot felt an unusual vibration. As he retarded the throttle, suspicion turned to amazement as the left wing fell, splitting the tiptank and spilling fuel on the runway. The selector and the indicators showed u/c down and locked.

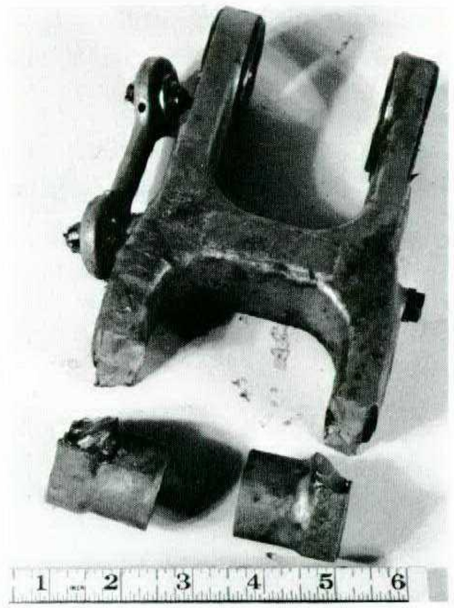
The failure of the drag strut H-link allowed the port main undercarriage leg to collapse rearward badly damaging the port wheelwell area, the practice bomb dispenser and port tiptank.

This was the third such failure in two weeks; one had occurred during a high-speed taxi test and one during towing. The progressive fatigue crack appeared to have originated at a mark left by a tool impact on the H-link. There were a number of such marks in this area. Using ultra-violet NDT examination,

all H-links on the base were examined; 11 were found suspect. To determine if it was progressive cracking or merely tool marks, these links were later X-rayed.

To detect any further such fatigue failures:

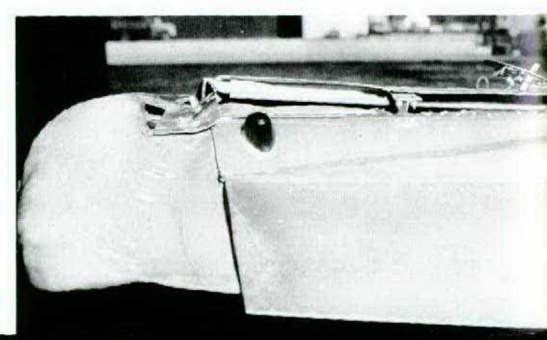
- all installed links will be X-rayed not later than the next airframe periodic inspection.
- links in stock will be visually inspected for surface irregularities or tool marks and any found will be dressed out.
- NDT of all H-links will be added to the CF104 #1 Periodic Inspection.

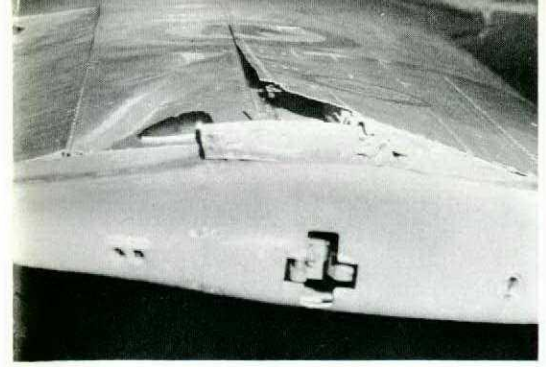


T33, WING TORN The aircraft was at 4000 above ground on a spotter photo flight with a formation. Flying at 400K in a 45-60° port bank the aircraft crossed in front of, and 700 feet above, the formation. "A severe vibration or buffet suddenly occurred not unlike turbulence at very low level in gusty wind conditions ..." The copilot mentioned being thrown about the cockpit.

The pilot then noticed the port tiptank commence a rapid vertical oscillation. Despite reducing power and easing off the slight G (1-1½), the oscillations increased and structural failure seemed imminent. When the wings started to ripple and the tiptank seemed about to tear away, the empty tanks were jettisoned. After declaring an emergency, the pilot carried out a controllability check before landing safely off a straight-in approach.

The outer wing skin and tip fairing were buckled and torn. For 55 inches along the upper spar cap, rivets had been pulled away like torn stitches. Internal wing damage





affected the formers, stringers, and forward spar cap flange. In addition, the left aileron was buckled and the left flap was binding.

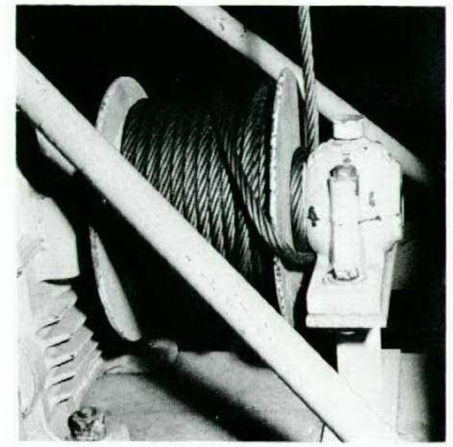
The failure or loss of the tiptank sway braces accounts for its oscillation - severe enough to smash the wing. Improper installation or structural failure of the upper sway brace caused the near disaster. An elongated gouge in the wingtip fairing supports both theories.

The hazards of incorrect installation of tiptanks have been advertised - maybe the pictures will drive the message home.

Answer:
A lightning strike last summer at CFB Toronto.

BUFFALO, CRANE HAZARD A crew of 3 were installing an engine with a manual gooseneck crane. While the NCO i/c operated the crane the two men guided the engine into place on the engine mounts - until there was a sudden snap. The engine dropped onto the maintenance stand on which the men were standing. The men were uninjured but the engine wasn't.

The cable had piled up and jumped the drum flange - the second such case. However, the previous occurrences had been blamed on the electrical operation of the crane and not its design. This proved to be a red herring and quite possibly resulted



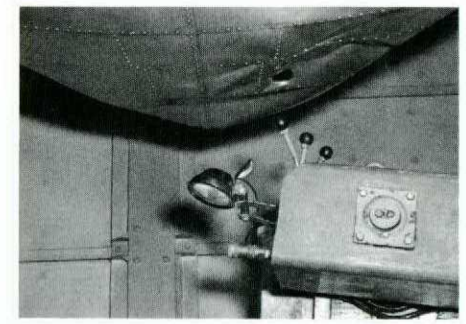
in no precautionary instructions being issued.

Despite its inadequate design (no level-winding guide) this type has been used for many years without a problem, suggesting that operators and supervisors have been more vigilant in the past.

A UCR - at first, not implemented - suggested logically enough, enlarging the side flanges of the cable drum. However, an operator must still use the utmost care and vigilance to prevent uneven winding. Thus, without the more expensive level-wind device, the hazard of injury and damage exists. Only time will establish if the cheaper model was really a "best buy".

C130, TECH INJURED After buttoning up inspection panels on the rudder, the technician lowered himself in the personnel bucket of a telescoping lift truck. Once below the tail tip the bucket was maneuvered to one side to clear the nearby hangar doors; then, instead of going down the bucket went up. The controls and the man's hand were jammed into the fuselage lower surface. As the controls were jammed, the bucket could not be lowered; he was eventually freed by a combination of cargo ramp lowering, deflating the nose oleo and a crowbar between the vehicle and aircraft.

Fortunately there were only minor injuries. The man had maneuvered the bucket incorrectly. However, the designer is really at fault by negligently designing the lever movement in the wrong plane. A control lever which is moved forward to raise and back to lower counters the instinctive impulses of an operator.



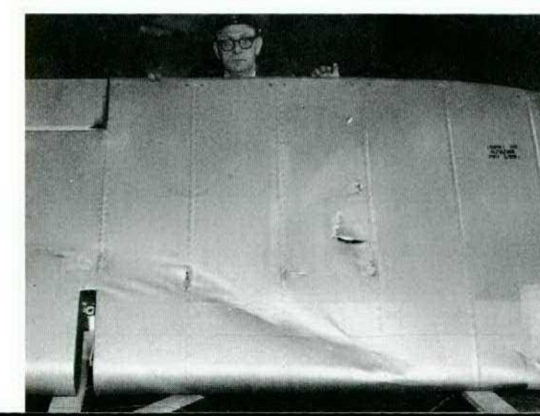
This accident points to a need for formal safety criteria in such devices.

DAKOTA, UNFORECAST WINDS In the early morning at an isolated northern airport the crew were astonished to find the aircraft they had parked the previous night, in a different spot. The starboard elevator was overlapping the wingtip of a civilian twin-engine job.

Unable to obtain chocks from the civilian agency the night before (everything was closed up), they nevertheless decided that with the parking brake set it was safe to leave the aircraft unchocked. But the winds did not follow the forecast; throughout the night the force increased to nearly 50 mph in gusts - enough to blow the aircraft backwards 50 feet and swing it through 70°. The starboard elevator was extensively damaged necessitating a fly-in replacement.

Winds continued to climb during the day to 85 mph gusts moving the Dak backwards - even jumping a chock on one occasion. Good fortune alone prevented the aircraft from being exposed to these winds during the night.

Forecasting, say the experts, continues to be an "inexact science". The least imponderable aspect of weather, then, is the certainty of uncertainty - act accordingly.



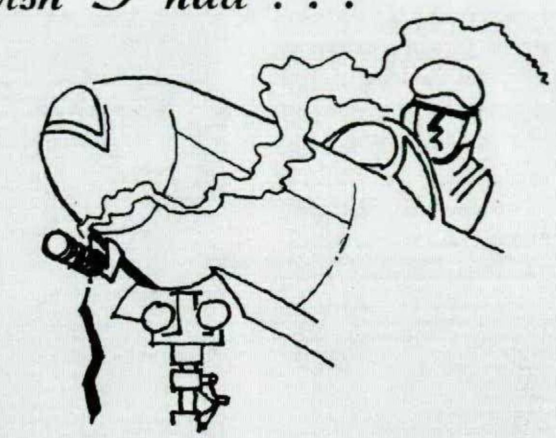
Comments to the editor

We here at St Margarets NORAD Control Centre are very proud of our equipment but were astounded to find we could control aircraft way out in Comox. I refer to your item in the Jan/Feb issue "Six Comox aircrew = 7000 Voodoo hours". This photo shows 6 aircrew from 416 Sqn. As we have been recovering 416 Sqn aircraft at CFB Chatham, it is hoped that we are not compromising flight safety by recovering these aircraft so far from their base at Comox.

Col J.J. Collins
CFS St Margarets

Frantic attempts to have these officers transferred to Comox to validate the story, failed. This was one error we didn't deliberately slip in to keep readers alert (or awake)!!!

I wish I had . . .



...removed the pitot cover!

cont'd from page 3

Adequate planning must be preceded by a thorough survey to determine to what extent existing NDT resources are utilized. The confirmation of aircraft structural integrity now being achieved by the extensive use of radiographic (X-ray) examination should result in revisions to depot-level maintenance procedures. Eliminating costly duplication of inspections is possible. Any evaluation of new methods must be made against the background of current maintenance problems to determine those to which our attention must first be devoted. Proven methods must be further investigated to expand their usefulness in solving existing problems.

In the immediate future, our efforts shall be directed toward planning the future growth of NDT for aircraft maintenance. Surveys will be carried out to establish our needs and determine our problems. The attention and thoroughness given by all formations to these surveys will influence the extent of the maintenance contribution to flight safety. In this way, you provide the effort in unearthing the facts so that the tools which science and applied engineering have created, can contribute to the airworthiness of our aircraft.

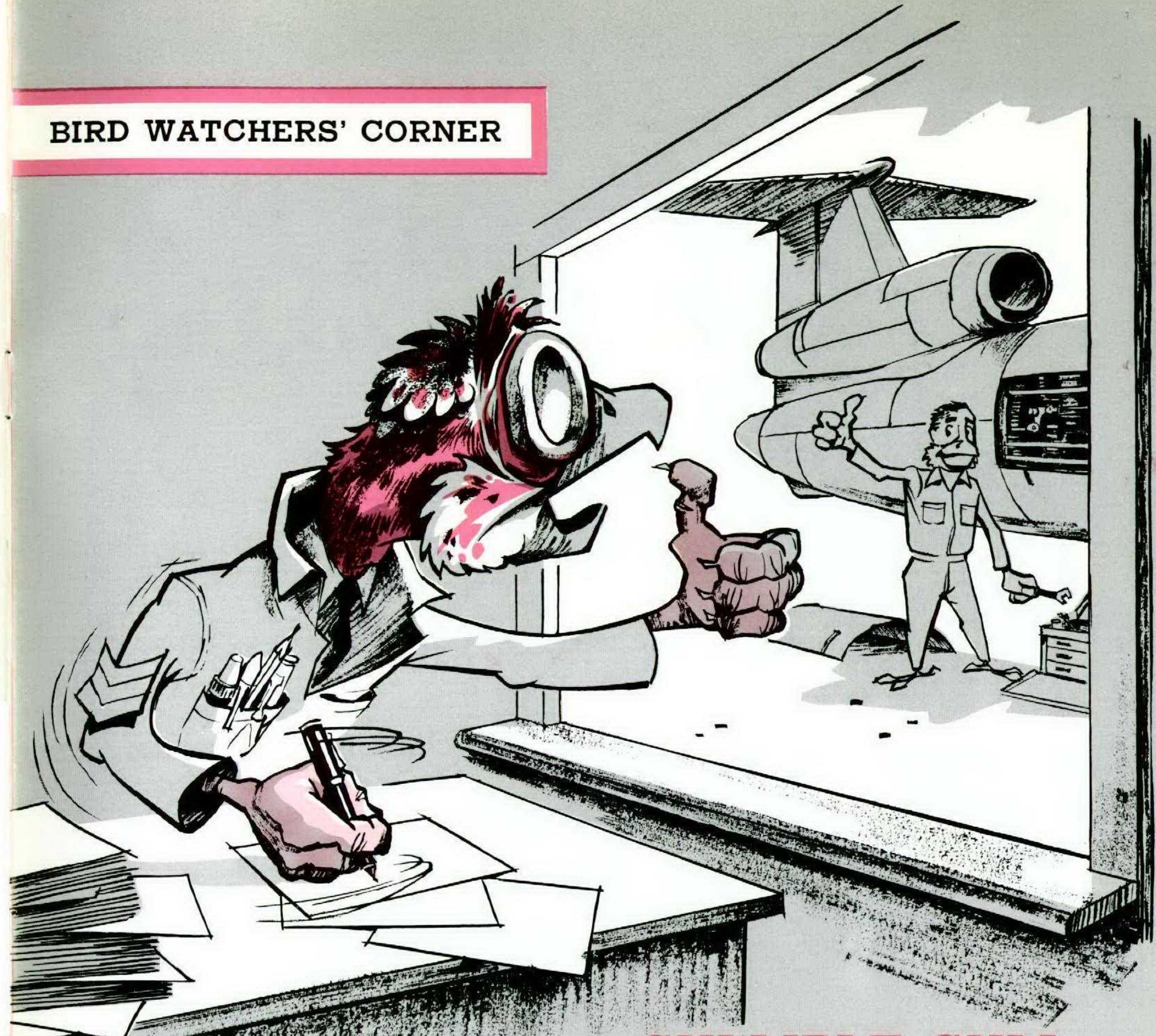
Maj M Chamberland obtained a BA in 1953 and a BSc (Metallurgy) in 1958 from Laval University. As an ROTP graduate, his first assignment was to 12 TSU, Weston, Ontario, which he left in 1961 for RCAF Materiel Laboratory, Rockcliffe. In August 1963, he won a Canadian Welding Bureau scholarship and attended Cranfield College of Aeronautics, UK, for postgraduate work in welding metallurgy. In October 1964, he was posted to 6RD (now AMDU) where he held the position of NDT officer until July 1967. He is currently responsible for the development of NDT resources, including SOAP, for the Directorate of Aerospace Maintenance.

Poor lighting penalty

The servicing officer reported that the lighting on the ramp area was inadequate. Recently, a crew were doing a run-up on a visiting aircraft and a fuel tank leak was not detected because of poor lighting.

- Flight Safety Committee

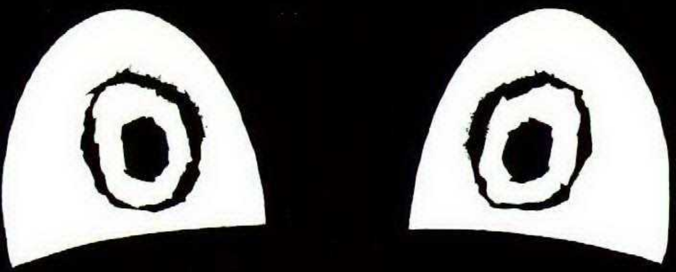
BIRD WATCHERS' CORNER



GULLIBLE GULL

From casual observations of this bird, some bird watchers are misled into supposing that Gullibles are nest-bound sanctuary seekers. And it must be admitted that occasionally this species does display an instinctive inclination to rest in the nest. Take the Gull's less-than-complete scrutiny of his flock's work, for example. Real or imagined pressure of work seems to intervene — particularly when the inspection involves another experienced and trusted bird. Thus, from the good intentions of both parties, old Gullible gets gulled and a mis-mated part is missed. Confident in the competence of a feathered fellow he casually gestures his acceptance while a characteristic song escapes his gullet:

WHENEVER-I'M-RUSHED I-DISPENSE-LOTS-OF-TRUST



...a useless dim glow!

Most aircrew make certain that workable flashlights are part of their flight deck equipment - but not all. On one very black night, seconds after takeoff, a fully loaded multi-engine transport experienced a loss of primary electrical power. To compound the problem, essential instrument lights were not automatically restored.

In an effort to provide the captain with instrument lighting during this critical phase of flight, the first officer grabbed his readily available flashlight, to use while making the necessary electrical panel switch configurations. To his consternation, the flashlight gave out only a useless dim glow!

Meanwhile, a quick-thinking flight engineer filled the gap by illuminating the captain's flight instruments with his own flashlight until the first officer, fumbling in the dark, managed to restore aircraft electrical power.

Flashlights of dubious quality as well as worn-out batteries continually find their way into the system - and stay there unchecked - unless there's a program for:

- getting rid of damaged flashlights
- ready access at the flightline to fresh batteries and bulbs - and even flashlights (at CFB Uplands!).
- a routine check program.

Convinced? OK, just answer this question: How keen is the above-mentioned crew <u>now</u> for maintaining their flashlights?