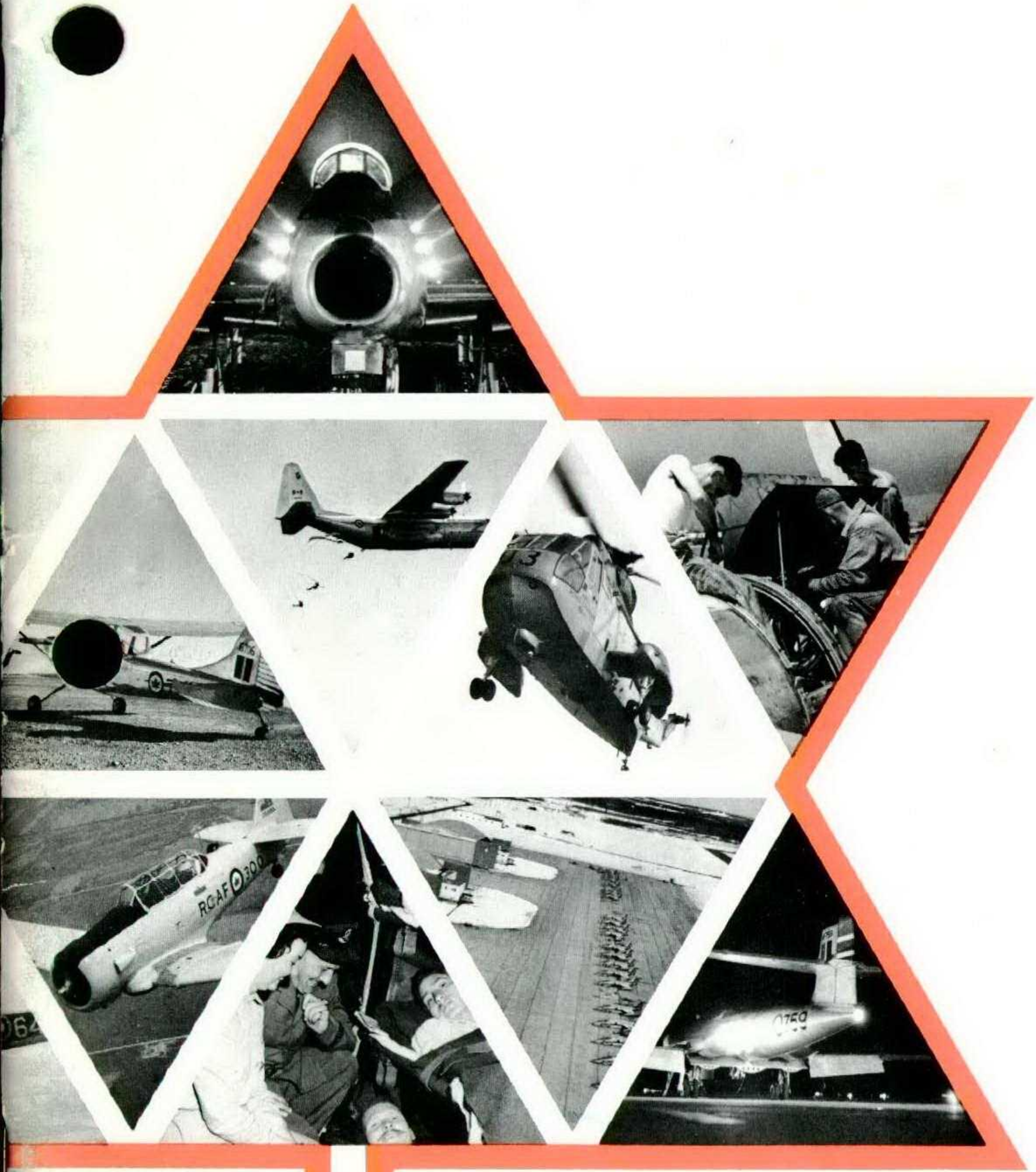
FLIGHT COMMENT

JANUARY · FEBRUARY · 1967



CANADIAN FORCES HEADQUARTERS
DIRECTORATE OF FLIGHT SAFETY

67 1967

Comments

FAA figures for 1964's crop of non-military flying accidents reveal incontestable proof – in case it hasn't been obvious to everyone already – that "pressing on" can be lethal. For continuing VFR in adverse weather, 134 persons were killed – more than all the other fatal accident causes combined. In fatal accidents where weather was the principal cause, the "low ceiling" factor equalled all the others combined. Sure sounds convincing.

■

A Yukon recently sustained damage from "an extremely heavy blow" from an unidentified vehicle. The damage was extensive enough to preclude this happening without the person's knowledge. It can only be concluded that barring malicious intent the damage was deliberately unreported. The person who failed to report this damage for selfish reasons may have jeopardized the lives of many people. The implications of this kind of act are so serious that there's an unwritten law among us who fly and handle airplanes: never conceal a mistake if it hazards someone else's life.

■

A violation recently filed by the captain of a civilian airliner against an RCAF Hercules brought out an interesting fact relating to visual phenomena. It was apparent to the RCAF crew throughout the occurrence that no mid-air collision was possible; what most likely occurred was an error from "spatial localization" – an illusion which can occur as a pilot suddenly emerges from cloud. Your flight surgeon can describe the problem at his next aircrew briefing.

DIRECTORATE OF FLIGHT SAFETY
CANADIAN FORCES HEADQUARTERS

G/C AB SEARLE
DIRECTOR OF FLIGHT SAFETY

S/L MD BROADFOOT
FLIGHT SAFETY

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FLIGHT SAFETY IN THE ARMED FORCES

As we commence a new year – a year of particular significance to us all – I am happy indeed to express a few words to those engaged in aviation in the Armed Forces. The occasion is unique by being doubly historic; on the year of our centenary we also enter a new era of military activities. For the first time the wealth of talent and experience of many officers and men with diverse backgrounds will freely combine. Nowhere in our forces will the impact of this be more apparent than in the challenging and exciting occupation of aviation.

Such an interchange of knowledge and ideas is increasingly necessary; as proof of this, our aircraft accident figures should be convincing to commanders, aircrew, and groundcrew alike. These losses compel us not only to improve and extend flight safety programs but also to enlist an enthusiastic support of them. I have confidence that the Armed Forces are achieving the professional maturity so vital to this enthusiasm.

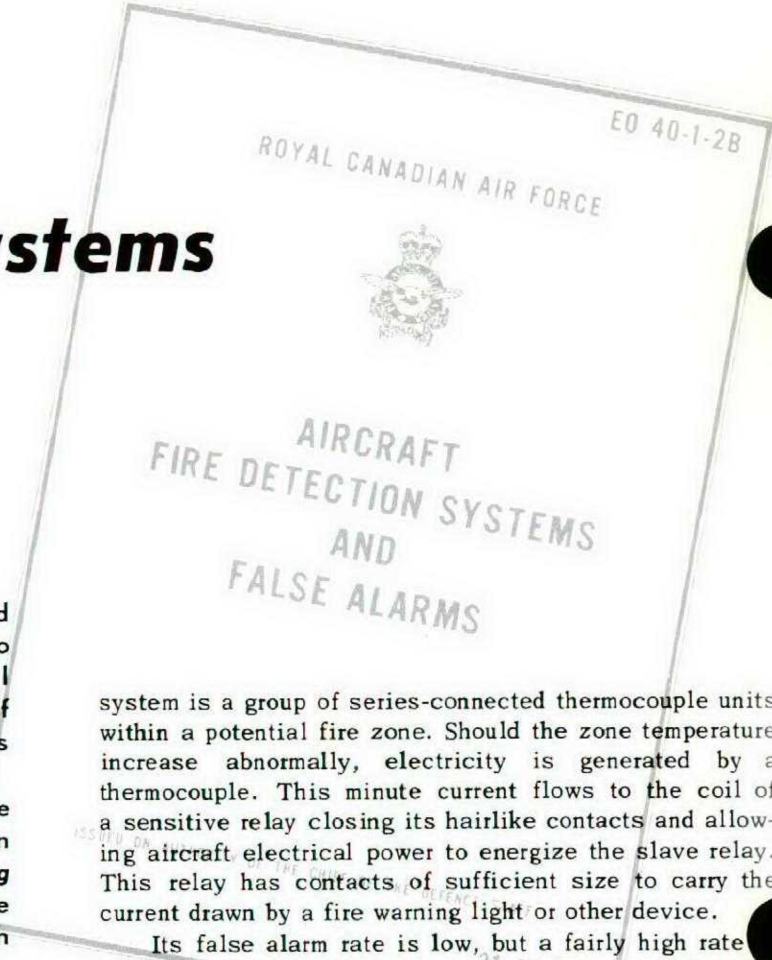
A preliminary review of 1966 shows that many of the accidents are repeats of those mistakes made in previous years, revealing a continuing disregard for orders. Orders pertaining to the operation and servicing of aircraft are derived, in large part, from prior experience – in this context, those who disregard orders only invite danger.

In certain areas, on the other hand, we made progress. I am particularly pleased to pay tribute to those responsible for the very considerable reduction in CF104 accidents. I note with much satisfaction the evidence of a maturity among the persons most exposed to accidents – the pilots. The many fine efforts of the majority, however, are often overshadowed by errors of the few. The over-zealous tendency to press on into deteriorating weather, costly damage from foreign objects dropped or discarded by unthinking persons, are only two of the persistent problems.

In this issue as in past issues there appear several "good shows" – individuals who have given that little extra which calls for special recognition. There are many others who have not been so recognized but who nevertheless by steady, conscientious performance of their jobs have helped not only to maintain a high operational standard but have also saved lives and prevented damage to aircraft.

If we are to make 1967 a memorable year, we need only apply good judgement, and enthusiasm for our work. I am pleased to congratulate you for past efforts – the year ahead is an opportunity for further accomplishments of flight safety.

J V ALLARD
GENERAL
CHIEF OF THE DEFENCE STAFF


EO 40-1-2B

ROYAL CANADIAN AIR FORCE

AIRCRAFT
FIRE DETECTION SYSTEMS
AND
FALSE ALARMS

Fire Detection Systems

F/L JH Belanger
MATCOM

Ideally, fire in an aircraft should be confined by combustion and exhaust gear and not venture into unauthorized areas. However, with an occasional assist from enemy action, materiel failure, act of God, or plain human error, fire can get out of bounds threatening lives and equipment.

Obviously, the best time to combat fire is before it gets started. Indeed, fire or overheat detection systems are designed to warn of an ***impending*** perilous condition. Crews can then take preventive action, such as reducing power, shutting down an engine or activating a fire extinguisher.

"Fire detectors" are heat-sensitive devices capable of being pre-set to generate a signal at a given temperature. When the temperature in an area becomes excessive, the system gives an overheat warning. The services employ three basic types of fire detection systems:

- thermocouple
- thermoswitch
- detection cable

All perform essentially the same function: *alerting the crew by warning light or audible signal.* On the other hand, a fire detection system which malfunctions, generating a false alarm detracts from alarm credibility. When a fire warning occurs and there is no fire it burns up only the crew!

Fire detectors are installed in potential fire zones, such as powerplants, engine nacelles, heater compartments, aircraft holds, and various areas inaccessible in flight. Some aircraft have smoke detectors in the cargo compartments: ambient air passes between a light and a photocell and if the air contains particles which obstruct the light beam to any extent an alarm is generated.

The Thermocouple

This system is installed in several aircraft types where it has given good service – the Dakota and Expeditor, for example. The thermocouple detector system is a group of series-connected thermocouple units within a potential fire zone. Should the zone temperature increase abnormally, electricity is generated by a thermocouple. This minute current flows to the coil of a sensitive relay closing its hairlike contacts and allowing aircraft electrical power to energize the slave relay. This relay has contacts of sufficient size to carry the current drawn by a fire warning light or other device.

Its false alarm rate is low, but a fairly high rate maintenance is required in some installations. It has the advantage of not setting off the alarm from a developing ground in the fire zone, as a potential does not then build up in the thermocouple elements. One disadvantage is that a break in the thermocouple circuit renders the system inoperative – although this condition is easily picked up by the test switch. The thermocouple system requires keeping the circuit free from ground faults and open circuits, both conditions being easy to spot with an ohmmeter or a megger. Once a malfunction is known, however, the defective thermocouple, connection, or wire, can be located only by a process of elimination. Of interest, is that thermocouples have a polarity; this must be observed whenever a thermocouple is installed. If the connections to a thermocouple were reversed and a fire energized the unit and an adjacent one to the same degree, the signals would cancel out and no warning would be given.

(EO 40-95AA, and respective aircraft -2, -4, -7 and -7A EOs carry detailed data on thermocouple detector systems.)

The Thermoswitch

This system is quite simple. It consists of a number of switches connected in parallel, so that the actuation of any one of them completes the circuit of the warning device. The heart of the system is the thermoswitch which is a cartridge-like shell of stainless steel inside which are two contact-carrying struts mounted under compression (Fig 1). A rise in temperature causes the shell to expand and extend, reducing strut compression. The contacts touch when the temperature calibration point is reached. Some systems employ a different type of thermoswitch in which a contact on a bi-metallic element completes a circuit at a certain temperature setting.

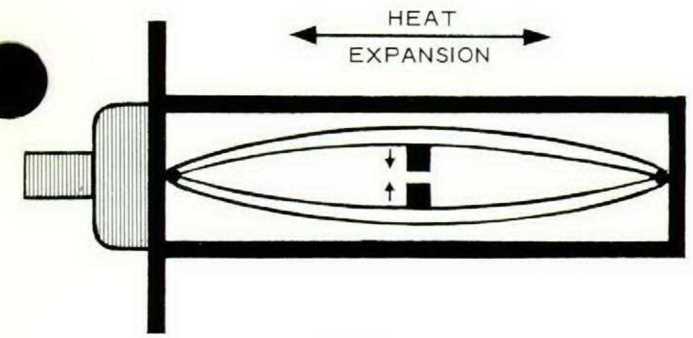


Fig 1

Thermoswitch fire detector systems have given good service in some aircraft such as the CF104, but have been troublesome in others. The dual-loop/two-wire system using a circuit-breaker relay does not generate a false alarm due to grounding; however, the single-wire system will false-alarm on grounding, and should not be called up on new engine fire detection installations. This system is capable of point detection but has a drawback of routing electrical connections and wiring into high-temperature areas. Further, the switch units, although rugged, can be jarred out of calibration.

Thermoswitches cannot be repaired or reset in the field but can be easily tested to confirm adjustment to a proper setting. In a potential fire zone, the high temperatures, the severe humidity, and vibration, subjects the wires and terminals to chafing, oxidizing and loosening, which degrade system reliability. The thermoswitches and mounting components which deteriorate with age should be replaced. All tradesmen working in the area must be careful to avoid jarring the switch units.

(EO 40-85HA refers to the thermoswitch tester and test procedures; applicable aircraft -2, -4, -7 and -7A EOs provide installation details and minimum inspection requirements.)

The Continuous-Wire, or Detection Cable

This is one of the later types to appear on the scene. While other detection systems perform point detection only, the fire detection cable can monitor for fire along its whole length. The cable is a flexible metal tubing enclosing a wire core insulated by a ceramic material (Fig 2). It can be any length, and several lengths can be coupled.

The whole trick to this system is the ceramic or salt-like material insulating the wire core from the outer shell. A handbook explains that this material has a "negative co-efficient of resistance with respect to temperature" – a somewhat baffling phrase for the uninitiated. It simply means that the resistance of this material (unlike most) *decreases* as temperature increases.

In this day, the simplicity of the continuous-wire type is indeed awesome. Anybody who knows the elementary Wheatstone bridge can readily grasp the idea. The detector element can be thought of simply as a variable resistance responding to heat. The cold core-to-sheath resistance is very high, therefore several lengths can be connected end to end without affecting response characteristics.

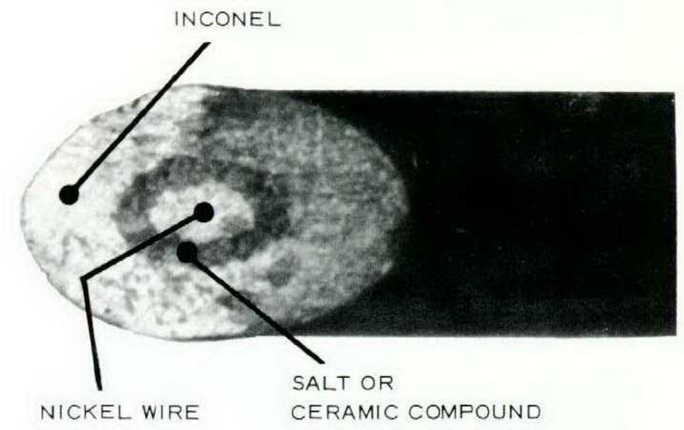


Fig 2

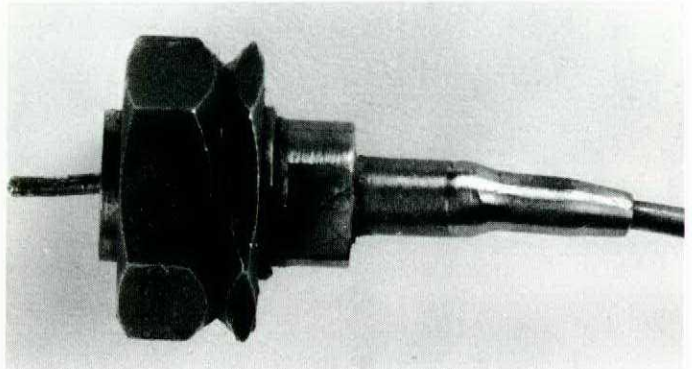
In a typical system, power from the aircraft is applied to the fire detection cable core through a bridge circuit. No current flows until a breakdown of resistance is induced somewhere along the cable by heat. The detector cable circuit is connected as a loop, so that a single break in the element leaves the system fully operative (provided the break has not left the cable outer shell in contact with the inner wire core) – at least, so the theory goes! Here again, a system test switch permits quick checks for open circuits. Fire detector cables lend themselves to easy routing but this feature multiplies the chance of malfunction.

This system is susceptible to four types of malfunction, sometimes causing a high rate of false alarms. These factors vary with the system manufacturer, aircraft installation, and the standard of maintenance prevailing.

- Chafing of the outer sheath occurs when the cable is improperly installed and rubs against a surface. When the sheath is worn through it sets off a false alarm.

A detection cable badly chafed – a dime appears huge beside cable and damage which caused a false alarm.

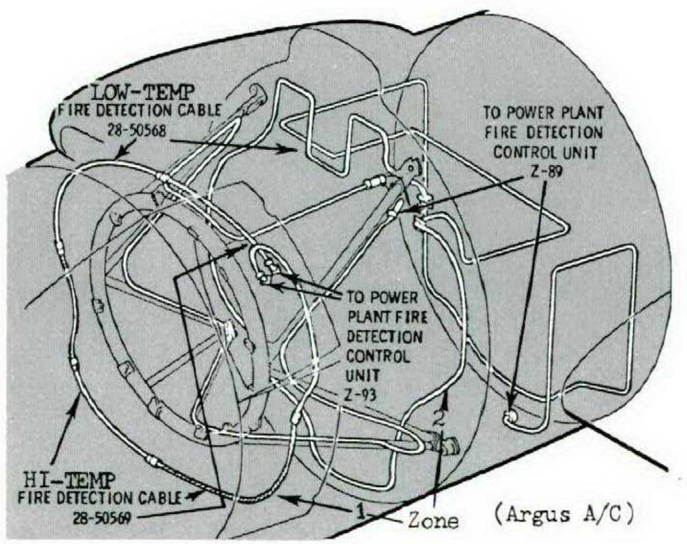
- Moisture or contaminants penetrating the fire zone connections. These fluids act as electrolytes which can create a path across the connection triggering a false alarm as the set point is reached. Give the element and intercable connectors a core-to-sheath resistance test. Connect, torque and lockwire suitably. Seal up the entire connection using adhesive CFSB-20-GP18a or equivalent, and apply adhesive to entirely cover the outside of the connector, and extend one-half inch maximum along the element wire. Clean the element end and inter-connectors with proper fluid and allow to dry.



Bent pin on cable connector

- Aging of the temperature-sensing material inside the cable, due to time, vibration, or temperature cycling.
- The flexible shielded leads that connect detector cables across door hinges, mountings, etc, may chafe, short, or absorb moisture.

Continuous wire systems are being improved; eg, the "Ground Discriminator" devices which turn off the system *before* a grounding element core causes a false alarm. Another method is to add a dual (or redundant) system, or fire-zone loop, to act as a standby in case of trouble in the first loop. The dual loop offers advantages although it doubles the amount of fire-zone hardware to maintain. Prototyping of this system is underway in aircraft where a persistent problem has been encountered.



Typical continuous-wire installation (Argus)

(EO 40-95AB-2 describes one type of continuous wire system, and applicable aircraft -2, -4, -7 and -7A EOs detail specific installations and inspection requirements.)

Other Systems

Another type of fire detection system now coming into use is the surveillance type. It has given go[od] service so far in the CH113, although our experience w[ith] it is still limited. Photocells pick up infra-red radiati[on] from a fire. A control unit picks up and interprets the cell response.

Also new is the LINDBERG "pneumatic" system; little is known as yet of the performance of this system. A gas-forming sensor tube in the fire zone contains a snap-action diaphragm switch at one of its extremities. Element damage will not cause a false alarm, however, it would render the system unserviceable. Considerable preventive maintenance is therefore necessary to prevent chafing, excessive vibration, etc, leading to element damage.

Summing Up

Warning devices and control units should be essentially trouble free. Although some detector system manufacturers have observed that thermal flows can be fickle, we may assume that in an installation properly engineered false alarms are usually caused by some defect developing in the detector circuits within the fire zone. This is not surprising, because the fire zone imposes th[e] most extreme conditions of moisture, vibration a[nd] temperature on the delicate and sensitive detect[or] elements.

Sustained care has to be exercised by technicians. When the false alarm rate is low a laxity develops that breeds false alarm causes. This explains why high false alarm rates tend to occur in cycles.

In all systems, the fire zone is critical, and the detecting hardware, the mounting hardware and connecting hardware must be maintained sound and secure. Fortunately, all this hardware is consumable – so, when it looks old, loose, worn, chafed, or otherwise, it should be replaced. The best time to do this is in the engine bay on power-plant build-up when entrails are bare and all equipment is readily accessible. On build-up, fire detector systems should be restored to a LIKE-NEW condition. CHQ and operating units should ensure that their power-plant build-up worksheets carry appropriate data in this regard.

We take for granted, of course, that all technicians are aware of the vulnerability of fire zone detection g[ear] and would never use them as footrests, handgrips, equipment hangers. But there are still opportuniti[es] for damage from a glancing blow by a slipping wrench, from stresses applied while working on adjacent equipment, and exposure to aircraft fluids. All technicians should report any detector which has bee[n] accidentally subjected to a stress so that it can be tested and replaced if necessary before it causes a false fire alarm in flight. NCOs doing percentage checks should look for any evidence of fire detector damage.

Early warning of an in-flight fire is essential, and fire detection systems are here to stay. However, we must admit that some systems now in use necessitate [h]igh maintenance. A concerted effort is required at all [l]evels – after all, false fire warnings are hard on aircrew nerves, and aborted missions are hard on the defence budget.

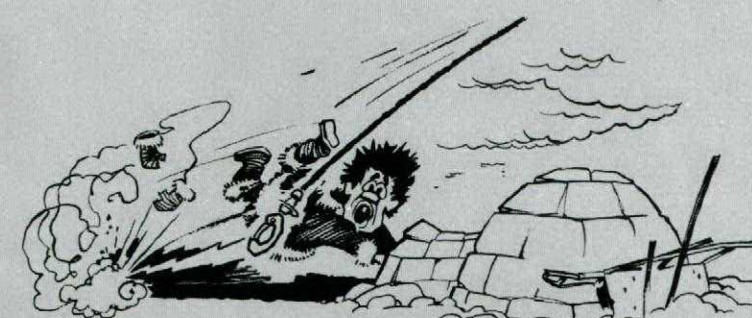
SPECT FOR	CONDITION	ACTION
1. CHAFING	A. DEPTH OF CHAFE MARKS NOT TO EXCEED 0.012 INCH OR 0.50 INCH IN LENGTH.	REPLACE (0.010" MAX; 0.50" MAX)
	B. CHAFE MARKS THAT ARE 180 DEGREES OPPOSITE OR IN DIFFERENT PLANES IN THE SAME DIAMETER. THE REMAINING CROSS SECTION SHALL NOT BE LESS THAN 0.050 OR EXCEED 0.25 IN LENGTH.	REPLACE (0.050" MIN; 0.25" MAX)
	C. "V" NOTCH TYPE CHAFE MARKS THAT EXCEED 0.012 INCH IN DEPTH.	REPLACE (0.010" MAX)
2. SURFACE SCRATCHES	A. THOSE THAT ARE IN EXCESS OF 0.010 INCH IN DEPTH AND A RUNNING LENGTH OF 1.0 INCH.	REPLACE
3. BENDS OR KINKS	A. THOSE THAT HAVE LESS THAN 0.25 INCH RADIUS.	REPLACE (0.25")
	B. BENDS OR KINKS WITHIN 0.50 INCH FROM THE CONNECTOR STRAIN RELIEF. BEND RADIUS AT THIS POINT MUST EXCEED 0.50 INCH.	REPLACE (0.50")
4. CRUSH	A. REDUCTION GREATER THAN 1/3 DIAMETER SHALL NOT EXCEED 0.25 INCH IN LENGTH.	REPLACE
TWIST	A. SHALL NOT EXCEED 360 DEGREES IN A SIX (6) INCH LENGTH.	REPLACE
	B. TWISTS THAT EXCEED 30 DEGREES WITHIN ONE (1) INCH OF STRAIN RELIEF.	REPLACE

	ACTION
1. STRIPPED THREADS	REPLACE
2. SAFETY WIRE HOLES BROKEN OUT	REPLACE
3. CRUSHED OR OUT OF ROUND	REPLACE
4. LOOSE MALE PIN	REPLACE
5. BENT MALE PIN	REPLACE
6. LOOSE, BENT OR CRUSHED FEMALE CONTACT	REPLACE
7. DIRTY OR CONTAMINATED	CLEAN (USE TRICHLORETHYLENE)

F/L JH Belanger

F/L Joseph H Belanger enlisted in the RCAF in 1943, and served on the aircraft instrument-electrical maintenance staff of 426 Sqn at Dorval from 1947 to 1955. He was transferred to Air Materiel Command in 1960 after receiving his commission in 1959. He served in the former SACO (Senior Aircraft Officer) branch until 1962 when he joined the SAVO (Senior Avionics Officer) branch as a Technical Aeronautical Engineering Officer.

Large Charge



Army tests at Fort Greely, Alaska, showed that static electricity caused by blowing snow (either from wind or rotor downwash) can build up a charge on a sling load carried beneath a helicopter. This electrical charge built up to 200,000 volts, pegging the meter in a very short time.

Be sure slings are grounded before troops grab them. A survivor sure wouldn't allow himself to be picked up twice that day!

MAC FLYER

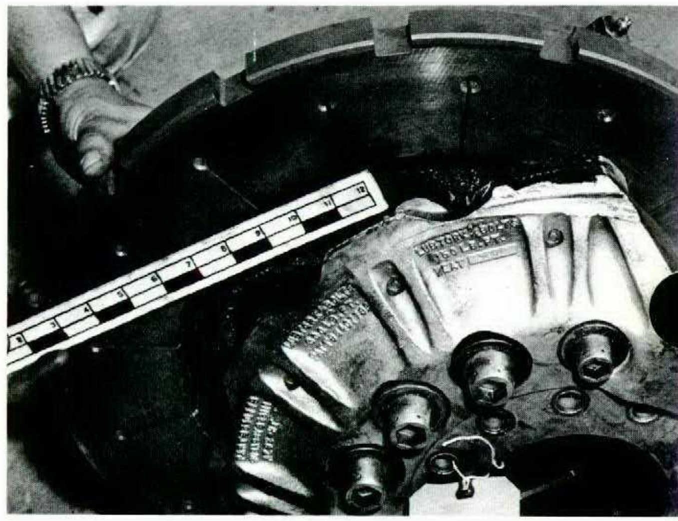
A little more attention...

They hadn't towed the Hercules very far from the hangar following the removal and reinstallation of a brake assembly when a loud scraping noise was heard from the vicinity of the port wheel. The damage to the bearing and brake assembly is shown in the photos.

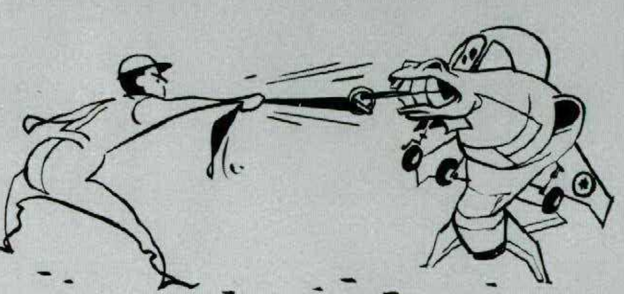
Had the noise not occurred or the extensive damage been detected, the aircraft would have remained in a hazardous condition for taxiing, takeoff or landing.

Earlier, the brake assembly had been removed from the axle and returned to the tool crib. A spacer, which "usually stays on the axle when the brake unit is removed" this time, stuck to the brake assembly. Assuming the spacer unit to have remained on the axle another unit was installed with the resulting damage.

To the technicians involved, the word "usually", now has a decidedly unpleasant association.



Flag Yankers!



An alert corporal at 1 Wing (Cpl FR Sova) UCRd the split rings which attach the T33 seat pins to the flags. These rings are no match for the brawny aircrew who regard these flags as pin handles. The rings could be beefed up, the corporal suggested, by lock-soldering the rings – and his advice has been taken.

Now, what of the aircrew with a penchant for over-stressing streamer components? Clearly, these pins are devices to prevent injury or death. They should be maintained in tip-top shape by careful inspection – and handling.

Aircraft in Tow

Chances are, if you're one of those people regularly called upon to move aircraft in, out, and around hangars, you won't have a towing accident in the next year or two - statistically, that is . . .

Nevertheless, in the one and a half years from January 64 to June 66 no fewer than 61 people were involved directly and several hundred others indirectly in towing accidents resulting in aircraft damage.

Concerned about damaging an aircraft while towing? Whether you're patriotically motivated to the point where you deplore unnecessary waste of public resources, or whether you are more inclined to the old "fire-proofing" motive, staying out of towing accidents means being alert. ALERT, not only in the bright-eyed sense but knowing where you're likely to get into trouble. Don't wait blindly for that agonizing moment when you're invited to explain in writing why that wingtip hit that hangar.

If you subscribe to the school of thought which says: "learn from the mistakes of others", a close look at the table below will give you some idea of your opportunites to ding an aircraft. Here's a very un-typical example: a sheet of plywood blows off a hangar roof, damaging an aircraft while it was being towed! This one, of course, was not the fault of the driver; however, it remains on our records as one of the few exceptions where "carelessness" didn't show up at some stage.

And what is carelessness? In towing it simply involves not being alert to the hazards. Take an example. A technician has, for some months, been brake-rider on a tow crew. He knows how to operate the brakes but does he fully understand the emergency system if the main should fail? This happened – he lacked the integrity to admit that he wasn't fully briefed.

Here's our experience of the last year and a half. As we said, most of these cases were assessed "careless-ness", but we have attempted to extract a significant factor leading to the damage.

Table 1 – Salient features

wrong tow bar	2
error in judgement	19
not fully briefed	6
snow or ice	7
obstruction	5
servicing (pre-tow)	6
too few men used (EO)	5
parking area	2
materiel (tow bar) and vehicle	5
aircraft improperly parked	1
miscellaneous	3

The error-in-judgement items were considered to be an unexplained inability to see, or act quickly, to avert an aircraft impact; these come closest to being true carelessness.

Since accident assessments no longer have primary and secondary causes allotted, the table below shows a breakdown of *all* causes in the 61 accidents in this analysis. Personnel figure in less than half of the total assigned causes. Noteworthy, is that briefing errors, ie, supervisory, are present in over half the cases in which towing personnel are a contributing cause.

Table 2 – Total Cause Factors

towing personnel	43
related facilities	9
briefing	22
alighting area	11
materiel	4
maintenance	8
civilian contractor	2
weather	3
other	15

These two tables will show with statistical certainty where you will have your next accident – that is, if you are not alert to all the dismal possibilities.

GOOD SHOW

LAC GI FOYLE

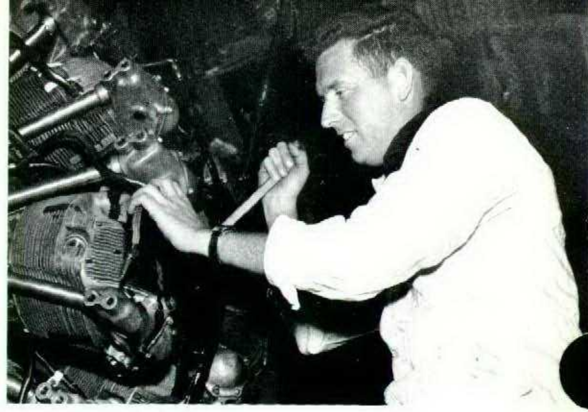
While the Albatross was taxiing for takeoff the flight technician, LAC GI Foyle noted traces of fluid on the upper trailing edge of the left wing. He immediately reported this to the aircraft captain who shut down the engine. Investigation revealed that one of the screws holding a fuel tank access panel had worked loose allowing fuel to leak into the area close to the hot upper exhaust stacks.

An extreme hazard and possible tragedy was averted thanks to the sharp lookout and alertness of LAC Foyle.

LAC KS MASKELL

LAC Maskell, while modifying a CF101 nosegear, noticed that the shims in the mod kit were about one half the thickness of the shims replaced. Had he installed these incorrect shims, a failure of the nosegear compression limit switch house or mount might have occurred.

LAC Maskell's vigilance not only prevented the failure of a costly component but has also greatly reduced the out-of-service time of the CF101 fleet – another close call; close enough to be measured in thousandths of an inch.



LAC MS HOOLEY

LAC Hooley was fire guard during the starting of the reciprocating engines on a Neptune. Fuel discharging from the blower case was ignited by torching from the engine's exhaust system. A flash fire spread along the ground under the starboard wing and around the undercarriage. The aircraft was in danger of catching fire.

A moment's hesitation could have meant a serious fire. LAC Hooley's alertness, prompt action, and his skill in employing the fire fighting equipment quickly extinguished the fire, preventing any damage to the aircraft.

CFN AG MACKINNON

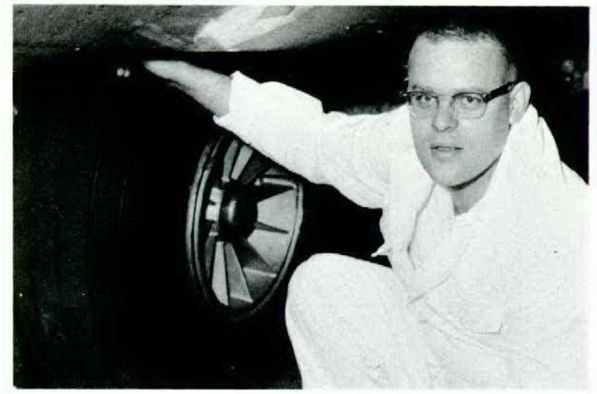
Cfn AG MacKinnon, a RCEME aircraft technician, was giving an L19E a periodic inspection during a field training exercise. While visually inspecting the engine compartment for general condition, he detected a suspicious mark on the rear inboard portion of the motor mount. Cfn MacKinnon and his supervisors teamed to extend the investigation. Using mirrors and jury-rigged lights, they confirmed Cfn MacKinnon's discovery – a hairline crack in the motor mount. The engine was removed and the motor mount replaced in the field.

Cfn MacKinnon's alertness and attention to every detail in this instance is noteworthy; however, this is only half the story. Four months earlier, Cfn MacKinnon had discovered another cracked mount during routine maintenance. The crack had been very difficult to see; its full extent was revealed only after the engine was removed.

Cfn MacKinnon is commended for his continuing thoroughness and attention to detail while working under far from ideal maintenance conditions in the field.

LAC BA MARLATT

When checking the nose undercarriage of a Hercules, LAC Marlatt suspected there was a difference between this undercarriage and another he had just inspected. He returned to the other aircraft and re-inspected the drag link. On checking the EOs, LAC Marlatt found that the nosegear drag strut bearing retainers were installed backwards. LAC Marlatt's discovery led to immediate inspection of other aircraft as the installation had occurred during a check at another base. This Murphy



could have resulted in the undercarriage jamming either retracted or down.

LAC Marlatt's alertness led to the uncovering of a hazardous defect. It took conscientiousness and a sharp eye to uncover this inconspicuous Murphy.

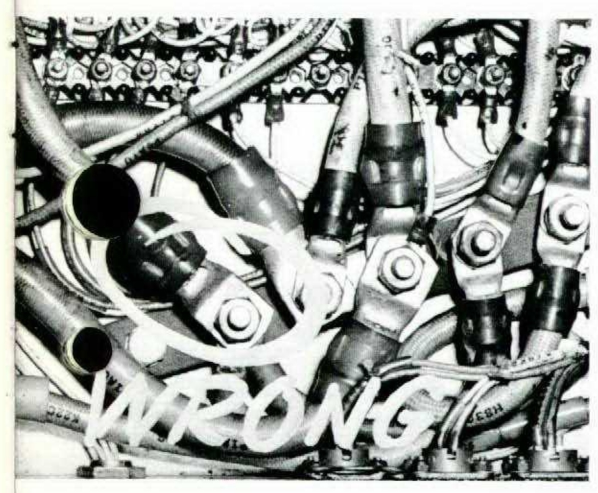
CPL MC DOWNIE LAC WA VIGUERS LAC GH WHITLOCK LAC BNJ BROOKES

The Argus start-up was normal but when the aircraft taxied away, the start crew – Cpl Downie, LAC Whitlock, LAC Viguers and LAC Brookes – saw fuel venting from both wings outboard of the outer engines. They knew expansion overflow could cause venting from these positions but not being satisfied, followed the aircraft to the run-up position where they advised the flight crew of the situation. By this time only the starboard wing was continuing to lose fuel. A leak in a fuel tank below the filler neck was allowing fuel and fuel vapour to fill the wing cavity.

Cpl Downie and his crew, by this display of alertness and initiative, prevented a takeoff with an extremely hazardous fuel leak. This crew demonstrated a thorough knowledge of the aircraft when they assessed the venting as abnormal, and a high degree of integrity by following up the investigation.

LAC WA Viguers LAC BNJ Brookes LAC GH Whitlock Cpl MC Downie

Murphy Again



Here are two ways to connect the positive generator lead on the Albatross. When incorrectly connected as in the picture it is linked to the propeller feathering circuit terminal. Be alert!

Lighting and Limits

F/L AF McDonald

The suspicion that something was wrong with the approach aids kept tugging at my thoughts . . .

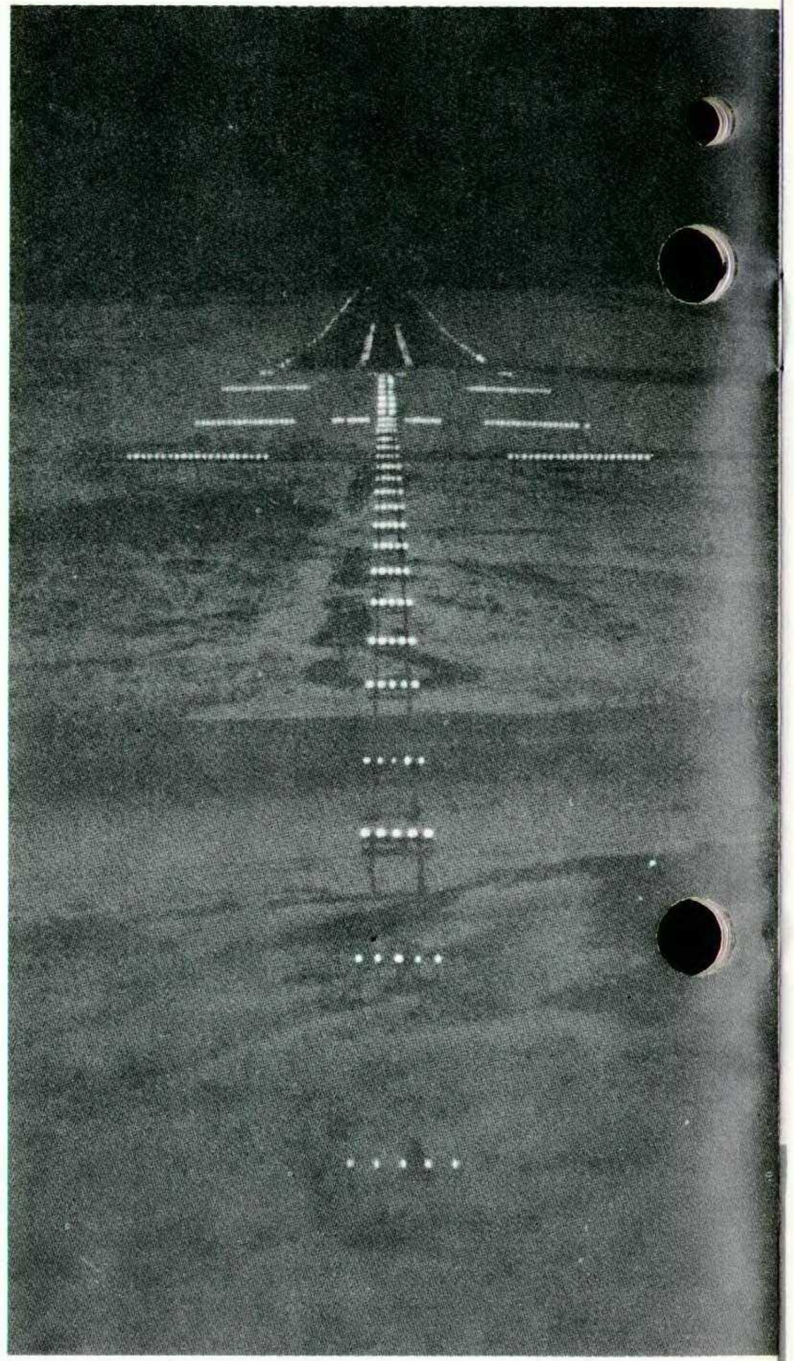
Tooling along at 29000 for Chatham in the late autumn evening my suspicions about the Ottawa weatherman's forecast for destination were far back from thought. He had predicted that the weather would be 800-and-2 with the risk of 400-and-1 in light drizzle. With an east wind and a four-degree spread, I had mused at the time that this fellow might be somewhat optimistic; perhaps he didn't know that on occasion the Northumberland Straits can make forecasters look like crystal-ball gazers.

On entering the Chatham area the approach controller's voice swept away the cobwebs as I was cleared for a TACAN-2 approach and GCA to runway 09. The weather, he informed me, was 200-and-1/2 in drizzle. There's one thing certain about the Mirimachi Valley – predictably unpredictable. However, there was sufficient fuel for an approach and a low-level diversion to my alternate, Summerside.

The approach and GCA went without hitch, but at minimum I looked out into a black void. There was a wet glimmer off to the right but nothing positive. Twenty-five minutes later I was marshalled in by a rather startled linecrew at Summerside, and cursing the fickleness of the New Brunswick skies.

On the overshoot, Chatham had advised that the weather had not gone below 200-and-1/2. The suspicion that something was wrong with the approach aids kept tugging at my thoughts; a little research soon proved how right that suspicion was.

Back in the early fifties GCA limits had been established at 200 feet and 1/2 mile using a three-degree glide slope. A little math proves the soundness of these limits since at 200 feet the aircraft would be positioned 3815 feet from GCA touchdown. A standard GCA touchdown point approximately 800 feet from the threshold means that at GCA minimum, the aircraft would be 3000 feet from the runway, and at that point the aircraft would be over the high-intensity lights. However, the 2.5° glide slope now used at all RCAF jet stations puts the aeroplane 4580 feet from GCA touchdown. At Chatham with GCA sited-in at 200 feet from the threshold, an aircraft at GCA minimum is still 1380 feet from the first high-intensity lights. No wonder I missed the approach – there were no lights at minimum which could ensure a safe transition to visual flight.

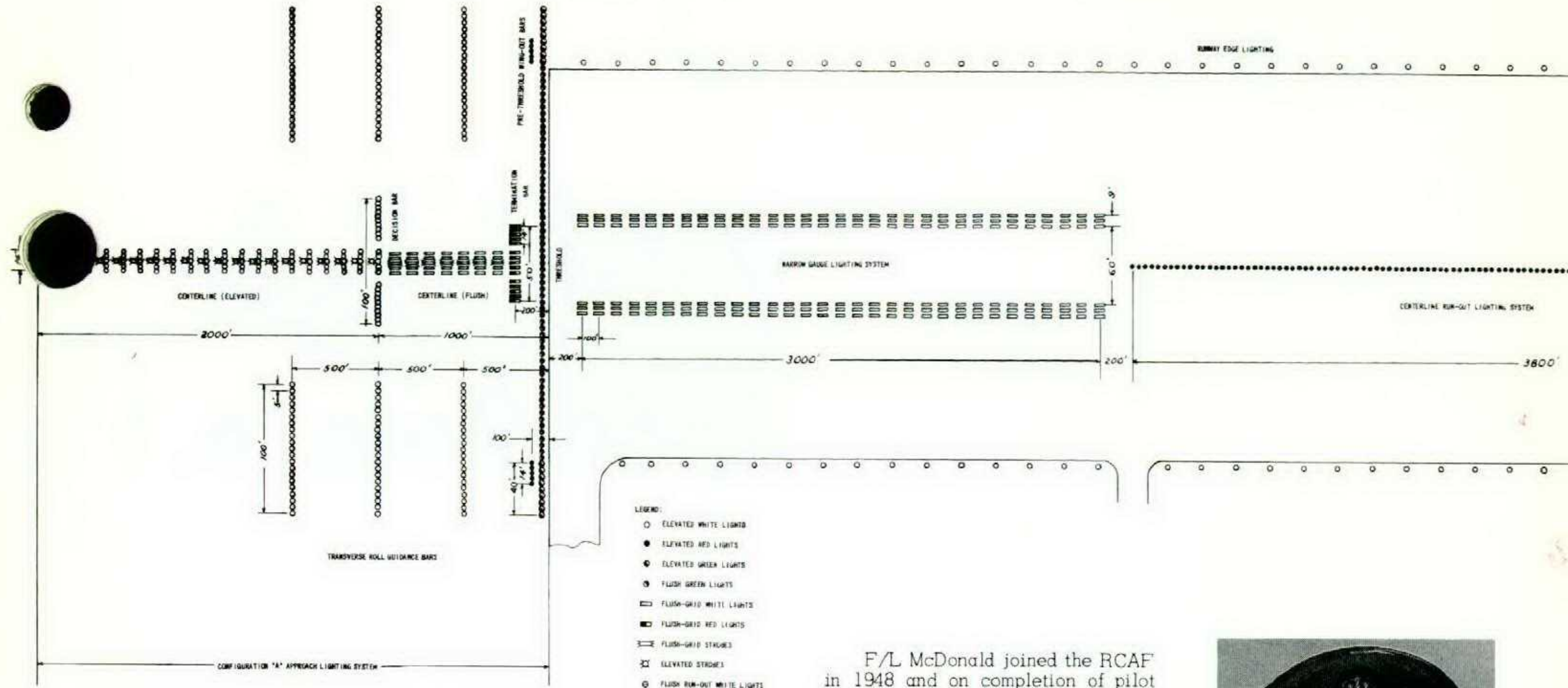


Centreline approach lighting system showing transverse roll guidance bars and narrow-gauge lighting system. Strobe lighting and centreline run-out lighting are not visible.

Going back to the early radar days when the present GCA minima were established, limits were derived from these criteria:

- lateral position and direction of motion were assessed (as they still are) from the visual pattern of lights; assessment took from 2-5 secs
- lateral error and heading error correction if necessary took at least 8 secs; height was related to glidepath assessment; the flare-out and landing took 5-7 secs.

The least time required would be 15-20 seconds. A rate of descent of 600 fpm indicates a cloud-breaking height of 150 to 200 feet.



Integrated Visual Approach and Landing Aids system (IVALA)

F/L McDonald joined the RCAF in 1948 and on completion of pilot training at Centralia was transferred as a weapons instructor to the Pilot Weapons School at Trenton, and MacDonald, Man. In 1953, he was assigned to the Regular Support Unit of 438 (F) Sqn (Aux) in Montreal flying the Vampire, T33 and F86. Transferred in 1957 to 3 Wing and 434 (F) Sqn, Zweibrucken, Germany, he became Deputy OC and in 1959 flew with the Air Division team that won the Guynemer Trophy – emblematic of air-to-air gunnery supremacy in NATO countries. In the fall of 1960 he joined the RCAF's "Golden Hawks" aerobatic team and flew two years with the group. Since then he has been employed at CFHQ and at present is co-ordinating requirements for aircraft instrumentation.

In my opinion, present-day radar and improved aircraft instrumentation have nearly eliminated lateral and heading error. Correction can be achieved during the time taken for assessing position; that is, in the 8 to 15 seconds from cloud-break to flare. This would indicate a 150-foot minimum. At bases with threshold GCAs and a 2.5° glide slope the distance from GCA touchdown at 150 feet is 3440 feet – right back where the pilot can take immediate advantage of high-intensity approach lighting when transitioning at minimum altitude. Thus, with the present instrumentation and improved radar our GCA minima should be established now at 150-and-1/2.

USAF landing limits for many of their bases, eg, Dow and Westover, indicate that limits can be safely lowered to 100-and-1/4 with an improved approach and runway lighting system. The USAF approved lower limits after completing a comprehensive test of an Integrated Visual Approach and Landing Aids (IVALA) system in the winter of 1959 at Dow and Westover. The abstract to the report of the trial states that "the IVALA system provided the essential components necessary for aircraft recovery under all visibility conditions down to reported zero, using only ground-controlled approach as the primary approach facility. The approach lighting system, with strobes, provided early identification and the necessary visual information so that aircraft could be brought safely down to 1/4 mile. From this point, narrow-gauge flush runway lighting provided the necessary roll and directional guidance for the landing. Centreline run-out lights ensured directional control following touchdown for all types of aircraft".

There is every reason to incorporate these improvements in our own lighting systems; all development in approach aids are tending towards lower landing limits for destination and alternate airfields. Their inclusion is simply a matter of time. Furthermore, the incorporation *now* of flush narrow-gauge runway lighting will improve flare and landing cues for night recoveries. Takeoffs will be simpler and more positive with the addition of centreline run-out lighting.

The addition of strobe, narrow-gauge and centreline runway lighting will be a relatively inexpensive addition to our present high-intensity approach lighting considering the undeniable gain in flight safety, and reduced diversion costs.

There is no question that our present lighting system is satisfactory for approaches to those bases that have GCAs positioned around 800 feet from the threshold but for airfields with threshold-sited GCAs, it is not. However, the proposed system will provide adequate transition information at all bases to limits of 150 feet and 1/2 mile. If lower landing limits are to be attained – and international aviation appears to be going to at least 100-and-1/4 – the addition of strobe and improved runway lighting is a must.

Canopy Care in Winter

The man who cleans the canopy may not be aware that innocent-looking spots and scratches show up larger-than-life at altitude...

The search for materials and the design of transparent canopy areas has been very thorough, but so far only plastics can be formed to aircraft configurations and still maintain acceptable optical quality. However, plastics for all their advantages of optics, weight, strength and molding ability, have drawbacks.

The most troublesome problem with transparent plastic enclosures? They scratch too easily. The resistance of transparent enclosure plastics to solvents has been increased nearly tenfold, but their resistance to solvent and scratch is still far below that of glass. In the present state of technology, this is a penalty which must be accepted.

Routine cleaning and careful waxing according to instructions will do much to protect these vital surfaces. In a sense, the wax can be considered as a sacrificial coating, functioning in the same manner as wax on an automobile or furniture.

Removing Ice and Frost

Removal of frost and ice from unprotected, stowed or parked aircraft can be accomplished by three methods: mechanical, thermal,or chemical.

The low resistance of transparent plastic to abrasion rules outmechanicalmethods such as rapping or scraping.

Thermal methods, either hot air or infrared radiation, are quite satisfactory for use on transparent enclosures if the maximum temperature of the enclosure surface is kept below 120°F.

Chemical methods of frost and ice removal depend on a water solution of a material capable of electrolytic dissociation. The greater the dissociation the greater the depression of the freezing point. A common example of this is the addition of glycols to liquid cooling systems of automobiles. Another is the use of a salt such as calcium chloride to rid streets of ice. Of the two examples given, the glycol solution is relatively non-corrosive and may be employed for extended periods in a liquid cooling system. On the other hand, salt solutions are very corrosive to most metals. A salt spray exposure test is universally used to assess the value of corrosion preventive systems. Obviously, the risk of corrosion denies the use of salts for ice/snow removal from aircraft. Glycol and alcohol solutions have been successfully used for many years. Commercial airlines prefer the glycol over the alcohol.

Solvents can damage plastic surfaces; there are severe limits on the choice of fluid for de-icing or frost removal.

Glycol and alcohol tend to run off before they can dissolve or melt the ice or frost. For this reason, spraying is recommended. Use a very fine fog; the fluid that runs off is wasted. When the ice crystals of the frost are melted, wipe the enclosure with a clean soft cotton flannel cloth soaked in the glycol or alcohol. Alcohol will probably work better for this wiping operation.

For ice removal, use heavy soft cloth similar to a blanket. Wet this with glycol or alcohol and squeeze or wring to a nearly drip-free condition. Lay the blanket directly on the ice coating. Additional glycol and alcoh[ol] should be added as the "melting" progressess. T[he] blanket prevents the glycol or alcohol from running off. The blanket must be free of all foreign matter such as sand and grit, and may be laundered and used repeatedly.

This method of ice removal should introduce sufficient glycol or alcohol into the water so the runoff will not freeze elsewhere on the aircraft. A final wipe of the transparent area with an alcohol wet cloth is suggested.

The basic resin of the acrylic transparent enclosure, the aircraft paint, is the same as the finish on most automobiles. Using concentrated (full strength) glycol or alcohol will mar the transparent enclosure and the aircraft finish just as it would the automobile finish.

If the aircraft is to be flown immediately, the air stream will blow away the residual glycol or alcohol. If the aircraft is to stand, the remaining glycol or alcohol should be flushed off with water.

Be very careful if it is necessary to clear ice from aircraft surfaces. Anti-icing and de-icing – defrosting fluid (Mil-A-8243) should not be used on exterior surfaces unless the fluid is diluted with an equal amount of water, (ethylene and propylene glycols). In temperatur[es] above freezing the fluid must be rinsed off the aircra[ft] with water spray. Do not rub the fluid-coated surface.

Not commonly appreciated is that plastic surfaces (paint and canopy) soften on exposure to the fluid at temperatures above freezing. Degree of softening is dependent on, (and proportional to) both fluid concentrations and time of exposure.

Adapted from
Northrop F5 Service News

Tragedy at El Kuntilla

The sweltering 98° of the Egyptian desert, the field elevation of 1700 feet, and the loading of the Otter to [..]% of maximum permissible all-up weight left no margin for error. Another supply run – and another routine desert patrol – became a tragedy.

To observers that day, the takeoff appeared OK until shortly after the aircraft became airborne. Under normal conditions at this point, "takeoff" setting on the flaps is moved to "climb". But these weren't normal conditions; it was this flap selection – now decidedly premature – which initiated what the pilot stated was a sinking feeling. "The aircraft was sluggish and started to sink. We flew about 500 or 600 feet straight ahead and the aircraft continued to sink. I pulled back further on the stick as we approached a little rise ahead but the aircraft hit the edge of the rise. It bounced two or three times and seemed to stall and had very little control. The last bounce was about 50 feet high and then it crashed, exploded and broke into flames . . ." With power full on and heavily loaded, the aircraft was well behind the "power curve".

A United Nations Observer officer died in the crash [an]d both pilots subsequently died of burns.

The tragedy brings into the open a problem as old as flying itself – how to protect the aircrew against fire. Both pilots were wearing nylon shirts unprotected by any flying suit. The investigation established that the molten nylon "substantially aggrevated" the burns. Had these officers been wearing flying suits their chances of survival would have been greatly enhanced.

Why, then, were they *not* wearing flying suits? The answer is obvious. The flying suits available to them at the time were of such densely-woven cloth as to make them worthless – and hazardous – in the near 100° heat of the Middle East.

For nearly two years now the development of a fire resistant, yet comfortable flying suit has been underway. The recent introduction of new synthetics gives hope that flying suits of the future will be much more fire resistant than in the past.

Another chapter in what might be called the Great Nylon Debate has been written. There should be little doubt remaining in anyone's mind that the wearing of exposed synthetic fibre clothing is an act of suicidal indifference in the face of experiences such as the El Kuntilla tragedy.

Flash-Back

Times haven't changed – ten men stand around while one man shovels.

Get Winter-Oriented

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JULY
QF S 291921Z 30⊕E50⊕150⊕15T 3010 CU+4CB3AC1 FUNNEL CLD E

JAN 1300Z
YI O15 328/-18/-22/0801/032/FROIN
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The thunder, cumulonimbus, and a funnel cloud in the July QF weather report points to an *obvious* flight hazard. On the other hand, the winter report from YI would seem to indicate that the weather could be completely dismissed, but there's a potential winter weather hazard even on that clear, calm winter morning. Aircrew should be aware of the peculiar aspects of Canada's winter weather.

To Canadians winter means SNOW. Snow, like a woman, may lie there looking pure, white and soft but you should never trust her until she gets old and crusty. As an example, a forecaster after considering the future development of weather systems, gradients, inversions, stabilities and the condition of the snow lying on the surface makes this terminal forecast:

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MJ O 2215
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Four hours later the weather report is:

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MJ W3X1/4BS 182/20/15/2225/992/BS10
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The wind was forecast to be 15 mph but for some reason it increased to 25 mph. This lifted the snow lying on the surface giving blowing snow with a 300-foot ceiling instead of an unlimited one, and ¼ mile visibility instead of 8 plus. If the snow had been lying on the ground for several days, or the sun or a previous wind had formed a slight crust, it would not have lifted. The only error in the forecast would then have been the relatively minor one of windspeed.

After a fresh snowfall a very close watch should be kept on the winds. A 15-20 mph wind may drop the visibility as low as ¼ mile, and if stronger than this, down to zero. The term drifting snow is used if the snow is not lifting over eye height. Drifting snow, particularly in the morning, is a strong indication that visibility will soon be reduced in blowing snow. Although blowing snow sometimes reaches heights above 3000 feet, it often will not rise to control-tower height. In this case the tower visibility will be included in the remarks of a weather report giving a fairly precise description of the blowing snow condition. Since blowing snow originates from the ground, cockpit visibility will normally be lowest near the ground and improve with height. Falling snow, conversely, will reduce visibility the most near the cloud base.

Snow, like a bride's tears, doesn't require much to start, but once underway, falls in copious amounts. For rain to fall, something like a 10000-foot thickness of cloud is required; this takes a fairly well-developed weather system. Snow can fall easily out of a 2000-foot thick cloud which can be produced by little more than a wiggle on an isobar – and ten inches of snow is equivalent to about one inch of rain.

Snow is typically contrary. It will drift in behind plows as fast as it is cleared away. Lying on the runways as wet snow or slush it can create enough resistance to aircraft wheels that flying speed cannot be reached on takeoff. An aircraft landing may start hydroplaning under the same conditions, and go out of control.

Snow wetness depends upon its temperature; this unfortunately may be hard to assess from the temperature in the weather report. In sunshine with little wind, dirty snow may melt when the shaded air temperature in the weather report is 15 to 20 degrees below freezing. At night with a clear sky and little wind, the snow may be freezing even though the temperature is well above freezing. Sunshine may melt snow on runways and taxi strips; treacherous slippery patches will result on refreezing. Slush splashing on the airframe during takeoff may freeze as the airflow speed increases, cooling the snow by evaporation.

Snow not only reduces visibility, it affects vision. Falling snow can reduce visibility to ¼ of a mile or less, but white-out or grey-out conditions exist whenever there is snow lying on the ground. A white-out occurs when flying over an unbroken snow cover beneath a uniformly overcast sky when the light from the sky equals that reflected from the snow. Depth perception and orientation are lost in a featureless white world without shadows, horizon or clouds. In a grey-out the horizon can be seen but there's a loss of depth perception. After a snowfall, a low sun shining on top of an overcast stratus deck might create these conditions.

Snow affects radar. Wet snow reflects the radar signal so that an aircraft may be very difficult to detect. Dry snow, on the other hand, has very little effect.

As thunderstorms go with summer flying, so icing goes with winter flying. Of the various forms of icing, freezing rain is undoubtedly the worst. Snow falling through an above-freezing layer melts into rain. The droplets can become freezing rain in a sub-freezing layer below, or if supercooled, will freeze on contact. This situation occurs most frequently in the north-east quadrant of a frontal depression, where warmer air with a high freezing level over-runs colder air with a low freezing level. It may be difficult to delineate the freezing areas or the above-freezing layers precisely; therefore, to avoid freezing rain, fly above the freezing level of the over-running warm air. Winter freezing levels are:

- Maritime Tropical air – around 10000-12000 feet
- Maritime Polar air – 6000-8000 feet
- Maritime Arctic air along either coast – 4000-5000 feet
- Maritime Arctic air inland – near the surface or on the surface
- Continental Arctic air – near or on the surface.

Most severe winter storms occur when waves form as a pair on two parallel fronts. To top the upper freezing level in a combined Arctic front/Maritime front wave, you would have to climb above the Maritime Polar air mass freezing level. In a combined Maritime front/Polar front wave, it would be necessary to climb over the 10000-12000 foot freezing level of the Maritime Tropical air.

If freezing rain falls far enough through the cold air, it may freeze and become ice pellets. These will ping against an aircraft like very small hail and indicate freezing rain above and, if the frontal surface is lowering on route, you may get freezing rain ahead. Ice pellets can form in heavy cumulous cloud; they will then fall in showers lasting a minute or two. It will require judgement to decide if the ice pellets are an indication of freezing rain, or heavy cumulous.

Freezing rain's little brother, freezing drizzle, is not as complicated. Water-droplet clouds can form at below-freezing temperatures, and if there is very little updraft in the cloud, ie, the air is stable, the larger droplets will float down as freezing drizzle. It falls in significant amounts only from stratus cloud based usually at 300-600 feet and seldom more than 3000 feet thick. Icing in freezing drizzle, although not as heavy as in freezing rain, can still be hazardous, and will be heaviest just near the cloud base because the drizzle evaporates as it falls.

Except for VO, Canada's chief export is CA (Continental Arctic), an air mass colder than any air mass has a right to be. Its temperature, instead of decreasing with height, *increases*. These two qualities bring about a host of unusual happenings.

First of all, being so cold, it is dense. An altimeter indicates various pressure surfaces as height, but pressure surfaces are not always at the same height. In cold air – and CA is as cold as they come – the pressure surfaces are very much lower than your altimeter assumes them to be. You are then flying lower than the altimeter is indicating.

An outbreak of CA, particularly down the centre of the continent, creates a very strong low-level inversion. This can easily be of the order of 24°C in the first thousand feet. Such an inversion forms an extremely effective block between phenomena above it, and the ground; and of more importance, to the dispersion aloft of anything in the lower layers. City smoke, fog rising off open water, moisture from the combustion of heating fuels are all trapped near the surface, reducing visibilities and at times even creating a poisonous atmosphere. This inversion strengthens when a thin layer of Arctic air (possibly less than 1000 feet thick) is over-run by warmer air from the south.

A very strong inversion produces a dead layer near the surface with little or no wind or turbulence. Under these conditions wingtip vortices from large, heavily-loaded aircraft taking off or landing, are at their worst. These vortices are not prop-wash, but spiralling funnels which can have a rate of rotation about 90 degrees a second, and a downwash strength up to 1200 feet a minute! This could easily flip a small aircraft and create problems even for a large one. In a light wind with little low-level turbulence a dangerous vortex can exist for about *ten minutes* after a large, heavily-loaded aircraft has taken off or landed.

In a strong inversion the surface wind may be negligible but at 200-300 feet above the ground it can be blowing 30 kts or more. If an aircraft descends in a headwind and passes within a few seconds into a no-wind or light wind condition, it will lose that much airspeed. This loss may not be quickly recovered by power and a stall can occur. Conversely, if the approach has been made in a tailwind the aircraft will enter the calm layer having too high an airspeed and with it, a stopping problem.

There are further implications to this very strong low-level vertical wind shear. In para-dropping it is normal to average the wind at drop height with the surface wind and use this as a drop wind. This can be seriously in error under inversion conditions. Also, aircrew frequently use surface wind reports to obtain a wind for low-level trips; these too can be grossly in error even for a trip 100 feet above the deck.

Winter is a period of extreme pressure differences between high and low pressure centres. The pressure altitude at Rivers has varied during the winter from a low of 640 feet to a high of 2670 feet! Due to this one cause alone the takeoff run of an aircraft can vary tremendously. For example, the difference for a T33 with this pressure variation is around 800 feet.

The areas surrounding rapidly-moving and/or deepening lows contain worsening weather conditions in the path of the storm. The altimeter setting will also be changing rapidly. An error of something like 80 to 100 feet in an hour is common. Unless a current altimeter setting is applied, you will be lower than your altimeter indicates if the pressure is falling rapidly.

Before writing this article, it was necessary to go over last winter's weather reports to get the "feel" of winter again. Most notable was the rapidity with which weather changes. Here are two examples from last February:

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FEB 5
1700Z YI E90⊕12 176/-10/-15/0912/984/AS10
YI S 1750Z P6X1/4S+ 1116 S10

FEB 21
0900Z YI 100-⊕15 843/34/29/2521/899/AC3
1000Z YI 9⊕M18⊕40⊕10R- 843/37/32/3035+44/899/SF2SC5SC3
1014Z YI S P4X1/4VSBS 3152+76 S10 PRESRR VSBY 0-1/2
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Need one say it? DON'T FLY ON WEATHER REPORTS ALONE.

Sure, winter flying is hazardous – to the pilot who for one reason or another chooses to ignore nature's bag of weather tricks. Now's the time to get winter oriented.

NT Taylor

Mr NT Taylor, a science graduate of the University of Alberta, is an instructor in meteorology at CNS/CFS, CFB Winnipeg.

He began his career in meteorology as a forecaster at Greenwood in 1950. In 1953 he served in the RCAF as a meteorological officer in the Air Division. In the latter part of this tour he was Senior Met Officer of 3 Wing, Zweibrucken. Upon returning to Canada, he was posted to Rivers as Senior Met Officer, a position he held until last summer when he moved to CFB Winnipeg.

During World II, Mr Taylor was an RCAF bomber pilot. Attached to the RAF, he saw active duty in the Middle East and India, after which he completed a tour of operations with Coastal Command. At the war's end he was a Canso instructor at Pat Bay, BC.

When the OC asked some of the senior NCOs to write a story on safety maintenance for Flight Comment, our unanimous reply was negative – leave that to the authors, we said. However, the suggestion did stir up some memories and we began to talk about accidents and safety. In an hour or so of reminiscing we heard of more experiences than you would have thought possible – some in the light vein, some quite tragic. Let's just list some from four NCOs representing approximately 100 years accumulated service – all names withheld, of course, to protect the guilty!

Why I Don't Really Need the EO-00-80- Series

Let's start back when I was in technical training prior to enlisting in the RCAF. First, the class were given a bastard file each to learn how to shape metal. After about three weeks of seven hours a day I understood how that file got its name. Some didn't have handles. I still remember some of the nasty cuts in those young fellows' hands. One EO I don't need.

Soon we progressed to making old objects like scribers, dividers, and finally to making rings out of large pennies. These were dandies; they left a big black circle on your finger but the pride in having made it yourself kept you wearing it. About a week later the light came on while trying to lockwire a component ... pricked my hand on a sharp piece of wire. Reaction was normal ... pulled my hand back fast, the ring caught on a stud ... result – a cut about ¾ of an inch around my finger. Another EO I don't need – haven't worn a ring since.

One of the next incidents I recall was while working on night maint. My buddy put a stand up to the front of an aircraft to start a routine check, then turned the prop just enough to get at the top plugs. Next thing, I saw him six feet in the air followed by a beautiful three-point landing. He broke four fingers and several bones in his foot – just forgot to check "switches off". Just cancelled requirement for another EO. By the way, he now gets a small medical pension.

Not long after that one, I was overseas in Bomber Command – quite a change to say the least. First big problem was transportation ... was told "Get yourself a bicycle". 'Ever try to ride a bicycle back from a pub at midnight in a blackout? Well, the next day you look for a way to clean your uniform. 'Ever try a five-gallon can of high octane? Works fine but after a short while, airmen with sensitive skins break out with a nice red rash. Why nobody suffered third degree burns I'll never know. EOs cover this but I learned the hard way.

Had another very exciting day when some boys were bombing up and refuelling at the same time. The electric bomb lift worked well but the man on the refuelling hose was a little careless. Some high octane went down over the wing, then things happened pretty fast – just like the first of July. Fortunately, nobody was seriously hurt but three bombers, a 4000-gallon tender plus some 500 lb bombs make pretty expensive fire crackers. Delete one more EO.

It didn't seem too long before all the noise was over ... next it was on the Northwest Staging Route with an old Dakota. One day, when the fuel tender pulled up with no markings my first question was: Is it 90 or 100? I was assured it was 100 – just what I wanted. Well, by then I'd had five years and didn't believe anything I heard. Let's put a gallon in the snow bank and check the colour – when the pump started, out came stove oil. We were both a bit shook. That lesson didn't cost much, just a little embarrassment; however, I would have paid the full price of that one. EOs now cover all markings.

Another time at the west coast we had just washed a Canso; the floor was wet and one of the men put a light in the aircraft and proceeded to plug it in. The cord was faulty ... only 110 volts but it was enough. The ambulance was just coming around the corner when the airman regained consciousness. The EO covering this would never have the same effect if read daily for a month.

These are only a few of the incidents I personally have seen or been alive to tell about. The reason I don't need EO-00-80- is I've already made every mistake in the book or been around to see others make them and suffer.

Let's not have everyone get his education the same way; it's much easier – and hurts less – to get it from the EO 00-80-series.

The Phantom Nurse

These two stories obviously have something in common. Both patient and pilot were victims of Foreign objects. The mechanic failed to count his tools and the nurse failed to count the instruments. The patient should have had a better chance to live, since the doctor had an assisting nurse to count the "tools"; however, the mechanic was alone – without a nurse.

At this point we introduce the Phantom Nurse to provide the same protection as the doctor's. She will unfortunately not be a living 36-26-36 but exists as the technician's conscience and sense of responsibility. It is this Phantom Nurse who will ensure double check of equipment after inspections to insure nothing remains that might be a hazard to someone's health.

– Cold Lake

PATIENT DIES AFTER ROUTINE SURGERY

The autopsy revealed that the nurse responsible for checking the doctor's instruments failed to complete the double check after the operation. An instrument was left inside the patient, causing internal hemorrhage and death.

AIRCRAFT CRASHES IN DESOLATE AREA —PILOT EJECTS

The lengthy investigation revealed that on a low-level mission, the aircraft crashed because of jammed controls. The pilot of the stricken aircraft had made one transmission to that effect; later a spanner was found in the mid-section of the wreckage.

SAFETY COMMENT

CLOSE CALL · OPERATIONAL HAZARD · SAFETY SUGGESTION

Lives and money can be saved by timely use of this form - if you have experienced or seen an unsafe or potentially hazardous occurrence pertaining to aircraft in flight or on the ground - use this report.

You are free to remain anonymous if you wish. Give all details and any recommendations.

To: Unit Flight Safety Officer

LOOKOUT!

An Expeditor carrying four passengers entered left base for a landing at an uncontrolled airport. Two army helicopters were observed to be approaching. The Expeditor pilot was aware that the helicopters were landing because of radio transmissions. For the same reason, it was assumed that the helicopter pilots would know that the Expeditor was also landing there.

While the Expeditor was touching down the helicopters were observed over the field commencing an approach *across* the runway to the tarmac area. An overshoot was contemplated but was decided against for fear of a mid-air collision. Instead, the landing run was continued, favouring the right hand side of the runway, assuming that the helicopters would maintain sufficient altitude to avoid a collision.

During the latter stage of the Expeditor landing run, one helicopter passed directly overhead clearing the Expeditor by 10 to 15 feet. The downdraft from the helicopter actually caused the Expeditor to lift from the runway.

pin it down - write it up

"Cleared for Immediate Takeoff"

The T33 pilot had been assigned a routine mission. The walk-around and taxi out were normal – brakes and undercarriage were serviceable. As the pilot was approaching the runway, he was held momentarily for a GCA on final, and then cleared for an "immediate takeoff". The pilot elected to do a rolling takeoff. He angled across the runway intending to align himself on the centre stripe. Power was advanced to 65% with 30-45° of turn remaining. The aircraft then "...ceased to turn". Fifty feet later, and by now in a bit of a panic, he returned to idle and began braking. The aircraft rolled about 300 feet before leaving the runway and continued another 500 feet coming to rest in deep snow. On its way it smashed into a VASIS installation. The pilot states that by the time he was near the centre stripe he was going "possibly 40 knots" and had only 15° of turn to go – approximately the angle he ran off the runway.

The investigators could not establish any reason for the aircraft to behave in such a manner. It remained, therefore, for an analysis of the pilot's technique.

The pilot states he had not selected TOE switch but obviously the power used to bring him to speed before completing the turn was excessive. The fact that the aircraft carried as far as it did demonstrates the inertial force involved. The board was left with one conclusion – that the pilot lost control of his aircraft due to excessive use of power.

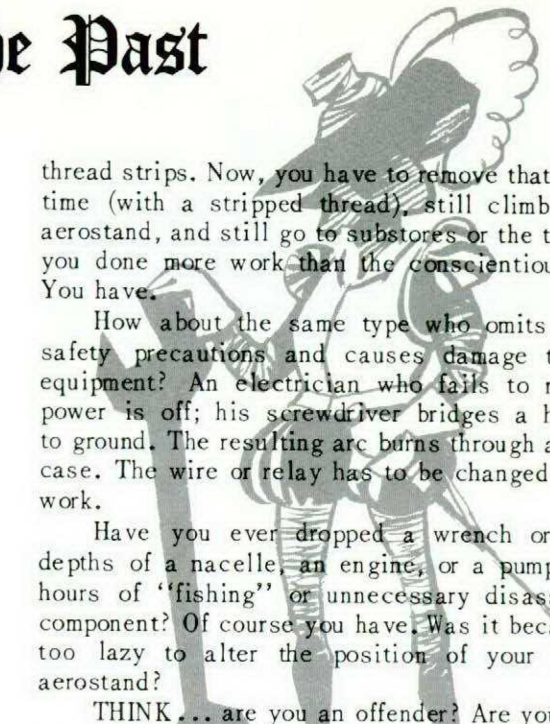
This embarrassing occurrence brings up the question of how we respond to the tower's urgent "cleared for immediate takeoff." Like so many directives of this sort there is room for wide variation in interpretation. We can, if the conditions are right, get sucked in committing a goof. In this case, a hasty pilot, and a controller's clearance were all the ingredients needed for an expensive accident.

Comox Pilot Earns Urn

F/L Campbell of 121 Search and Rescue Sqn Comox, an old hand at search and rescue missions (4000+ hours), receives BC's Beck and Bevington air safety trophy. Awarded annually for contributions of air safety, the presentation recognizes F/L Campbell's participation in the rescue of three persons from a downed plane on Vancouver Island in the summer of 1965.

F/L DM Campbell receives air safety trophy from Mr DH Beck of BC's aviation council.

A Ghost from the Past



In this day and age it is fashionable to ridicule or belittle most things which relate to the past and to our ancestors. We have a way of seeing their efforts as futile against our own; indeed, to try extracting any benefit from their experience is considered almost outright heresy. Certainly, their old cliches often cancelled one another: "Many hands make light work", is countered by "Too many cooks spoil the broth". If "A stitch in time saves nine", does not "More haste, less speed" or "Haste makes waste" seem to contradict?

One such proverb, passed to me by my father constantly comes to mind: "A lazy person takes the most pains". This one requires a second look to see the underlying truth. A lazy person presumably would not take any pains at all, but with our system of supervision this lazy person can be made to do a task again and again until it is completed to the supervisor's satisfaction. Actually, the lazy person has done more work, and taken more pains than if he had completed the task satisfactorily the first time.

How many of us have taken a short-cut that backfired? You have and so have I; we'll all take some more in the future. Remember that nut and bolt you were installing? It should have been renewed but to climb down off the aerostand, walk to substores or the tool crib was just too much effort. So... back went the old bolt and nut. Just as you torque it up to its proper value, the thread strips. Now, you have to remove that bolt a second time (with a stripped thread), still climb down off the aerostand, and still go to substores or the tool crib. Have you done more work than the conscientious technician? You have.

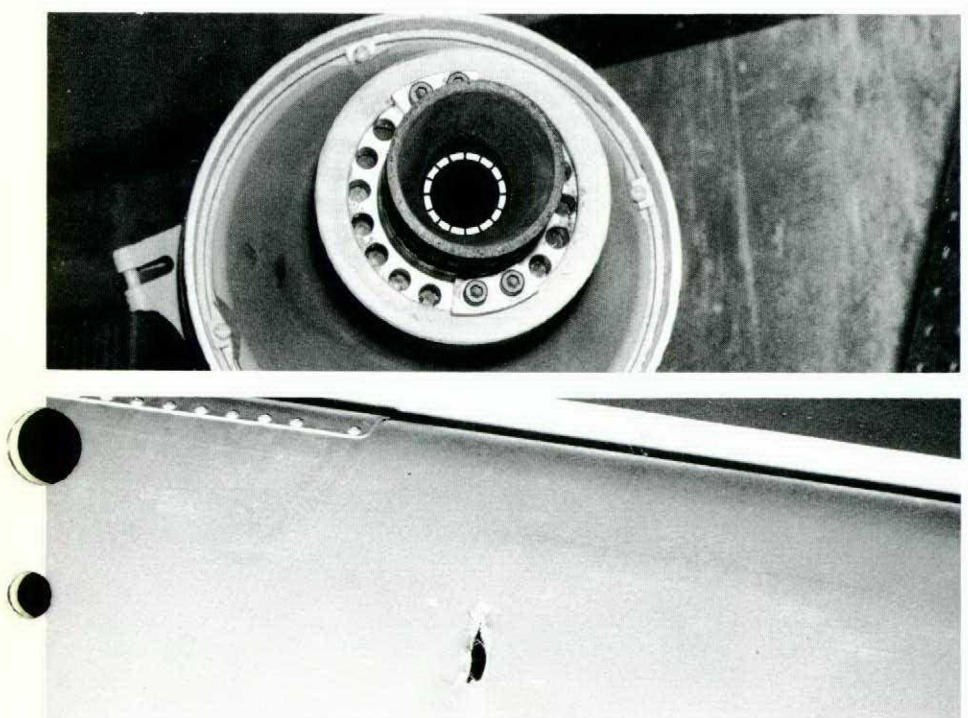
How about the same type who omits taking proper safety precautions and causes damage to a piece of equipment? An electrician who fails to make sure the power is off; his screwdriver bridges a hot connection to ground. The resulting arc burns through a wire or relay case. The wire or relay has to be changed – again extra work.

Have you ever dropped a wrench or nut into the depths of a nacelle, an engine, or a pump, resulting in hours of "fishing" or unnecessary disassembly of the component? Of course you have. Was it because you were too lazy to alter the position of your stepladder or aerostand?

THINK... are you an offender? Are you one of those persons who take the most pains? Do you end up doing a job twice because something "Goofed" the first time? Yes! I'll bet you are... and so am I... but I'm trying not to be. It's getting easier; each time I slide back and take the "easy" way – then have to do it all over again – I can almost hear my father chuckling away as if to say "I told you so"!

– CFB Greenwood

Jarred Jato



"Fire one" .... airfield!

Practicing for a flying display the pilot fired all four JATO units simultaneously. The small fires started on the airport infield led armament technicians to suspect a JATO malfunction – and they were right. One of the nozzle openings had melted to a diameter twice the normal size (see photo). It was this molten metal which had started the grass fires and was later found to have caused skin damage to the aircraft.

Possibly someone had dropped this bottle cracking the solid propellent, thereby creating a much-increased burning surface. The burning was intense enough to melt the venturi nozzle.

JATO units are known to require extreme care in handling – the photos show why.

ICE COLD FEAR – *revisited*

Briefly, the T33 descended through a very heavy icing area. On overshoot from the approach, full throttle produced 98%, 425° JPT and only *165 knots* with a clean aircraft.

In our Jan/Feb 66 issue, we related the experience of two pilots in a heavily-iced T33. The barometric pressure control unit in the fuel system was discussed. We were requested to explore whether the TOE function (takeoff and emergency) would have solved the pilots' problem.

Ice accretion on the sensor of barometric pressure control during descent had reduced fuel flow, and mass airflow was also reduced by screen icing. The former explains the low temp; the latter, the curiously mismatched high rpm. In this case, the TOE switch would not have helped because he had 98% rpm – very close to governed speed, anyway.

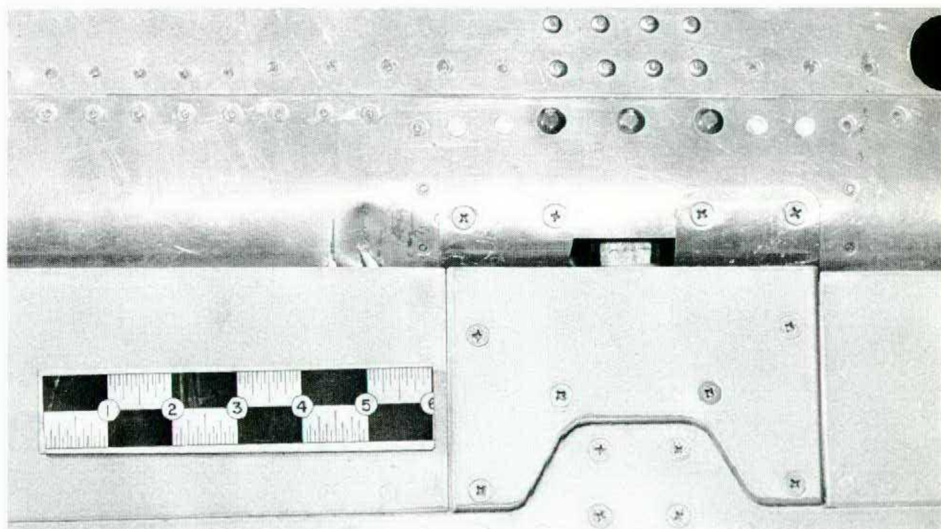
The TOE switch would have helped had the BPC iced over at high altitude but not the engine intake areas. As the aircraft descends the barometric pressure control's normal function (increasing fuel flow with descent) would be lost resulting in a insufficiency of fuel at low altitude. The pilot would have a reduced available rpm and JPT; this would be corrected by the TOE switch, that is, one pump at full stroke plus what you could get from the other one still under the malfunctioning BPC control.

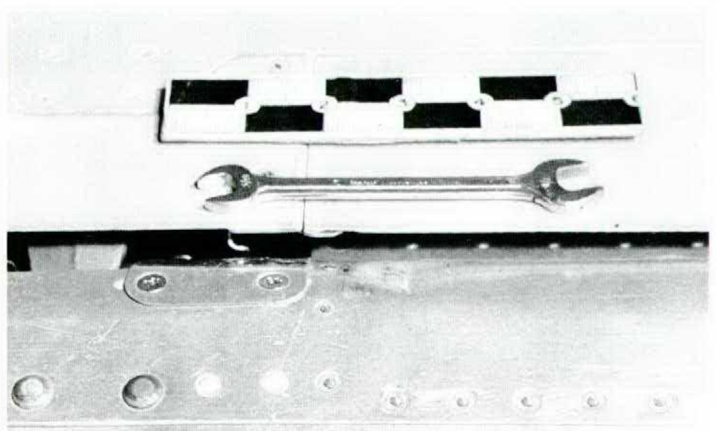
Wrench Jams Flight Controls

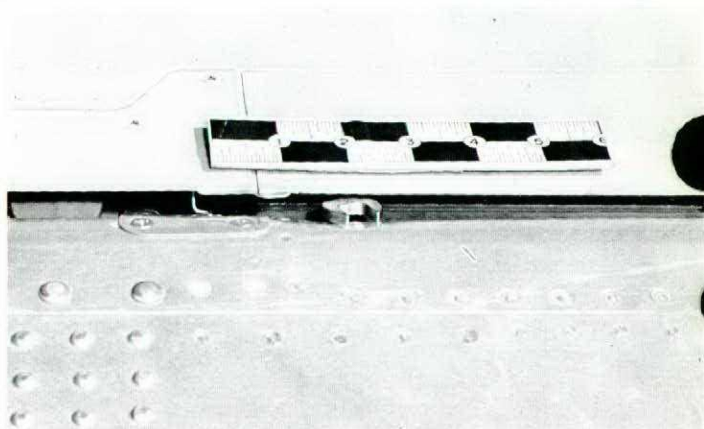
Following extensive modifications by a mobile repair party, two training trips were flown before a student pilot doing an external made the chilling discovery depicted in the photo. An open-end wrench was lodged between the Tutor's wing and leading edge of the aileron. Investigation uncovered not only the source of the wrench but the owner himself.

The cause factor assessment reads:

Maintenance factor – Civilian contractor – carelessness.







From AIB files

Aircraft	– Tutor 26107
Date	– 16 Jun 66
Pilot	– O/C GR McNabb
Injuries/Fatalities	– Uninjured
AIB Investigators	– S/L BT Burgess S/L DL Campbell
Board of Inquiry	– S/L DM McNaughton F/L RM Culbert F/O DJ Batcock F/L JA MacDougall

Circumstances

The student pilot was authorized for a solo training mission consisting of stalls, aerobatics, maximum rate descents, unusual attitude recoveries, and spins. During the mission the pilot put the aircraft into a spin to the left but on recovery the right rudder pedal would not move – the rudders were jammed in full left position. The pilot, unable to apply right rudder to stop the spinning, ejected successfully at 7000 ft indicated.

The bailout chaff display was not seen on radar, however, the RCMP advised the base about an hour later of the crashed aircraft and its location.

Investigation

At the crash site, careful scrutiny of the rudder control system paid off. The rudder pedal had fouled on a forward console panel (see photo). Later, investigators demonstrated that the console panel could jam the rudder pedal fully forward if the pilot applied sufficient side force.

This fouling occurred because the aircraft was designed with insufficient clearance between the rudder pedal and the cockpit side panel. The military specification requiring a minimum of 1.5 inches clearance between primary flight controls and aircraft structure was not met.

The two significant aspects of this accident are:

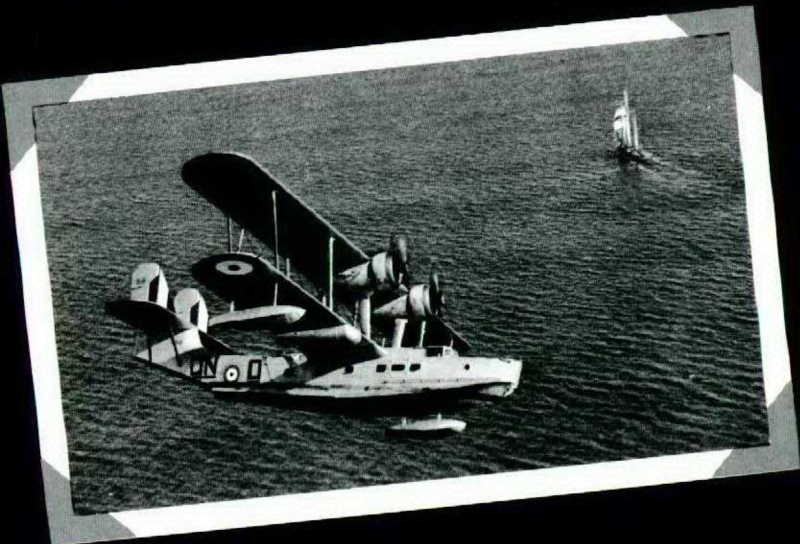
- After a similar incident over a year ago, corrective action recommended by the base was *not* done.
- The violation of a military specification remained unnoticed.
- The chaff dispenser malfunction on ejection was caused by the dispenser cord being too long.

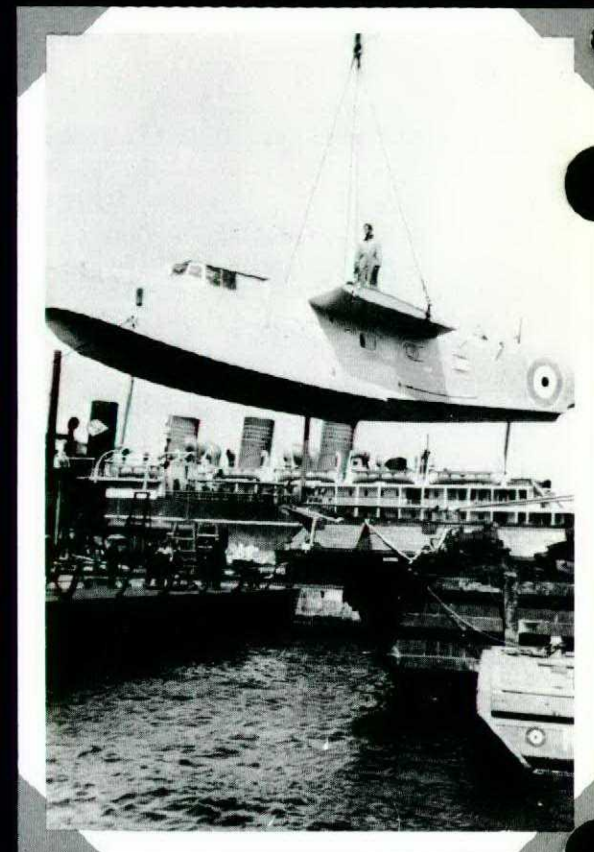
Remedy

All Tutor aircraft have been modified to prevent fouling between rudder pedals and cockpit side panels when full rudder is applied (EO 05-195A-6A/249). Also, a modification to ensure that the chaff dispenser functions on low-speed ejections (EO 55-50C-6A/16) was programmed for issue in mid-November on T33, F86, and Tutor aircraft.

AIB Note:

The members of the Board of Inquiry are to be complimented on an excellent Board. In fact, it was a Board member who made the discovery that the rudder pedal had fouled.





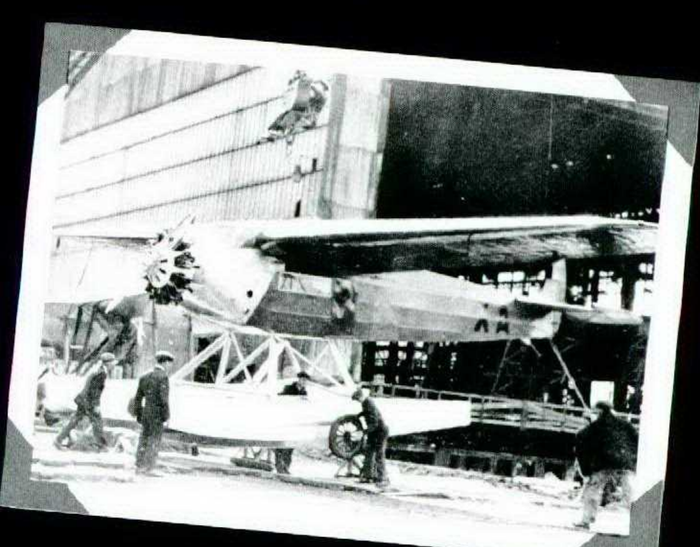
The Good Old Days . . . ?

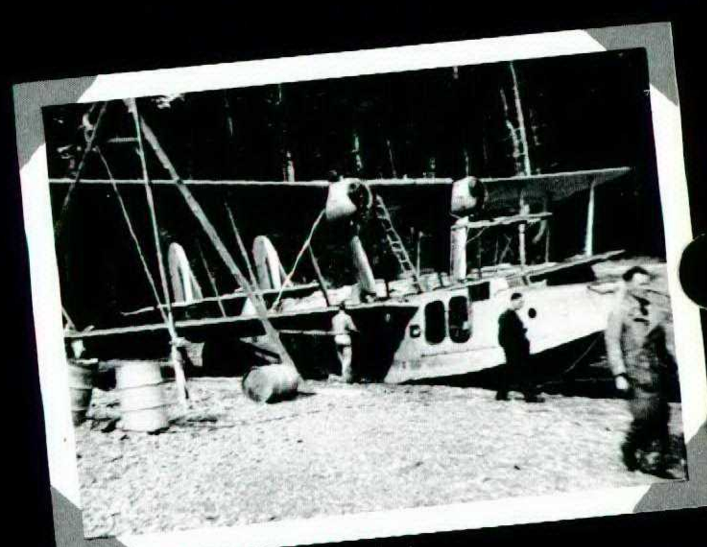
This NCO recollects the good old days about 27 years ago when he joined the air force for adventure – and a great interest in flying and fliers. After enrolling at Maritime Command Headquarters in Halifax I found myself taking a ferry ride across Halifax Harbour to Dartmouth Air Station on a nice hot July day in 1939. This was to become my home for quite a few years as an aero-engine fitter on the 5 Bombing Reconnaissance Sqn's flying boats.

For about six weeks we got the usual training in drill and QR Air readings, (although, if memory serves me, no flight safety lectures!). After this session we were sent to the waterfront which was our base of operations.

At that time our aircraft consisted of one Fairchild 72, one Norseman Seaplane and 9 Stranraer Victor flying boats, some of which were still being assembled in the hangar. Somehow, I ended up rigging and assembling these flying boats, and then – by special invitation from the flight sergeant – I found myself installing engines. A few weeks later we had the aeroplanes ready to fly.

Our "hangar" was a real open-air job. Built in World War I, someone had neglected to install the doors. In the winter months it proved to be quite a winter wonderland; the only place to keep warm was inside the hull of the aircraft. In these conditions we employed a novel way of keeping our tools warm. They were placed on a hotplate, and then passed gingerly to the fitters working on the engines.





Our maintenance offices and smokeroom were several buildings on a wharf nearby, and called the "fish houses". Here were also located offices for the Marine Section and a spark-plug cleaning shop.

Putting our flying boats into the water down a slipway in front of the hangar was quite an affair. The whole base – about 75 to 100 men – turned out for this job. Here I found out what a true old-fashioned "beaching party" was; the "party" consisted of four men in heavy rubber suits. These suits invariably seemed to leak around the crotch making it a breathtaking job in the winter with slop-ice floating around! In such instances there was one consolation – a small medicine bottle full of thick rum and sometimes the rest of the day off.

Beaching was not an easy task. The wheels on the beaching gear were large and hard to sink when being put in position. Often, when trying to push them the wheel would turn and you would end up with your head underwater, and floating – feet up – out to sea with the tide. This is where a dinghy, standing by was a great morale booster.

The aircraft was towed to its mooring by the shore party using a rig of ropes and pulleys. The crew on board would tie the aircraft to the mooring buoy until a Marine boat towed it to the main mooring point.

Being a crewman on this aircraft was considered quite a step. You were required to do these jobs:

- handle all engine controls except throttles and fuel contents gauges
- operate all machine-gun positions – nose, midship or tail
- send messages by aldis lamp and read semafore
- handle messenger pigeons
- cook for the crew when out on patrol

The crewman was also the de-icer system. By standing on the co-pilot's seat and sliding the hatch back, he would hang half-out, and scrape the ice from the windscreen while the co-pilot held him by the legs. This could be a heady experience, especially on bumpy days.

There was no intercom on board and message slips were the only means of communication with other crew members. To keep warm, wrestling was the order of the day; there was no heating system on these aircraft either!

Night flying was done using a flarepath laid out on the water. In the dark the mooring buoy was located with the aldis lamp. If you missed the buoy with the boat-hook the air turned blue as this meant a mad dash on deck to crank and restart the engines by hand before the aircraft blew ashore.

Refuelling was done at the mooring from scows, the fuel being pumped into the fuel tanks by an APU motor. On rough days, if the suction hose fell overboard a few gallons of seawater would go through. This required beaching the aircraft and draining the fuel system.

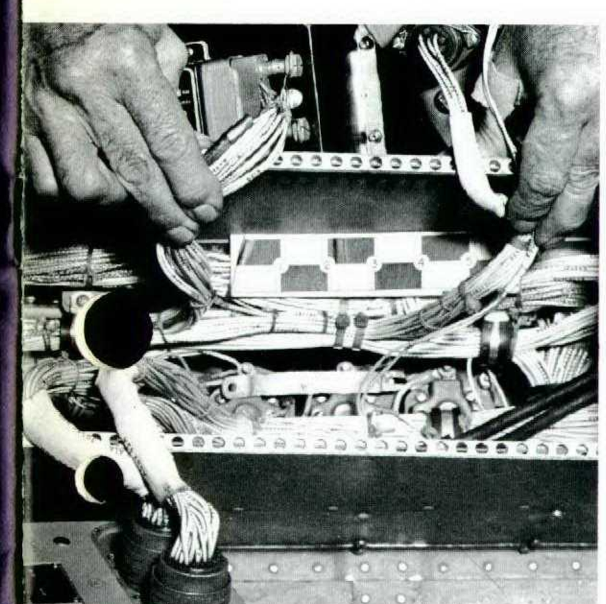
Limited hangar space meant most maintenance was done at the mooring regardless of weather. When it was required to go ashore we rang a dinghy bell and the duty marine boat would come and pick us up.

One thing with flying boats, there was never any idle time. Cleaning programmes to combat corrosion were always in effect. The airmen had taken great pride in keeping these flying boats serviceable and we were genuinely sorry to see the last Stranraer leave for the West Coast.

Conditions were rugged but morale was one hundred percent – yes, they were some of the good old days.

Sgt DJ Donovan
CFB Chatham

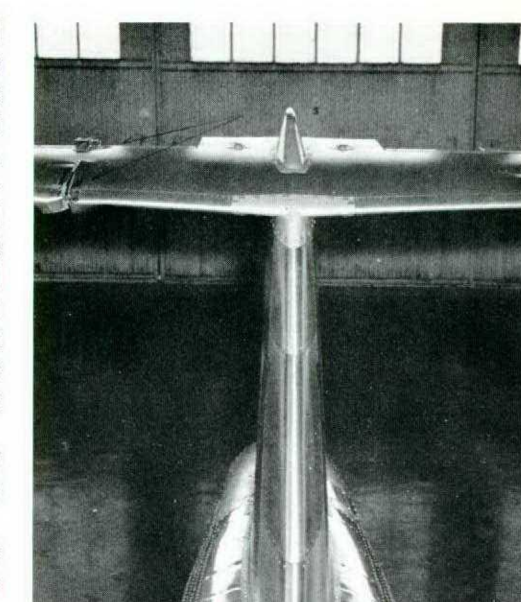
Canopy Ejects - FOD



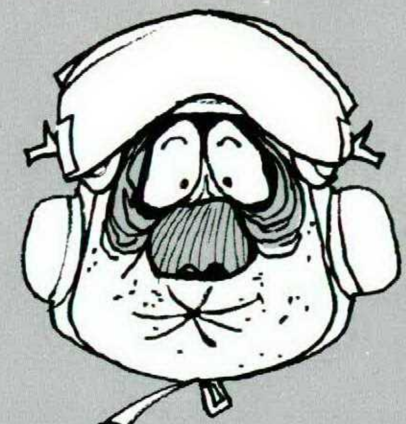
During the pullout from a vertical roll is a bad time to lose your canopy, but this pilot remained unshaken and returned to the field for an uneventful follow-up of what must have been an exciting moment or two. The pilot didn't deserve this sort of treatment – someone had left an unauthorized hand-made tool which wandered around the plane's interior till it shorted two electrical contacts. Despite an extensive investigation into whether this tool originated from a civilian or service source, the fact that the tool had no apparent use made the findings inclusive.

The pilot had returned from the occurrence unaware that the canopy had struck the horizontal stabilizer and elevator.

The gross amateurism of someone came uncomfortably close to causing a serious accident.



GLUE SNIFFER



After a relatively short instrument check I began to feel the effects of the glue. . .

A few days prior to taking a cross-country and instrument check, I remembered that the forehead pad in my hard-hat was loose and kept falling out. Rather than spend an extra 20 minutes to drive out to the air station paraloft and have it fixed, I decided that a little household glue would suffice. I used the glue that I first encountered in my desk, put the hat back in the closet, and forgot about it until the day of the check ride.

Imagine my surprise when the distinct odour of model airplane glue rushed from under the visor into my nose. After a relatively short instrument check I began to feel the effects of the glue, (or at least I imagined I felt them): I got a nasty headache, and I believe a slight case of euphoria. The remaining legs of our cross-country were short enough that the glue smell gave me nothing more serious than another headache, and after two-weeks the smell had gone altogether.

I'm sure that this incident could have been much more serious if the flying had been more arduous, say under IFR, ASW operations, at sea, and not feeling up to par, or not in good physical condition. I'm also sure that I will never again treat my own equipment's malfunctions just as I would never treat myself for disease or cold.

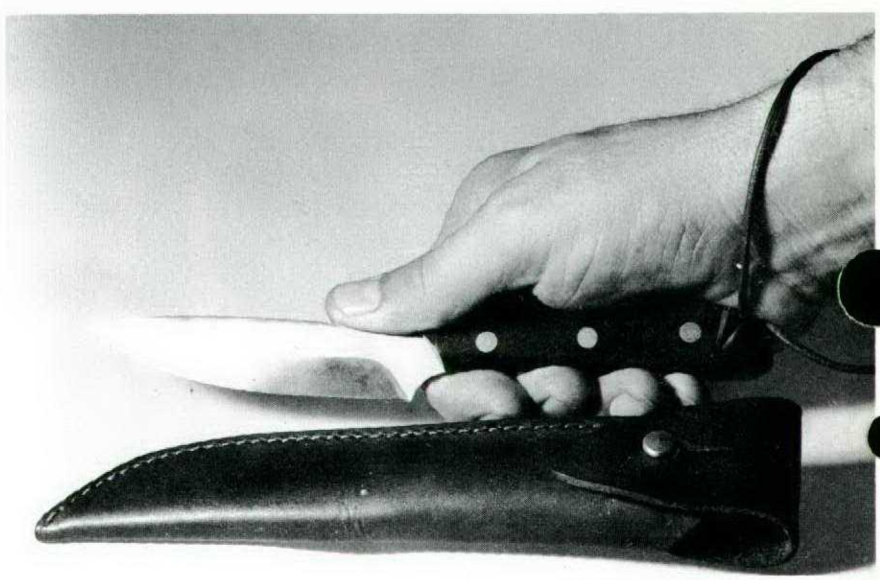
I think a potentially dangerous situation could have been avoided had I been reminded of the effects of glue sniffing. I've read accounts of glue sniffers in the papers, but never in a safety poster in the readyroom. "TREAT NOT THYSELF NOR THY EQUIPMENT" is my personal safety slogan from now on.

– USN Approach

Knife, Aircrew, Survival

For some time now, there's been a general dissatisfaction with the aircrew hunting knife and sheath. The sheath, in particular, was dangerously inadequate, often coming unstitched and never providing enough security for the knife itself.

Looks like we've found an excellent survival knife for non-jet aircrew who must carry a knife on their person. User trials in the three services have demonstrated its suitability. The robust leather sheath and the short bladed, well balanced knife, looks like a major improvement.



Gen from Two-Ten

L19, NOSE UP ON LANDING With winds light and variable the pilot approached the strip at 60 mph with 60° of flap. He bounced with power off and following the second touchdown began a slow veer to the left which he could not control. The aircraft, despite opposite brake and rudder, ran into the snow tipping the aircraft on its nose.

In this case, in which no specific cause could be given for the accident, it looks very much like that hoary old stand-by "too little and too late".

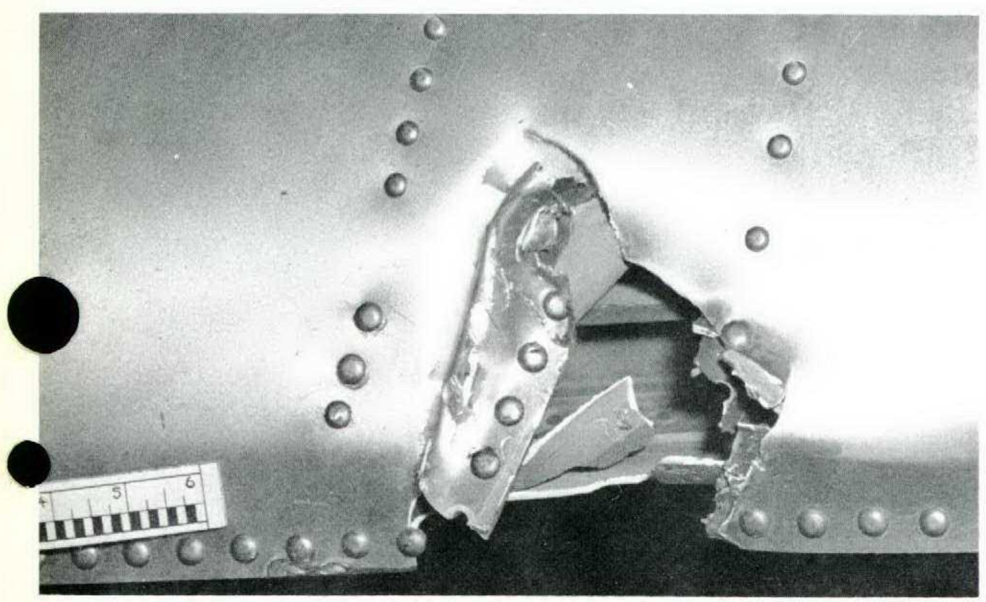
CF101, PROBABLE HYPER-VENTILATION The pilot states "during an intercept at 33000 feet a tingling sensation was noticed. I had difficulty breathing out, had a lightheaded sensation, and had a slight loss of peripheral vision. One hundred percent and emergency oxygen was selected and descent to below 10000 feet cabin altitude was initiated . . ."

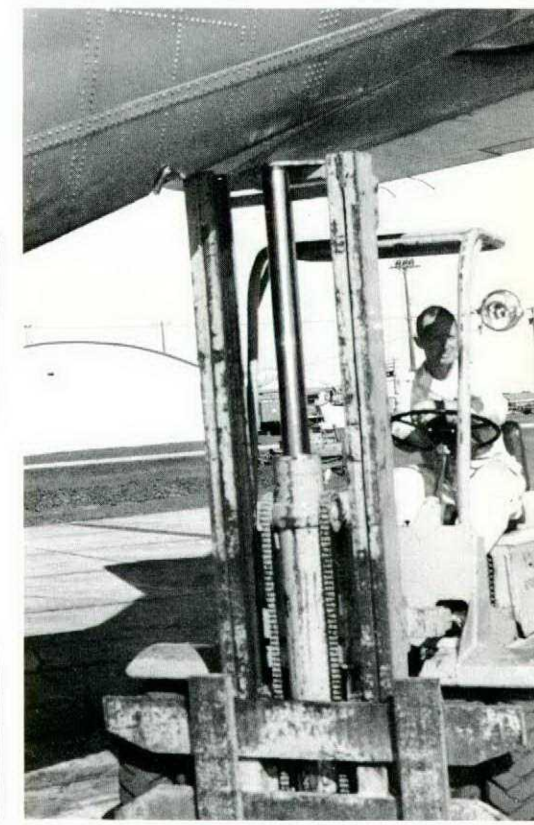
In what appeared to be a case of hyperventilation, the pilot quickly took action and averted what could have been a serious emergency.

Pilots should be aware that a normal response to moments of intense concentration, such as during an intercept on a dark night, will increase respiration. This pilot was quick to recognize symptoms and responded in time to arrest the symptoms.

C130, FORKLIFT AGAIN "I backed up the forklift to what I thought to be a substantial distance . . . I proceeded to make a sharp left turn watching the top of the boxes . . . the boxes were high enough that it was difficult to watch the top of the boom . . . I then heard a crunching sound . . ."

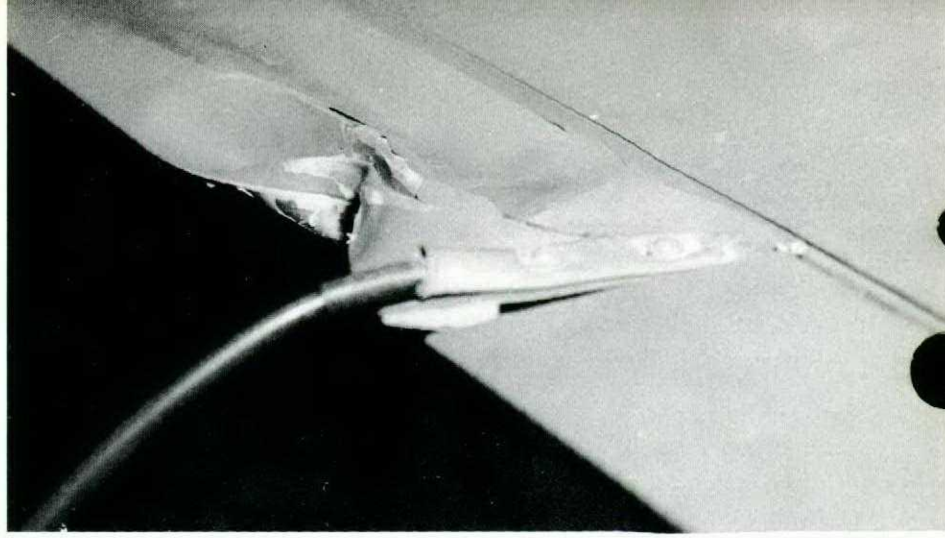
The forklift driver had not backed far enough to clear the aircraft before turning – gouge one aircraft.

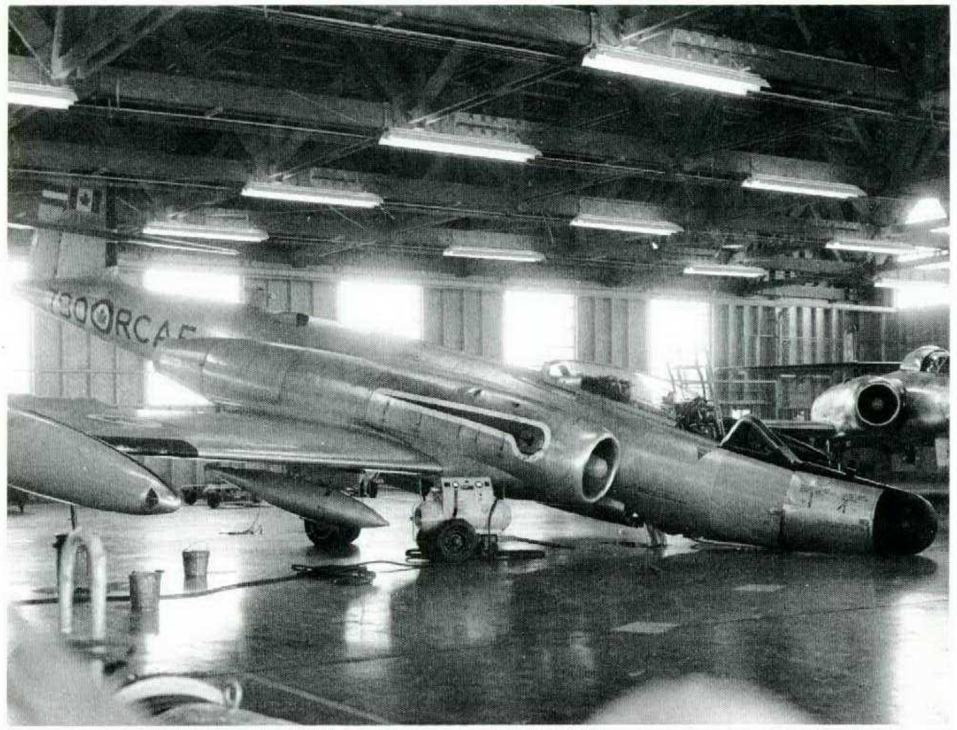




TRACKER, STAND HITS AIRCRAFT While pushing an engine stand across the hangar, a technician swung the stand toward the aircraft. The stand was in full swing when he realized that it was too heavy to control by himself. The result is shown in the photo.

While it could be argued that the man was unfamiliar with this heavier type of stand, that fact alone would suggest a little more caution – and a helping hand from a nearby onlooker.





CF100, GROUND RETRACTION To select the "up" position on the CF100 undercarriage lever requires a pull of at least 40 pounds. Nevertheless, somehow an unknown person had left the lever in the "up" position. It was only a matter of time until a maintenance job required the application of hydraulic pressure.

Two airmen whose experience on the CF100 totals 22 years became the victims of an incomplete precautionary check. They had simply removed the grounds locks and innocently applied hydraulic pressure.

Their poor judgement involved in not using jacks for work on major undercarriage components went unnoticed by supervisors. Henceforth, the simple expedient of jacking the aircraft off the ground before removing the locks should insure against a recurrence.

C45, UPSIDE DOWN The two student pilots taxied out for takeoff on a training flight. All appeared OK on lineup and throttles were advanced; on release of the brakes the aircraft rolled and as the tailplane lifted the aircraft began to turn left. The student at the controls applied opposite rudder, but this failed to correct the swing. The other student suggested differential throttle to arrest the turning, so the right throttle was retarded an "undetermined" amount. The resulting assymetric power caused a violent swing to the right.

(Wheel brakes were not used as the students were under the impression that this was dangerous with the tail up.)

By now off the runway, the pilot elected to abort but first decided to correct the swing by returning power to the right engine. This imparted enough momentum to the aircraft that it tipped over when it struck a snowbank further away from the runway.

Attempting a short field takeoff with a crosswind, limited experience, and poor technique proved to be a devastating combination.

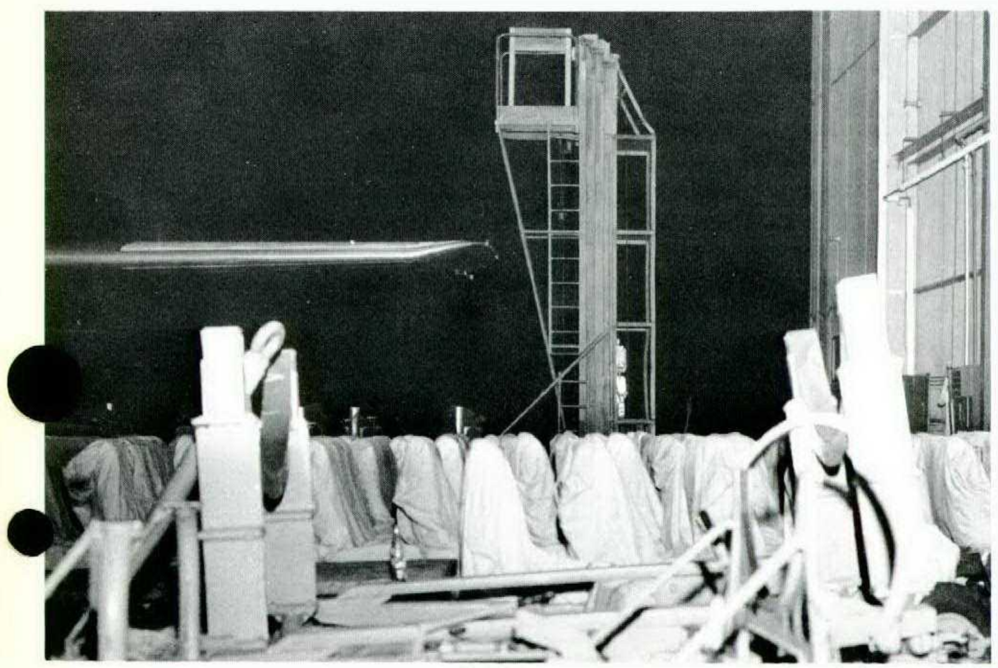
(The deceleration locking mechanism on the shoulder harness saved these men from injury but the rather flimsy structure of the nose area and its penchant for nosing over has sparked an investigation into aircrew wearing safety helmets.)

C130, ENERGIZER STRIKE The mule driver, who had earlier attached the energizer to his vehicle, drove away after the aircraft start-up. The mule drove away alright – but without the energizer – it disconnected, striking the aircraft.

How the vehicles became unhitched was not determined but appears most likely to have been a separation which followed a too-hasty engagement.

OTTER, STRUCK TREES The pilot was briefed to carry out simulated low-level strike missions in co-operation with the Army, but the only strike that occurred was to the Otter aircraft – by a tree. Disregarding the strictures of CFP100 regarding minimum clearance above obstacles the pilot pressed home the "attack" striking a tree.

This uncomfortably close call, with a senior officer on board, could have been catastrophic. Looks like a highly experienced pilot had a severe lapse of good judgement.



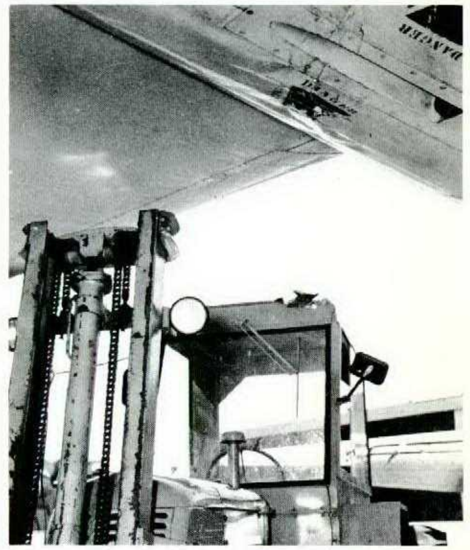
YUKON, TOWING This large expensive aircraft was being pulled out of the hangar; the photo shows the incorrectly-located maintenance stand into which wing tip crunched.

The salient feature (apart from the obvious) of this tip-tussle was that a corporal was incorrectly assumed to be an NCO in the context of the order which reads "the NCO i/c will accompany the aircraft during the move and will direct the operation personally".

Too, while investigators are compelled to assess this kind of accident as essentially a lack of judgement on someone's part, the tricky job of moving large airplanes in a limited space is unnecessarily compounded on too many occasions by thoughtlessly abandoned equipment – just waiting to be struck.

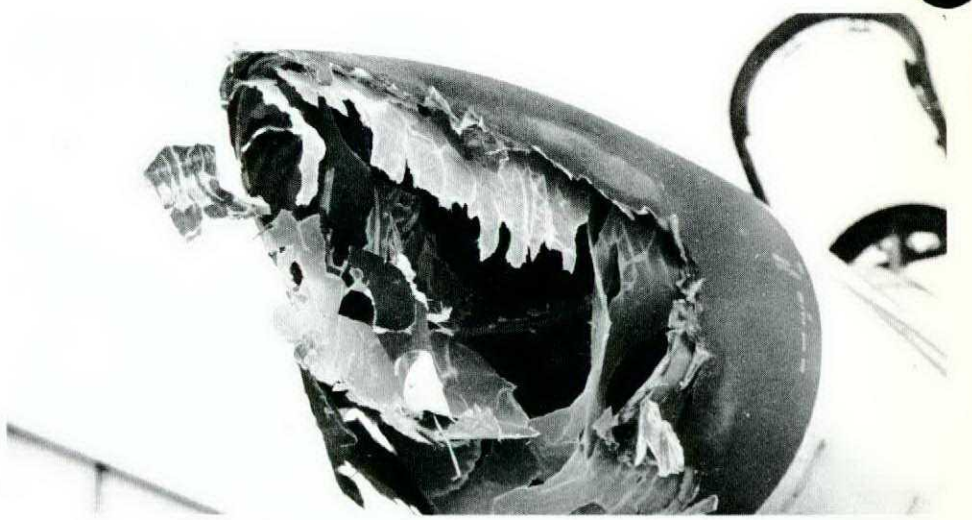
HERCULES, RAN OFF RUNWAY At a northern base the aircraft was unable to stop on an ice-covered 6000 ft runway which had, in the pilot's words, "nil braking". The left front main tire crushed a runway light gouging the tire; both had to be replaced. The pilot used insufficient reverse thrust on initial landing roll acting on advice that the braking action was "satisfactory".

This business of asking the other fellow for a braking action report too often predisposes a pilot to accept a remark such as "fair to good" as having real meaning. Type of aircraft, loading, pilot technique, even different areas of a runway, all influence a pilot when he describes runway conditions. If there is doubt assume the worst — you'll be in the right frame of mind for a successful landing.



ARGUS, TRACTOR STRIKE To pick up a trailer positioned under the aircraft the driver attempted to pass under the fuselage with his cab tractor. The driver demonstrated either ignorance or deliberate disobedience of unit orders which prohibit vehicles within 10 feet of the aircraft.

The armed forces' vast experience in this type of operation have generated a comprehensive set of regulations which (if followed) would virtually preclude this sort of occurrence. The circumstances suggest an open disregard of the 10-foot restriction at this station; a keener lookout should be exercised by supervisors.



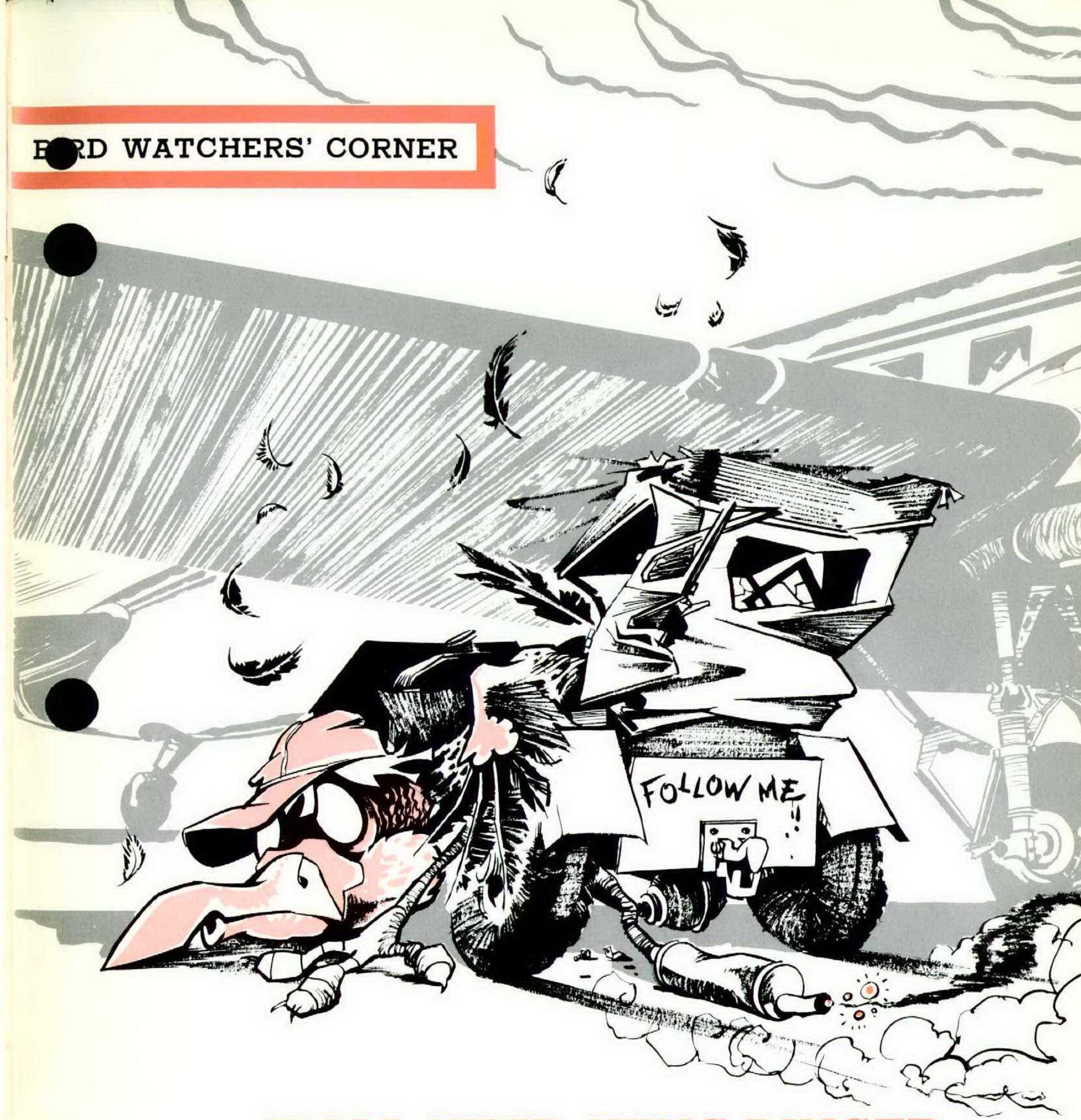
CF101, FUEL TENDER SKIDS The fuelling tender was being manoeuvered in the confined apron area of a readiness alert hangar. The driver stated, "I pressed the brake and the wheels locked but I kept going straight". The vehicle was obviously not driven with the necessary caution for the slippery hard-packed snow surface.

The dismal facts leading to this very expensive accident came to light in the subsequent inquiry. And it reads like a checklist of "don'ts":

- The vehicle was driven above the speed limit required in orders.
- The driver had read and acknowledged driving regulations about two months before.
- The vehicle had an unserviceable speedometer which had never been recorded in the vehicle's records.

Despite this driver's lack of experience in the vehicle, as well as handling it in hazardous winter conditions around aircraft, he was moving fast enough to skid his vehicle for *27 feet* prior to impact.

BIRD WATCHERS' CORNER



WALL-EYED WING-DINGER

Birds at rest know few enemies to match this perambulating menace. An aggressive bird-of-prey, the wing-dinger is at his instinctive best rendering other birds unfit for flight—an urge he pursues without regard even for his own safety. Nature has endowed the Wing-Dinger with an exquisite imbalance of faculties—limited vision and an irresistible compulsion to move in confined spaces at high speed. After each inevitable agonizing impact the terror-of-the-tarmac whistles amid his fluttering feathers, in tones not unlike the high-pitched squeak of tearing metal:

HIGHSPEEDANDPOORVISION MEANSAWINGDINGCOLLISION

CLOSE CALL

OPERATIONAL HAZARD

SAFETY SUGGESTION

SAFETY COMMENT

Lives and money can be saved
by timely use of this form -
if you have experienced
or seen an unsafe
or potentially hazardous occurrence
pertaining to aircraft in flight
or on the the ground -

use this report.

pin it down - write it up

18