FLIGHT COMMENT

NOVEMBER • DECEMBER • 1971

Winter woes - part V

Comments

Not long ago a pilot landed *sans seat pack* after an ejection into winter bush conditions. Only one of the seat pack connectors was found attached to the parachute. Whether he had neglected to do up the other one during strap-in, or whether it had come loose prior to or during the ejection, could not be established. The point is, he was down - without survival equipment; the message is, check those seat pack connectors - both of them!

The USAF has recently modified all 115/145 refueling units and fillstands to adapters, couplings, and hoses that cannot be used on JP4 refuelers. A 2-inch aluminum adapter was added to the original 3-inch fitting. Measures have been taken and modifications performed that ensure that proper fuel is placed in the proper refueling units. Wrong-fuel incidents of the kind leading to this modification have also occurred from time to time in the CF (at least three aircraft have been refueled with the wrong fuel during the last year) and our maintenance managers are studying the USAF system with a view to adopting it. Additionally, the USAF has recently changed the decal markings on all 115/145 refuelers. Previously the fuel markings on all refuelers, regardless of product grade, were white in colour with a red background. The new markings for 115/145 are white with a purple background. JP4 markings remain the same.

We'll be watching with interest for the reaction of crews and passengers when the new Twin Otter - with a heating system that almost ceases to function at idle power - comes up against a long delay on the ground in the bone chilling mid-winter temperatures of places like Frobisher and Yellowknife. Of added interest will be the cost entailed in providing an adequate system later on, compared to the cost of installing the equipment in the first place.

The Department of Energy, Mines and Resources are producing a world aeronautical chart (WAC) Scale 1:1,000,000 for Canada that replaces the present WAC ICAO series. Of immediate benefit to users is the improved display and currency of information. These charts (19) are to replace the present 66 charts of the ICAO series and the ARC series as they come into stock. Complete coverage of Canada is expected by mid-summer 1972. Comments on the new series should be forwarded to CFHQ/VCDS/DCOPSR/DMC.

CANADIAN FORCES HEADQUARTERS — DIRECTORATE OF FLIGHT SAFETY

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DIRECTOR OF FLIGHT SAFETY

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A Progress Check

As 1971 comes to a close, it's time for a progress check on action that has been recommended on this page during the past year or more. Such examinations from time to time, provide the follow-up that enables us to assess whether or not we are taking effective preventive action to eliminate those identified hazards most likely to cause future accidents.

The hazards and the record:

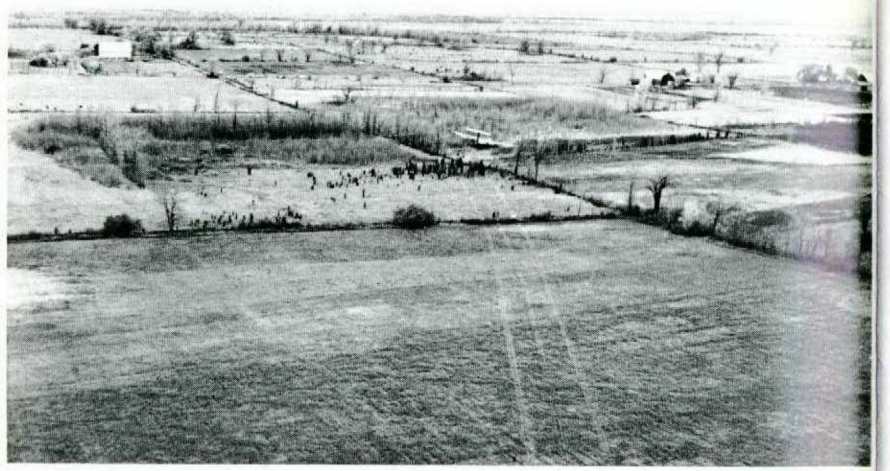
- *Towing and ground handling of all types of aircraft without taking adequate precautions to avoid numerous known hazards.* From the beginning of 1969 to the end of August this year, 111 aircraft were damaged through the operation of vehicles and GSE. Since last discussing this subject in early 1970, there has been no apparent reduction. By the end of August this year the figure was already within eleven of last year's total.
- *Repetitive occurrences involving misuse or abuse of brakes.* While these continue to involve an unacceptable waste of resources, the record this year indicates that there will be a significant improvement in this area.
- *In recent years, 50% more accidents took place in the summer months than in winter. In other words, the onset of fair weather signalled an increase in the number of accidents, when theoretically it should be the other way around considering obvious exposure factors.* This trend was continued in 1971.

The 3000 occurrence reports received during each of the past three years indicate that our message has gotten through; namely, that what may appear in the field to be an isolated instance often establishes a significant trend when correlated at higher headquarters.

Looking back we can see quite clearly how most of our accidents and incidents could have been prevented. However, YOU alone are in the best position to evaluate your operation in relation to particular hazards, and in most instances to apply the needed corrective measures "before the fact".

COL R. D. SCHULTZ
DIRECTOR OF FLIGHT SAFETY

This article is written with the 20-20 vision of hindsight reinforced by opinions and observations of specialists involved in the investigation — an atmosphere totally different from that facing a crew sweating it out under the stress imposed by an emergency. Who knows how many of us would have reacted the same way under the circumstances? It is not the intent of the article to admonish the crew, but rather to give the maximum number of aircrew the opportunity to learn from this crew's experience and the subsequent investigation. Hopefully, others will be induced to make a critical analysis of their own procedures.



Capt D. W. Rumbold

A Combination of Circumstances

It was the last trip of the conversion course as the Buffalo took off, carrying a crew of four. The pressure was on to get the job done in time. On the climb-out towards Lake Ontario, the captain briefed his student to be prepared for simulated emergencies, including engine fire. Low cloud forced them to come back over land to do the exercise, where the captain announced a simulated fire in the left engine, and again advised the student (as he had during the climb) to go through all the procedures short of actuating the fire extinguisher. He chose the left engine deliberately, because the Buffalo's left nacelle contains the auxiliary power unit (APU). One of the engine shutdown steps is to close the "fuel/oil/hydraulic" switch, which in the left nacelle also serves the APU. Hence, the left engine can only be restarted by first turning the "fuel/oil/hydraulic" switch back on, and then either starting up the APU or obtaining a "cross-bleed" start from the right engine.

For some reason the *right* engine throttle lever was retarded. In the following moments as the student attempted to correct his mistake by restoring power to the right engine and shutting down the left, power was lost on both engines — the right engine had compressor-stalled — there was a dazzling display of coloured lights across the instrument panel and the intercom went dead. As he attempted to sort out the emergency, the captain took control and turned towards a small airport in the area. However, as the crew had no success restarting the engines, the descent soon became so steep that the airport disappeared above the windshield and the captain was forced to turn towards the largest nearby field.

He set up a steep approach over some trees to force-land diagonally across the field. To ensure making it, he left the gear and flaps till the last moment, and then firmly placed the aircraft down just beyond the trees.

It turned out to be a wet pasture, and downhill, and contained some substantial trees in the far corner. The captain tried briefly to ground-loop, but immediately abandoned the attempt when the aircraft slid sideways on the wet grass. Coming straight again, they hit a rail fence head-on, and continued through the pasture towards still more trees at the far side of the second field.

The silence in the cockpit was finally broken by a crunch from the right wing tip as it was ripped off by a sturdy tree. The nose gear and right main collapsed as the aircraft plowed through another fence into a marshy area filled with small trees.

When the aircraft stopped, the flight engineer opened the overhead hatch to scan for fire, then he and the two pilots climbed up through it and slid off the right wing to the ground. The fourth crewman opened the cabin door and stepped out.

In the aftermath, the accident cause was traced to a combination of circumstances:

- The procedure for stopping a Buffalo engine is to close the fuel lever, not the throttle. The student did this correctly on the left engine and turned off the left "fuel/oil/hydraulic" switch. Prior to that he had re-applied the power to the right engine, but unfortunately, it compressor-stalled just as the left engine was shutdown. The investigation later revealed that the right engine had had an in-flight compressor stall three weeks previously, which had not been reported. The intake guide vane variable geometry feedback cable was five and a half turns out of adjustment.
- The sole source of power for the Buffalo intercom relied on engine generators — it has now been put on the essential D.C. bus.
- Left with no choice but to start the APU, the captain relied on memory, the intercom being inoperative. The flight engineer neither offered nor was asked for assistance. As a result, the APU's output of vital bleed air inadvertently remained diverted to the cabin heat system, leaving insufficient bleed air to restart an engine.
- An order setting a minimum altitude of 3000 feet (AGL) for single-engine work was not too clearly understood following a recent transfer of the Buffalo fleet from one command to another. The practice emergency occurred at only 2200 feet.

Happily, not all the combinations of circumstances involved in this accident were adverse.

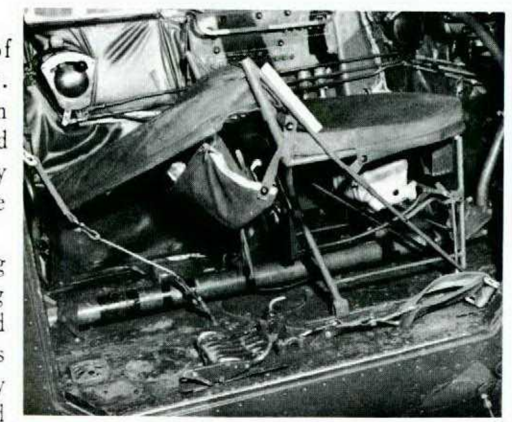
- The forced landing on land was fortunate, since the aircraft carried neither dinghy nor life preservers.
- There was no fire. The crash rescue crew, having been informed by the tower that five men were on board, would have searched in vain for the fifth crew member listed on the flight authorization.
- There was only one minor injury — the student (wearing oxfords) injured his heel jumping from the wing to the ground.

Nevertheless, this combination of circumstances caused a "B" category accident, putting the aircraft out of commission for an estimated 15 months of expensive repairs. No, it isn't those alligators which we might expect to gobble us up, it's the ducks that will nibble us to death.

Night Fright

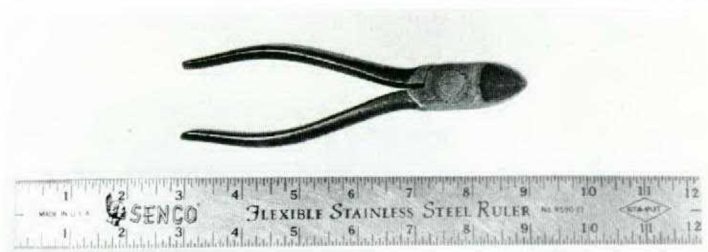
One L19 pilot we know of thinks he has heard of everything as a result of a recent unnerving experience. He was cruising along one inky night without a care in the world when suddenly the back of his seat snapped off, capsizing him into the passenger seat aft. Luckily he was able to regain his composure quickly, before the aircraft got away on him.

This known weak spot in the L19 is gradually being replaced with strengthened seat backs, and those awaiting modification are checked visually each day and checked with dye penetrant after each 15 hours. More emphasis is being placed on briefing passengers to ensure that they don't use the seat back as a handhold for entering and leaving the aircraft.



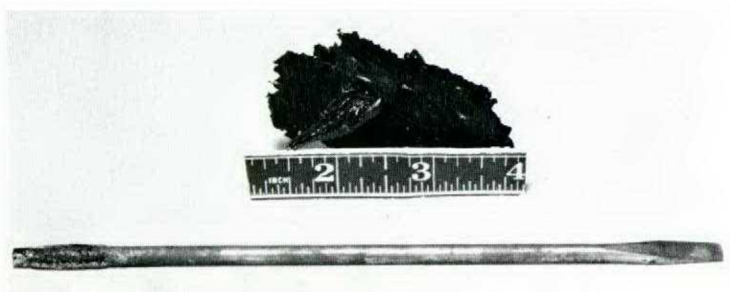
Have You lost These?

There are obviously some lighter-than-normal tool boxes around these days judging by the assortment of tools shown here - all of which were uncovered from CF aircraft in a two-week period this summer. Our previous experience indicates that tools left in the wrong place can have disastrous results.

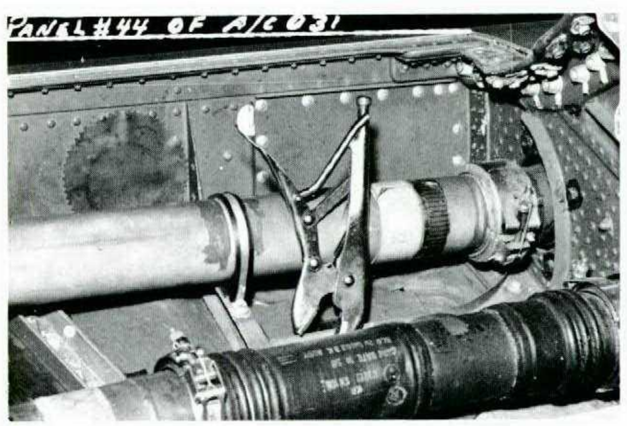


As he was doing a walkaround prior to his second trip of the day on the aircraft, the pilot noticed a scratch on the engine as he peered through the plenum chamber access panels. When he removed the lower plenum panel to investigate, this pair of side cutters dropped out.

While a CF104 pilot was strapping in, a technician discovered a pair of needle-nose pliers in the cockpit beside the seat.

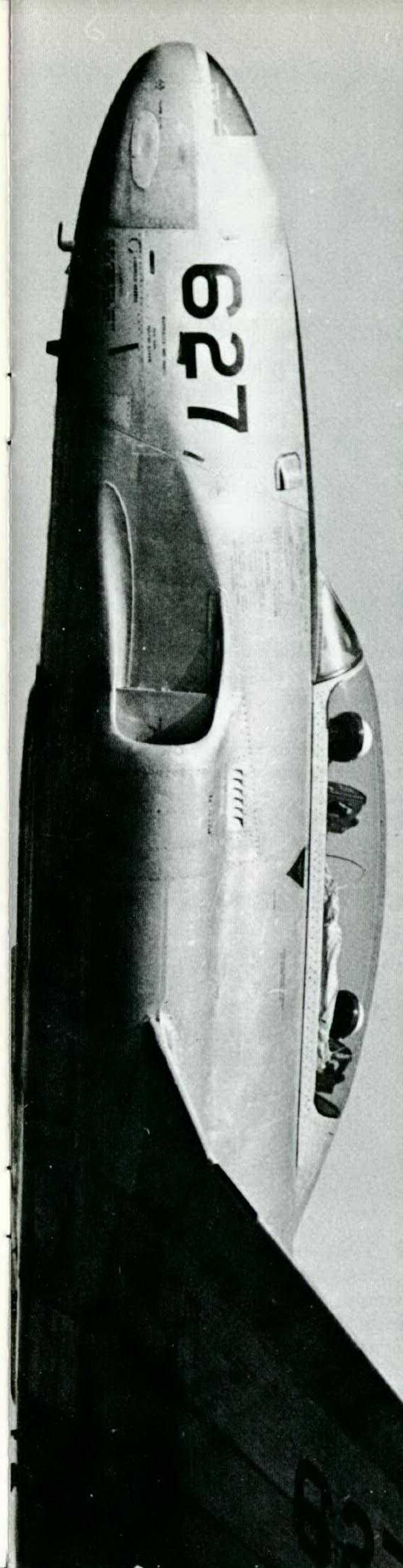


The plastic handle on this 6-inch screwdriver was unable to withstand the temperatures inside the shroud ring of a CF5 engine.



During an overstress check these vice-grip pliers were found in the dorsal area of a Voodoo. Luckily they were not in a critical location.

Our maintainers have been working for some time on developing effective measures to eliminate the hazard of misplaced tools and the Canadian Forces are now about to embark on a service-wide program of Tool Control. Approval has been given for design work to commence on the introduction of individually tailored tool systems to aircraft units. The order in which bases, squadrons, workshops and so on will be reviewed has yet to be decided. Two trial projects are already under way at CFB Portage la Prairie and CFB Shearwater where results indicate that Tool Control will be as effective and popular as it has proved to be in the armed forces of the UK and Australia. The Jan-Feb issue of Flight Comment will include an article on the workings and advantages of Tool Control.



in case you were wondering...

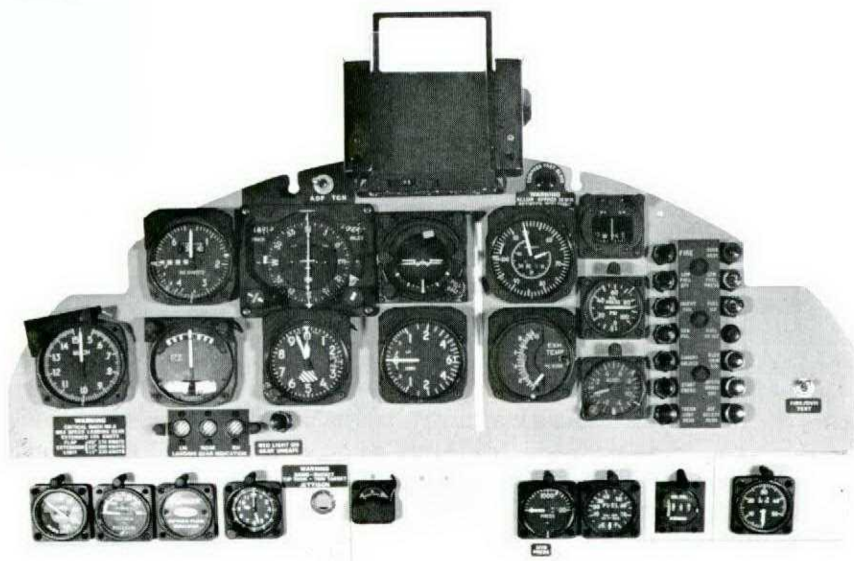
CURRENT T33 MODIFICATIONS

ROCAT SEAT Twenty-five seats had been modified in September 1971. At that time further work had to be suspended pending the resolution of a problem with initiator acquisition. Modification will go ahead at the rate of four seats per week once the initiator problem is resolved. When modified aircraft reach the field, L14s and instrument panels will be placarded to indicate those aircraft equipped with the rocat seat.

SEAT PACK AIR LOCK FASTENERS The long established CF method of holding back improved equipment until the old wears out was applied to the new seat pack fastener. Thus, the task (awkward under the best conditions) of connecting this important survival item was compounded by the presence of two types of fasteners in the system. Instructions have now been issued to install the new seat pack fastener on *all* T33 seat packs.

HSI MODIFICATION A total of 75 T33 aircraft were scheduled for modification. Forty-four modified aircraft were in the field on the first of September 1971, ten more were being modified at the AMDU in Trenton, and the remainder are programmed for completion at a rate of three aircraft every two weeks.

Originally HSI aircraft were approved for Training Command only, but as the requirement has lessened in TC, the overflow is going to Air Defence Command. It is possible that ADC will have their entire fleet HSI equipped.



Good Show

MAJ W.L. MONKHOUSE
LT H.V. BOYKO
CAPT D.J. COAKLEY
CPL A. TREMBLAY

LT N.F. WEIMEYER USNR
LCDR D.R. MURPHY USN
LT(JG) M. RILEY USN
LT (JG) SD COHRIER USNR

Left to right: Cpl A. Tremblay, Lt H.V. Boyko, Maj W.L. Monkhouse, Capt D.J. Coakley

A Sea King helicopter piloted by Maj Monkhouse, sustained a collapsed landing gear during a destroyer hauldown landing on board HMCS Saguenay. Maj Monkhouse initiated an immediate wave-off back to the hover position and after assessing the damage to the starboard sponson, attempted to contact Saguenay, but the helicopter's radios had failed. Faced with the loss of communications and no cradle to land on, he directed the tactical navigator to signal by semaphore that they were proceeding to NAS Bermuda and he requested that the ship alert HMCS Nipigon, two miles away, to send a helicopter to Bermuda with technicians capable of constructing a landing cradle.

By the time the assisting helicopter arrived in Bermuda two U.S. Navy officers, Lt Weimeyer and Lcdr Murphy, were improvising a cradle for the crippled helicopter. Both had had experience constructing a similar device in the past.

To add to the drama, the crippled helicopter was low on fuel and there was danger of losing the aircraft if a water landing was attempted. Maj Monkhouse decided instead to "hot refuel" while in the hover. This emergency refueling operation was completed under the

Lt N.F. Weimeyer USNR

Lcdr D.R. Murphy USN

Lt(JG) M. Riley USN

Lt (JG) SD Cohrier USNR

supervision of Lt Weimeyer.

Meanwhile, the cradle was constructed using water-soaked mattresses on a wooden platform which was tied to the runway. Lt Weimeyer and Lt Dick, a member of the Nipigon crew, directed the aircraft, while two other Nipigon crewmen, Cpl Grant and Capt McLean handled the lines to ensure that the mattresses did not slip from under the aircraft when the weight was applied. After several attempts Maj Monkhouse finally settled his aircraft on the make-shift cradle. Sand bags were then stacked in strategic points and the aircraft was lashed to the runway to ensure stability. The shutdown, without the aid of the rotor brake, was uneventful.

The problems were not over yet however; a forecast of high winds made it necessary to move the aircraft into a hangar. Capt J.A. Leblanc, from the Nipigon, assisted by maintenance personnel from Saguenay, and USN personnel, completed this operation in seven hours. Technical advice and assistance was provided by Lt (JG) M. Riley, and Lt(JG) S. Cohrier, of the U.S. Navy.

Throughout the emergency, Maj Monkhouse and his crew improvised solutions to a series of problems and by doing so undoubtedly prevented a serious mishap. The rapid response and excellent support provided by USN personnel and the assistance of crewmen from the Nipigon, assisted greatly in the successful completion of a delicate rescue operation.

MR. EARL MCCALLAN

Mr. Earl McCallan

Mr. Ian Young

Mr. Earl McCallan, a Quality Assurance Representative employed at TSD Montreal, was assigned to perform a mandatory inspection of the flight control system of a newly manufactured Netherlands F5B aircraft in accordance with the manufacturer's functional test procedure. During the course of his inspection he noted that the test procedure required the control surface travel to be established and checked from the rear cockpit only. Realizing the aircraft is flown solo from the front cockpit, Mr. McCallan decided to check the travel of the control surfaces from there. The check revealed that with the landing gear up and the aileron control overriding the aileron travel limiter, the right aileron travel was less than the values obtained with the landing gear down. To satisfy himself that the condition was not an isolated case, Mr. McCallan checked a number of other aircraft for the same condition and found restrictions in right aileron travel as large as 1.9" in the 'UP' position and 1.5" in the 'DOWN' position.

Mr. McCallan next checked the applicable EOs and found that the contractor's test procedure and that of the EO were compatible. However, he found in the EO section concerning erect spin recovery that "it is imperative that the full aileron deflection be held during recovery". This led him to immediately originate a UCR which resulted in an advisory operational restriction being placed on the NF5B.

Mr. McCallan displayed keen observation in the first instance in recognizing a need to check the control surface travels from the front cockpit, then he methodically verified a similar condition on other aircraft and subsequently determined that the condition created a potential in-flight hazard.

WO W.A. Kightly

Sgt T. Chequer

MR. IAN YOUNG

While inspecting the upper wing of a CF104 at Scottish Aviation, Mr. Young, a SAL Inspector, noticed a small nick beside a pylon blanking plug screw. After having the nick dressed out, he followed up with a dye penetrant inspection (DPI). This uncovered a crack approximately three-eighths of an inch long.

This potentially serious flight hazard would have remained undetected and the aircraft would have been returned to flying status, had not Mr. Young's thoroughness led to its discovery.

WO W.A. KIGHTLY

WO Kightly was supervising the refueling and turnaround of a Canadian Forces 707. While the operation was in progress he noticed a bent corner on one of the trailing edge flap cove lip doors. Further investigation revealed that one of the two actuating arms of the cove lip door was broken and interfering with the normal operation of the flaps. Had this defect not been noticed, operation of the flaps could have precipitated an in-flight emergency.

Although assigned the task of supervising line activities, WO Kightly's professionalism prompted him to go beyond the assigned task and led to the discovery of a condition detrimental to the safe operation of the aircraft.

SGT T. CHEQUER

While supervising the maintenance crew during an inspection of a T33, Sgt Chequer observed that each time a man entered or left the cockpit the skin of the aircraft flexed inwards under the ladder. Realizing that this force could result in skin damage, Sgt Chequer inspected

GOOD SHOW

Cpl W.S. Johnson

Cpl O.E. Harvey

Cpl J.D. Roach

Cpl R.A. Pope

Cpl J.W. Cunningham

the area beneath the ladder mount and discovered a 2-inch crack. He then checked other aircraft and discovered one other T33 with similar damage.

As a result of his inspection he informed the squadron Engineering Officer of the condition. It was found that a 1967 modification to the T33 ladder had never been received by the squadron. Sgt Chequer's attentiveness to his job prevented further damage to the aircraft.

CPL W.S. JOHNSON

While inspecting the tail pipe assembly of a T33 during a 200-hour inspection, Cpl Johnson suspected a crack in the area of the roller mount. Further investigation under better lighting dictated an additional inspection by dye penetrant which confirmed a crack.

Although the inspection area was extremely difficult to see, Cpl Johnson's close attention to detail resulted in the discovery of a potential flight hazard.

CPL O.E. HARVEY

Cpl Harvey was carrying out an aero engine primary inspection on an Argus when he noticed a slight wetness around one of the spark plugs on number one engine. As he wiped off the area, he detected a tiny crack emanating from the spark plug boss. When the cylinder was removed it was found that the crack had progressed internally down through the boss and across the exhaust valve seat to the fuel injector port.

Cpl Harvey's comprehensive inspection technique probably prevented the break-up of the cylinder and a possible in-flight emergency.

CPL J.D. ROACH

Cpl Roach was performing the job of right wing man on a crew starting an Argus when he detected an improperly positioned brake line as he was removing one of the chocks. He immediately informed his supervisor and the aircraft captain. An investigation revealed that maxaret hydraulic return line on the right bogie was damaged in such a way that it was free to swivel from front to rear when the landing gear was cycled. Had the line been kinked during a cycle, hydraulic pressure could not have been released from the maxaret units and the wheels on the right side would have been locked.

By his alertness, Cpl Roach eliminated a hazard which could have caused all four tires on the right side to blow on landing.

CPL J.W. CUNNINGHAM

In the course of a FOD check for a missing PHI control knob in a CF104 cockpit, Cpl Cunningham detected a frayed aileron control cable. The cable was located in an inaccessible area and the fraying could barely be seen. It had been caused by FOD lodged in a pulley through which the cable passed, forcing it against a retaining pin. When the damage was discovered, 80% of the cable had already been worn through.

Cpl Cunningham's discovery illustrates the importance of thorough checking. Had the frayed cable gone undetected, chances are it would have finally broken in flight, possibly causing loss of control of the aircraft.

CPL R.A. POPE

While carrying out a Periodic Inspection on a Hercules engine fire detection system, Cpl Pope, an I&E tech, discovered a loose fire extinguisher line. Further investigation revealed that the line was broken underneath a securing clamp. The break would most likely not have been discovered during the normal inspection of the fire extinguisher system and had it come apart during flight, the fire extinguisher system could not have functioned properly in the event of an engine fire.

Although checking fire extinguisher lines was not his responsibility, Cpl Pope's careful attention and thorough investigation revealed the broken line and averted a possibly serious flight hazard.

It's chock check time...

The cleats on chocks should be checked before ice is encountered on ramps and aprons...

- Flight Safety Committee

Fouled-up Join-up: Again!

It seems that we have to foul-up at least one formation join-up each year. It also seems that the causes are invariably very basic. In this case the pilot lost sight of the lead and did not take positive action to achieve separation. Sure enough - we lost another 104.

The flight was to be a 3-plane cross-country; the aircraft were CF104s, two singles and a dual; the weather was excellent. After briefing, start-up and taxiing were normal, and lead and number two took off in echelon right, followed fifteen seconds later by number three, flying the dual. Soon after getting airborne number two reported an unsafe gear indication and he immediately pulled up to the right and out of formation. Number three, who was by then moving up towards his position, swung over to have a look at two's gear, but before he had time to move in close, number two reported that everything was OK.

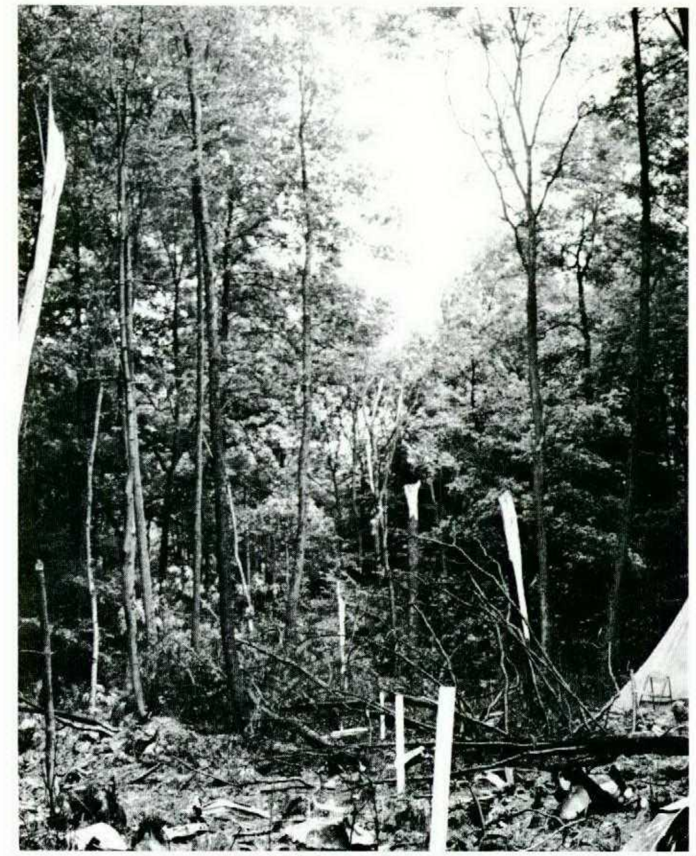
Number three was now in a position behind and to the right of the lead aircraft. As he moved forward and across toward his position on the lead's left wing, he misjudged his range and closure rate and was forced to come back to idle and use speed brakes in an attempt to slow down. But his efforts still didn't produce the required braking effects and the aircraft passed under the lead. Both pilots in the dual lost sight of the lead and as the pilot in control attempted to dive and turn away he actually pulled up towards the lead aircraft. At this point the horizontal stabilizer of number three struck the pitot boom and radar nose cone of the lead aircraft, shearing off the entire nose cone. Shortly after, the lead experienced severe engine noises and vibration and ejected safely.

This midair marked the sixth formation accident since 1969. The result: four fatalities and ten aircraft destroyed. In at least one other accident there was a remarkable similarity to the latest one, in that a pilot finding himself in a rapid overtake, elected to fly under and close to the lead aircraft. In both cases visual contact with the lead was lost and a collision ensued.

Formation has long been the orphan in our flying practices. We formally check the proficiency of pilots in instrument and clear hood flying every year, however, no equivalent check exists for formation flying. Formation flying will be at the top of the agenda at a Flying Standards and Discipline meeting to be held at CFHQ in November this year with participants from all commands.

The corrective action for this and other formation accidents includes:

- A review by CFHQ and commands of current formation orders.
- The promulgation of a standard lost wingman procedure for both IFR and VFR.
- All CF104 pilots have received a refresher formation briefing.

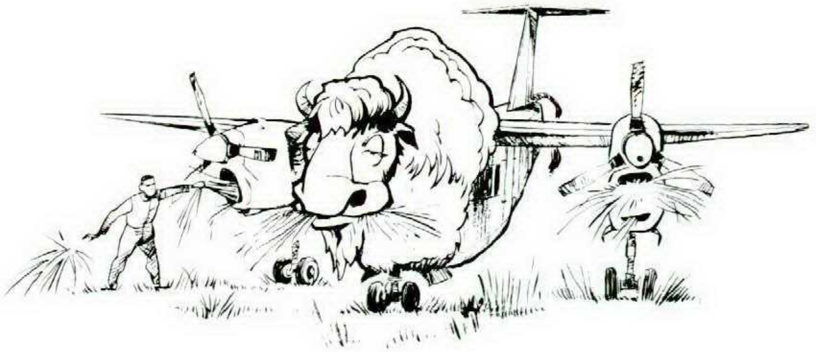


Trail through the tree tops and - impact!

Severed nose cone assembly.

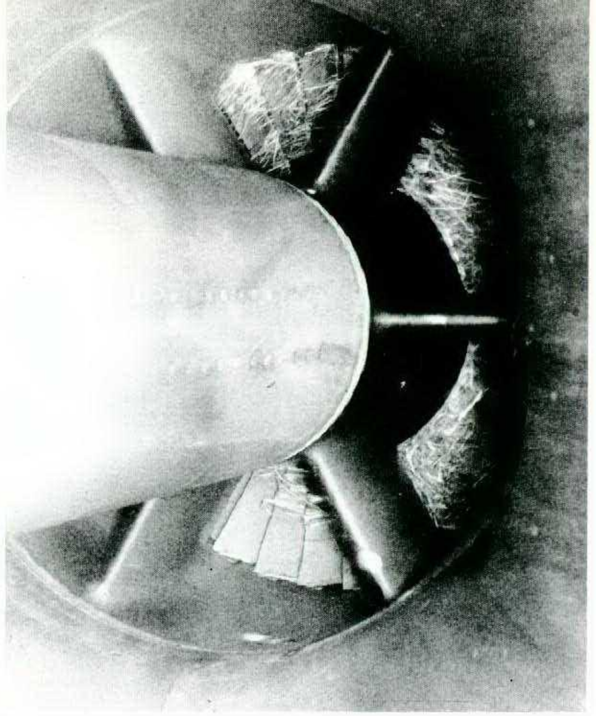
I wish I had . . .

...ordered my winter flying clothing earlier



Please Don't Feed The Animals

Capt P. R. Doherty
CFHQ/DAM



Anyone who has visited a zoo has doubtless seen this sign, or variations of it, posted on the cages and pathways. The reason for its being there is simple enough. The zookeeper is aware of the dietary requirements and limitations of his charges and plans their meals with this in mind. Visitors to the zoo, although well intentioned, are, by and large, unaware of these limitations and if they were permitted to pass out their treats indiscriminately most of the animals would quickly develop digestive disorders and other ailments.

At present, I'm the keeper of a rather unique kind of zoo. I'm in the "cage" (CFHQ), and all my "charges" (Buffaloes and Otters) are out in the "field" mingling with the "visitors" (maintainers and aircrew). At the moment, my Buffaloes are not getting a balanced diet. Since their feeding program is completely in the hands of the "visitors", it's necessary to get the word out concerning the dietary limitations of the Buffalo and other turbine powered denizens of the zoo.

A recent flight safety bulletin carried a photograph of a Buffalo's mouth (engine air intake) clogged up with a fair wad of cut grass. It seems the Buffalo, in a playful mood, was doing short field landing practice on a STOL strip covered with loose, cut grass. All this playful exercise evidently made him hungry, so with the assistance of a friendly visitor (pilot type applying reverse thrust) he gobbled up a greedy mouthful of grass that he could neither swallow nor spit back. Although all this probably made breathing a bit difficult, he was able to saunter back to the ramp where with the assistance of some other visitors (Maintainer type) the ill-advised meal was removed and normal breathing restored.

Subsequent investigation showed that many of the visitors were unaware of the digestive limitations of the local Buffalo. In fact several of those interviewed indicated that they felt that, "this engine will accept and ingest this type of FOD with little difficulty."

This comment can best be described as a "half truth", that is, it does have some basis in fact. Certainly, any dry fibrous material such as grass or straw which gets past the Inlet Guide Vanes (IGVs) and enters the compressor will be mulched and pass through the engine without causing failure or serious damage. However, the grass ingested in this incident was so long that it hung up on the IGVs and almost completely blocked the engine inlet. Had takeoff power been selected with this much blockage, it is virtually certain that a compressor stall would have occurred.

It is recognized that the operational requirements of the Buffalo necessitate an above average exposure to the possible ingestion of foreign material. However, by virtue of their design, all turbine engines are vulnerable to damage if they are made to process anything other than air and limited quantities of suspended liquid in the form of rain, snow or spray. Major damage will not be caused by the ingestion of so called "digestible FOD" such as grass, leaves, dust or sand, but there are compelling reasons for avoiding this wherever possible. For example:

- Sand and dust passing through a turbine engine compressor will cause progressive erosion of the compressor blading. In its early stages, erosion causes a "roughing up" of the compressor surface which increases aerodynamic friction and decreases compressor efficiency. It also makes the materials more susceptible to corrosion. More significant though, is that as erosion and corrosion progress, single blades can lose sufficient strength that they fail. The failure of a single blade will be compounded as it passes downstream through the compressor causing the "classic" FOD destruction of the engine.
- If moisture is present, dust and pulverized organic material (grass, straw and so on) will coat the compressor blades and shrouds. (Anyone who has even looked at the underside of a power mower knows what I'm talking about). This buildup of foreign material will cause a decrease in compressor efficiency and reduce engine performance.
- The least obvious but perhaps most troublesome effect of ingesting "digestible FOD", is the contamination of all components using engine bleed air. The most vulnerable items are the pneumatically operated valves in the air start system and the ECS (Environmental Control System, previously known as Heat, Vent and Pressurization, before the fallout of NASA jargon hit the aircraft industry). Recently because of a high failure rate, we have been faced with an almost constant IOR situation for the Differential Pressure Regulator Valves in the ECS. Cause of the high failure rate? Over 90% of the failures since the beginning of 1971 were attributed to contamination! Adding filters to the valve, have not succeeded in significantly lowering the failure rate.

A new start valve is scheduled to replace the previous contamination-sensitive model but we're still somewhat skeptical of the promised higher serviceability of the valve if it is forced to eat the garbage that the engine has successfully digested.

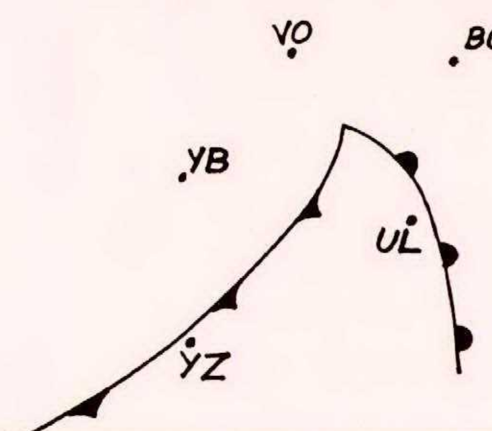
A Buffalo performing a short field landing on an unprepared strip, grinding to a shuddering halt in full reverse pitch, stirring up massive clouds of dust and debris, is a spectacular sight. No doubt it impresses the hell out of the spectators at airshows and those who view our public relations films. No doubt either, that it's necessary in *real, live* rescue operations and *real, live* tactical operations. But quite frankly, this abuse of the aircraft, its engines and bleed air systems in *practice* and *display* situations leaves me completely cold. It generates unnecessary maintenance activity and puts a fantastic strain on our spares support system. A practice STOL strip should be raked after grass cutting operations and it should also be as dust and litter free as is practical. And when it *is* necessary to perform STOL landings on unprepared or littered strips, common sense should dictate a visual inspection of the engine intake for FOD or clogging prior to attempting a takeoff.

So that's basically what can happen when you try to feed the Buffalo an unbalanced diet. His "feeding program" is in your hands and you can follow the zookeeper's advice or change it to suit your requirements. Just bear in mind that if his recommended diet is too extensively modified the Buffalo may develop stomach trouble and crap out, and the only cure is extended bed rest, expensive specialist care, and possible surgical treatment to restore bent and broken limbs.

Capt Doherty joined the RCAF Auxiliary as an AE Tech in 1960 and in 1961 enrolled in Mechanical Engineering as an ROTP cadet at the University of Alberta. On graduation in 1965 he went to Aircraft Servicing section at Namao and later to Aircraft Control and Records. In 1967 he moved to the Air Division where he worked in Snag Recovery and in Aircraft Repair at Zweibrucken, and in Maintenance H.Q. at 1 Wing. He was transferred to CFHQ, Directorate of Aerospace Maintenance in 1970 where he is presently the Technical Manager for engines and accessories on Tracker, Otter, Buffalo and Caribou aircraft.

How's your Wx?

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



A. E100⊕15 055/47/38/2310/967/SC3AC5 806

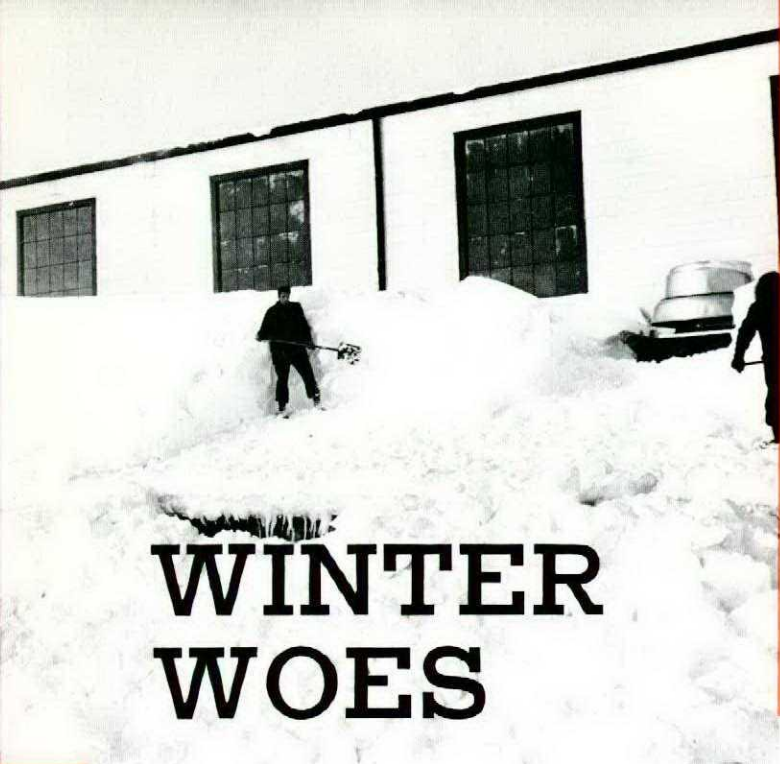
B. P10X1SW- 038/30/27/0613/960/S10 814

C. M13⊕15 027/32/29/3417/955/SC10 322

D. 31⦶M38⊕15+ 049/46/35/1810/966/SC3SC7 613

E. 10⦶10 033/38/32/3310/958/SC4 324

Answers on page 24



WINTER WOES

(an annual feature - No. 5 in the series)

Hazards associated with winter operations brought winter woes to many last year - more than double the previous winter's incidents in one of the categories shown in the table. This increase appears to be attributable to the severe winter conditions which were responsible for all-time record snow accumulation in some parts of the country. Many of the occurrences had a familiar ring, having repeatedly trapped the unwary in winters past. A bright spot was the fact that for the second year in a row there were no fatalities attributable to whiteout or pressing-on into snow showers or to any winter operating conditions.

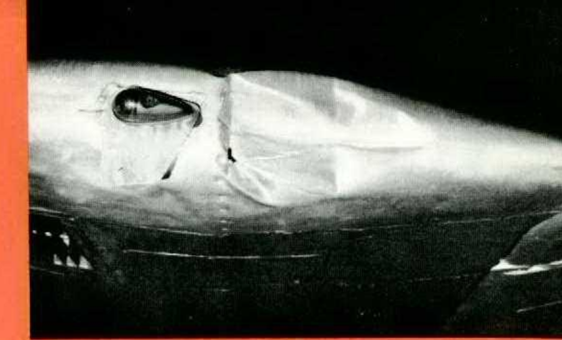
Last winter's record shows that...

- White coloured aircraft can melt into the background on snow-covered airfields. A Hercules crew can attest to this; they narrowly avoided a collision with a parked white Caribou while taxiing in blowing snow
- Exposure to extreme temperatures combined with hazardous winter conditions can lead to errors in judgement resulting in such occurrences as aircraft being towed into hangar doors and drivers losing control of towing vehicles
- Ice patches on runways and taxiways are a particular hazard when blowing or drifting snow conditions prevail. This was the setting last winter in which one was most likely to find aircraft off in the boondocks
- Personnel continue to take chances by not wearing adequate environmental clothing
- Unmarked snowbanks in the middle of a tarmac are a definite hazard - particularly during a whiteout
- No aircraft damage was attributable to private automobiles
- For the third year in a row Otters avoided thin ice

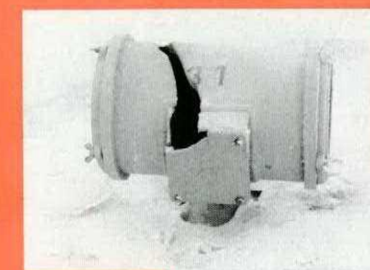
	WINTER INCIDENTS		WINTER ACCIDENTS	
	69-70	70-71	69-70	70-71
SNOW ON INFIELD	3	1	0	1
RESTRICTED VISIBILITY - HEAVY SNOW AND WHITEOUT	1	5	2	0
SNOW/ICE/SLUSH - RUNWAYS TAXIWAYS AND RAMPS	9	12	1	0
ICING - AIRFRAME, ENGINE LANDING GEAR, FLIGHT CONTROLS AND INSTRUMENTS	12	27	1	0

Pilot's failure to correct a swing as he landed in a strong crosswind resulted in his Dakota plowing into the infield and tipping onto its nose when it encountered deep snow.

"Yes Smedley, I know I said we'd do a quick turnaround at Moose Jaw, but..."



Slippery, ice covered tarmac and poor judgement by a towing crew resulted in the Cosmo wing crunching into a hangar door. The aircraft had been pulled out to allow the removal of another aircraft. Apparently the crew felt that since it cleared the doors on the way out, it should clear them on the way back in, an assumption that has embarrassed many towing crews in the past - during all seasons.

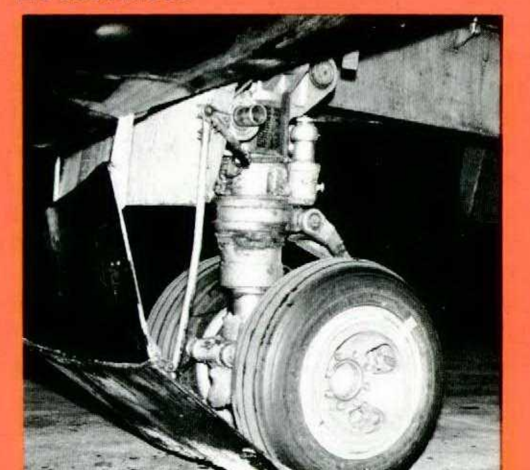


Winter fog, a frequent hazard at this overseas base, obscured the runway and contributed to a 4000-foot excursion through the toolies for a Yukon crew before they regained the runway during an after-landing roll.

Snow ceiling, poor visibility and darkness spelled embarrassment for a T33 pilot heading out to do a weather check. The trip was unexpectedly cut short when the unplowed taxiway became obscured and he taxied off into the infield.

Sixty yards short of the runway threshold the aircraft struck a 38" snowbank which caused the nose to pitch down, severing the nosewheel. Record heavy snow falls had overtaxed the snow removal equipment so that the normal approach references, including a number of threshold lights, were not available.

Accumulation of snow and ice on an Argus radome door assembly during take-off contributed to an unusually tight door fit when the gear was retracted. This was compounded by a materiel failure and resulted in one end of the door dropping to the ground where it was run over by the nosewheel.



It has long since been established that incautious mule drivers and slippery tarmacs make a poor blend. Damage to a Dakota elevator was one consequence of this combination last winter.

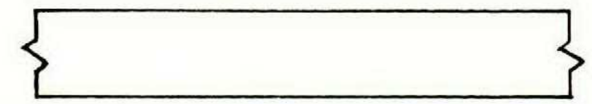
Windshield Design Development

Adapted from an article by Editor, Charles Gooch in Orion Service Digest

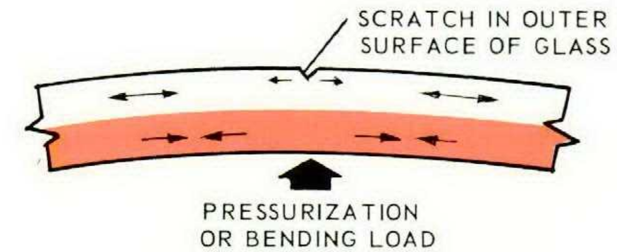
GLASS, BECAUSE OF its many desirable properties, has probably been the material most commonly used in aircraft windshield construction since the advent of cockpit and cabin pressurization. Its optical superiority over the various transparent plastic materials, combined with higher structural strength, greater resistance to weathering and aging, and chemical stability, makes it the logical choice of material for windshields where optimum visibility is required. The almost universal use of windshield wipers on large aircraft makes glass even more desirable as windshield material because its extreme hardness results in resistance to scratches and abrasion.

However, glass is extremely brittle. It has a relatively low strength-to-weight ratio when utilized for purposes such as window panels, and accurately contoured panels are costly and difficult to produce. For some time, glass was available only in the annealed state. In this form, panels of sufficient thickness to withstand the aerodynamic and cabin pressurization loads imposed on aircraft windshields were prohibitively heavy. Because of these and other characteristics, the use of glass on aircraft has generally been limited to only those applications where optical quality is of first importance. The development of tempering processes which permitted substantial reductions in thickness without reductions in strength and weight finally made the use of this material more practicable.

The brittleness of glass makes it extremely sensitive to surface, edge, or corner damage such as scratches or nicks; even microscopic flaws can act as stress risers and reduce the effective strength of an annealed glass pane considerable. (See Figure 1) This characteristic is a much lesser problem when glass is in the tempered form. In the thermal-tempering process annealed glass is heated to near the "forming" temperature (1000° to 1300°F), then suddenly chilled with a blast of cold air so that the surfaces of the glass are "set" before the inner core cools and hardens. Because of this differential in cooling rates, compression forces are set up in the surfaces while tension forces are set up in the inner core as shown in Figure 2A. Thus, under normal shear or bending loads compression forces in the surface layers of a tempered glass panel must be overcome before the critical tension loads of the inner core are reached (see Figure 2B). In particular, this means that surface scratches or cracks on a sheet of tempered glass do not tend to propagate either inward beyond the surface compression layer or along the surface layer. On the other hand, deep scratches or other damage that extend through the surface compression layer can cause immediate failure of the tempered glass sheet.

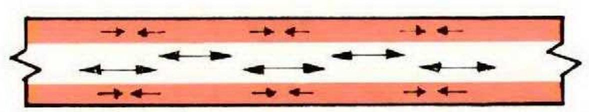


A SECTION OF NORMAL PLATE GLASS UNDER STATIC CONDITIONS. NO LOAD AND NO STRESS.

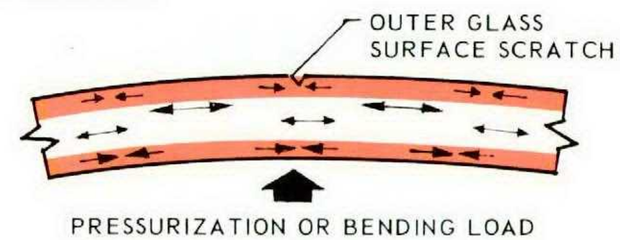


B SECTION OF NORMAL PLATE GLASS SUBJECTED TO STRESSES CAUSED BY PRESSURIZATION OR BENDING LOAD. LOAD PLACES OUTER SIDE OF GLASS IN TENSION AND INNER SIDE OF GLASS IN COMPRESSION. SCRATCH, ACTING AS STRESS RISER IN SURFACE OF GLASS UNDER TENSION, IS LIKELY TO PROPAGATE AND CAUSE FAILURE OF GLASS.

Figure 1. Sections through an Annealed Glass Pane



A SECTION OF TEMPERED GLASS UNDER STATIC CONDITIONS. GLASS SURFACE LAYERS ARE IN COMPRESSION BALANCED BY TENSION STRESSES IN THE CORE.



B SECTION OF TEMPERED GLASS SUBJECTED TO STRESSES CAUSED BY PRESSURIZATION OR BENDING LOAD. APPLICATION OF LOAD VARIES THE INHERENT STRESSES OF THE TEMPERED GLASS (INDICATED BY THE SIZE OF THE ARROWS). A SCRATCH WHICH HAS NOT PENETRATED THE SURFACE COMPRESSION LAYER IS NOT LIKELY TO PROPAGATE, AS LONG AS THE BENDING LOAD TENSION STRESSES AT THE OUTER SURFACE OF THE GLASS DO NOT OVERCOME THE INHERENT COMPRESSION STRESSES.

Figure 2. Sections through a Tempered Glass Pane

The degree to which a glass pane can be thermally tempered depends upon its thickness. Glass 1/4-inch or more thick can be fully tempered to a flexure strength (modulus of rupture) in the range from 25,000 to 30,000 psi. Glass less than 1/4-inch thick can not be tempered to such a degree, therefore 3/16-inch glass is normally semitempered to a flexure strength of 18,000 to 21,000 psi, and 1/8-inch glass can only be slightly tempered to 12,000 to 14,000 psi. The flexure strength of an annealed glass pane ranges from 4,000 to 8,000 psi.

A chemical process can also be used to temper certain types of glass. During this process the glass pane is immersed in a molten salt bath which causes a chemical change in its surface composition. The chemical change sets up compression forces in the surface layers of the glass, thereby imparting a certain degree (depending upon the formula of the salt bath) of temper to the pane. Presently, there is only limited use of chemically-tempered glass in the aircraft industry.

Laminated glass panels were developed to impart shatterproof characteristics to the glass. Such panels are produced by laminating a ply consisting of several 0.025-inch thick clear polyvinyl butyral plastic sheets between plies of preformed and pretempered glass as shown in Figure 3. The vinyl and glass plies are then bonded by application of pressure and heat; the temperature, below the bubbling temperature of the vinyl, is considerably less than that required for tempering the glass. Because vinyl has a natural affinity for glass, the bond is effected without the use of cement.

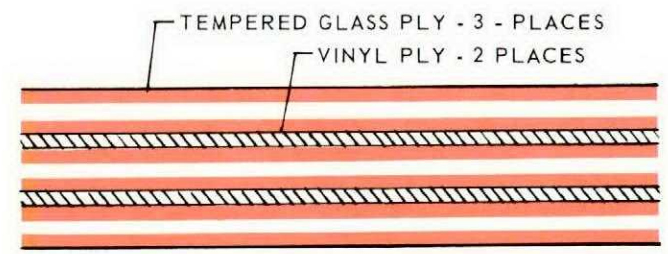


Figure 3. Section through a Laminated Glass Panel

WINDSHIELD EVOLUTION The development of laminated panels of tempered glass and a vinyl plastic material was the starting point in the evolution of the present day electrically-heated, impact-resistant windshield. The windshield shown in Figure 4A was representative of designs that immediately followed World War II. With the exception of sliding "clear vision" windows, these panels were made up of three plies of 1/8-inch tempered and polished plate glass, laminated with two thin plies of vinyl (plyvinyl butyral). The sliding panels consisted of two plies of 3/16-inch tempered glass separated by a single thin ply of vinyl (see Figure 4B). All the windshield panels were clamped to the windshield frame from the inside with retaining strips. From the maintenance viewpoint, this method provided a comparatively trouble-free installation with adequate reserves in structural strength. Nevertheless, it offered little protection against midair collisions with birds. To put it into technical jargon, this windshield installation was not designed to be "birdproof."

Early birdproof windshield panels were similar to the example shown in Figure 4C. They were much thicker overall than previous designs due primarily to a 3/8-inch thick center ply of vinyl sandwiched between 3/16-inch thick outer and 1/4-inch thick inner tempered glass plies. The resistance of the panel to bird strike impacts great enough to shatter both glass plies (see Figure 5) was derived from the ability of the vinyl ply to absorb the shock load by stretching and deforming. To ensure this resistance, it was essential that the vinyl be held around the edges with more security than the clamping action of previous designs provided. Therefore, the vinyl ply was bolted directly to the aircraft structure. To further refine the design and provide even more installation security, an aluminum insert was imbedded in the vinyl around the periphery of the panel and an aluminum spacer was installed in each bolt hole (see Figure 4C). This construction prevented deformation of the vinyl ply at the panel edges during installation and under pressurization loads.

Development of the early birdproof panels was followed by development of a panel which could be electrically heated by means of resistance wires about 0.001-inch in diameter imbedded between the outer glass ply and the vinyl center ply. These wires were connected to bus bars of very thin silver frit imbedded between the plies near the top and bottom edges of the panel. These heated panels were the forerunners of electrically-heated panels which were adopted later for commercial transports and patrol aircraft.

NESA and Electrapane Panels Heated panels of improved design feature, as a heating element, a transparent conductive coating of stannic oxide on the inside surface of the outer glass ply instead of resistance wires. This conductive coating, about 20 millionths of an inch thick, is called "NESA", while similar panels manufactured later by a different company are known by the trade name "ELECTRAPANE". This approach to anti-icing has proved to be more successful than the wire-heating method.

There is an interesting sidelight to the development of the original panel with a conductive coating. The trade name NESA is actually an acronym for "Non Electro-Static formulation A". This term may seem even more obscure than the trade name until we delve a little further into history. Prior to World War II, aircraft speeds and operating altitudes had increased to the point where the buildup of static electricity in the windshield panels was becoming a problem. The original NESA panel with a conductive coating and a connection to ground was designed to meet this contingency. Some commercial airplanes used this device at that time, and later it was fitted to several wartime military aircraft. Use of the same transparent coating as a heating element was a subsequent development and nowadays all electrically-heated panels still provide this means for windshield static discharge.

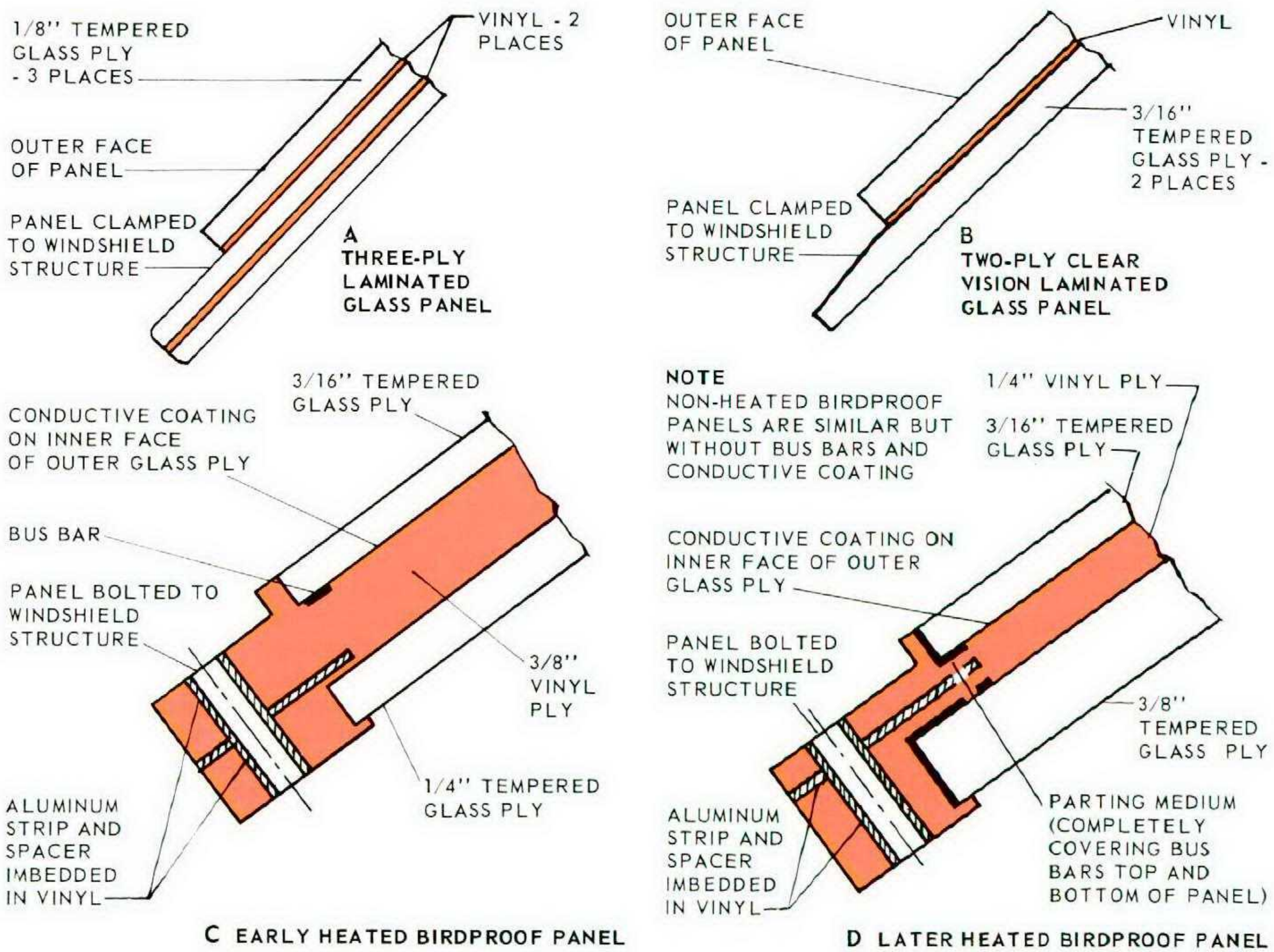


Figure 4. Sections through Windshield Panels of Earlier Design

Later Developments Improved aircraft performance, in terms of higher speed and altitude, required parallel improvements in windshield design. The greater pressure differentials encountered at higher altitudes, and the need for panels of greater area, dictated the need for increased structural strength. Figure 4D shows that in the next evolutionary step, the thickness of the inner glass ply (the principal load-carrying member) was increased while thickness of the vinyl ply was reduced correspondingly so that the overall thickness of birdproof windshield panels remained the same.

Laminated glass panels were further strengthened by reinforcing the edges with cotton-phenolic retainers and edging as shown in Figure 6. Primarily, these reinforcements improve transfer of pressurization and bird-impact loads from the panel to the aircraft structure. In addition, they act as a "plug" round the panel edge, helping to prevent extrusion of polyvinyl butyral birdproof ply material during panel installation and to prevent flow of this material from the edge of the panel assembly during its service life. The insulating qualities of these cotton-phenolic reinforcements also tend to minimize heat transfer between the panel and the aircraft structure.

Another design refinement on electrically-heated panels incorporated a parting medium around the panel edges between the glass and vinyl plies. The parting medium allows a slight amount of movement between the glass and vinyl plies at a point where the panel is subjected to flexing under pressurization loads. It also relieves high shear stresses which can occur at the edges of the panel at very low temperatures. Use of the parting medium to allow these movements to take place without restraint has been found to be less injurious to the panel than extending the bond to the very edge of the glass plies. The parting medium also completely covers, and therefore protects, the bus bars located at the top and bottom edges of the panel.

Why Electric Anti-Icing? In the preceding chronological discussion on the development of electrically heated windshields this rather obvious question has been purposely avoided. One might well question the advisability of developing a somewhat complicated method of electrical ice prevention for the windshield, when other well-tried methods such as the use of alcohol spray or hot air might accomplish this with less trouble.

Electrical heating of laminated glass windshields provides more than just a desirable anti-icing feature, it also maintains plasticity of the vinyl plies of the panel. The physical properties of the vinyl plies vary considerably with changes in temperature. Considering the range of ambient temperatures that could normally be encountered during a typical patrol mission, the vinyl would be brittle in the lower part of the temperature range and quite plastic in the upper part. Panel temperature is not so critical on most piston-engined aircraft, but it is more or less essential to heat the panels on the faster and larger turbine-powered aircraft to meet birdproofing requirements without restricting aircraft performance.

Since the desired birdproof characteristics (energy-absorbing ability) of a windshield depend to a large degree upon the plasticity of the vinyl, panel temperature is an important factor. The optimum temperature range for maximum energy absorption by the vinyl is between 80°F and 120°F. At lower temperatures birdproof characteristics of the panel decline rapidly and, depending upon the actual configuration, impact resistance can be reduced by 30 percent to 50 percent when panel temperature is still a quite moderate 60°F. Electrical heating has proven to be an effective means of maintaining the temperature of the energy-absorbing vinyl ply within the optimum range.

This is part of a larger and continuing effort to develop better design techniques, materials and processes to improve windshield performance. Progress is constantly being made to increase the effectiveness and performance of military aircraft. ▣

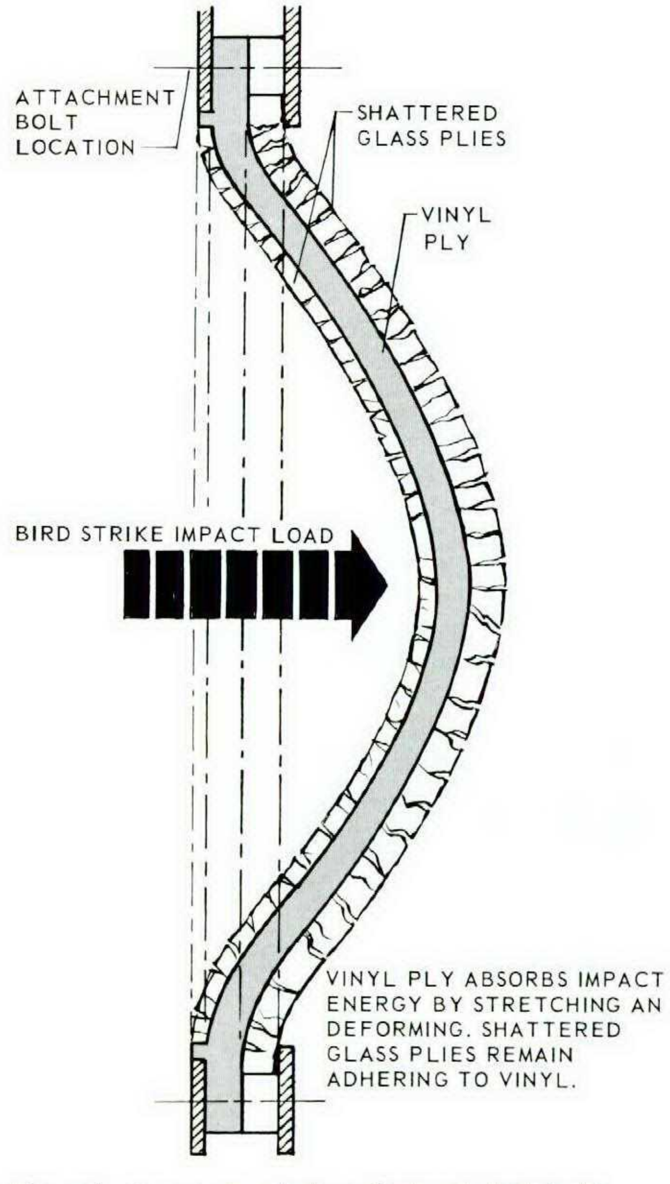


Figure 5. Manner in which a Birdproof Windshield Panel Resists a Bird Strike

for the sake of argument...

Protective helmets for Twin Otter pilots

With the introduction of the Twin Otter into CF operational flying, comes the question of whether or not aircrew should be wearing protective helmets in this aircraft. Several factors lead to the conclusion that they should.

Most important of these is the inadequacy of the windshield in withstanding birdstrikes; it fails to meet the CF criteria which requires that at cruising speed the windshield should be able to withstand a 4-pound bird. The Twin Otter's capability at cruising speed is to resist a 2-pound bird, but even this has not been tested. Related to the capability to withstand birdstrike is the fact that the aircraft will be extensively exposed to birds as a consequence of its assignment to Western and Northwestern Canada - to the areas of the great migration routes. The DFS Birdstrike Prevention Program, and statistics indicate that these are high probability areas for encountering birdstrikes. In Canada during 1970 there were 132 strikes involving CF aircraft, 74 of which occurred on the prairies. About 80% of that total happened below 3000 feet.

In addition to the high exposure to birdstrikes, aircrew will have greater exposure to accident potential stemming from the STOL capabilities which will be exploited in its role.

Pilots also come up against overhead hazards in the cockpit of this aircraft. For example: power levers, prop levers, flap lever and the overhead panel itself. Protective helmets would reduce the hazard created by these in the event of an accident, and would as well, avoid the head injuries encountered by aircrew when entering and leaving the cockpit - a rather common mishap in many aircraft as indicated by previous experience.

Opposing arguments - aside from the belief that the helmet is somewhat out of keeping with a certain image - contend that protective helmets create discomfort after extended periods of use. However, aircrew flying other aircraft in which protective helmets have been introduced, have found that their initial opposition, often based largely on emotion or tradition, gradually gave way in time to a growing measure of acceptance - especially when they were able to obtain a well-fitted helmet.

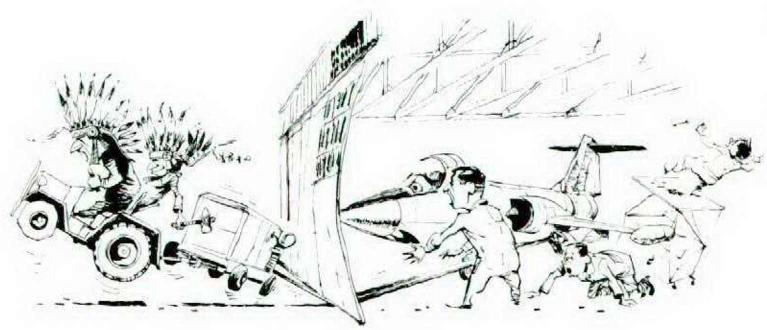
Too many chiefs

The incident message tells it:

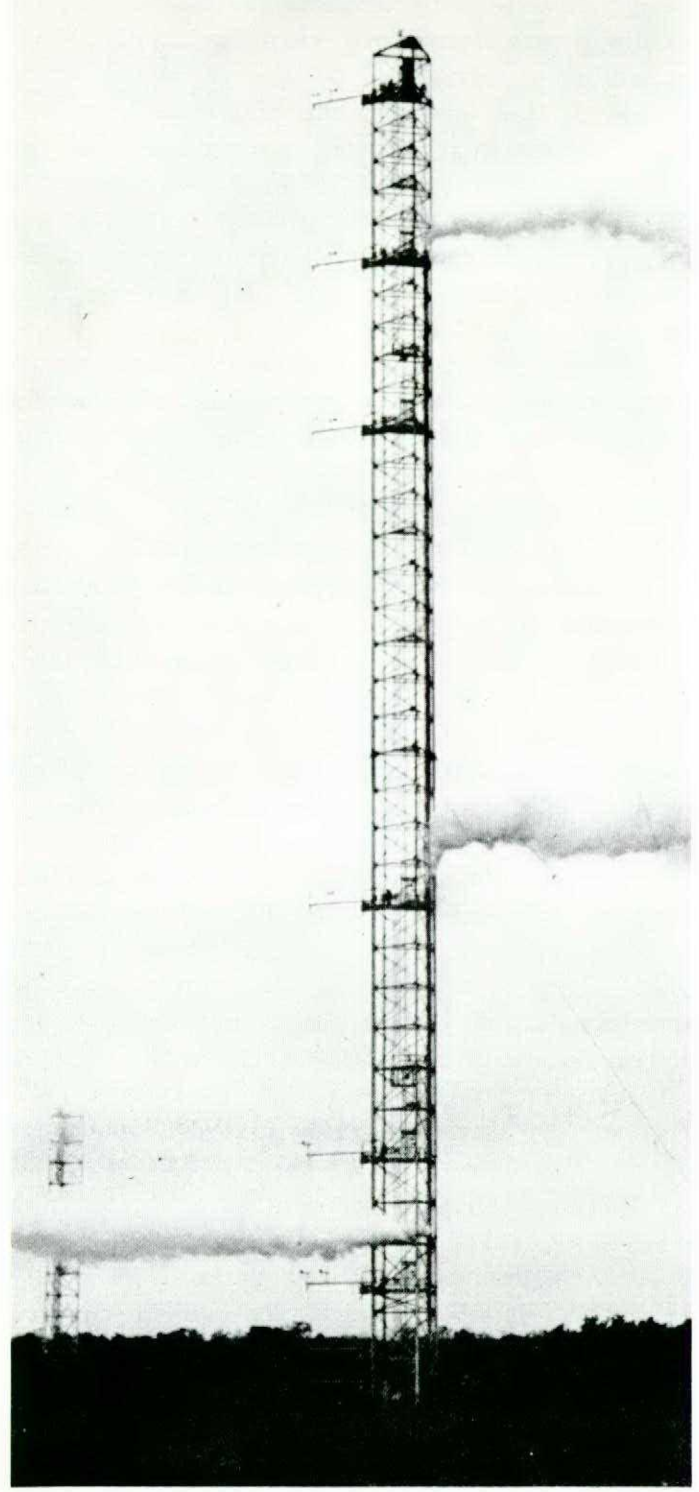
"A TOW CREW WAS SENT TO BRING BACK A HYDRAULIC TEST STAND WHICH HAD BEEN ON LOAN TO ANOTHER SQUADRON. ON ARRIVAL AT THE CLOSED HANGAR, THE MULE DRIVER AND HIS ASSISTANT MISTAKENLY CONCLUDED THAT THE TEST STAND WAS NOT BEING USED AT THE TIME, SINCE IT WAS PARKED OUTSIDE, CLOSE TO THE HANGAR DOORS WHICH APPEARED TO BE CLOSED. IT WAS ONLY AFTER THE MULE WAS CONNECTED TO THE TEST STAND AND AN ATTEMPT MADE TO TOW IT, THAT THE TOWING PERSONNEL REALIZED THAT THE STAND WAS IN FACT STILL CONNECTED TO *SOMETHING*. (The something turned out to be a CF104 which technicians were working on inside the hangar.) REALIZING THIS, THE MULE DRIVER STOPPED INSTANTLY. AT THE SAME TIME SHOUTS WERE HEARD FROM PERSONNEL INSIDE THE HANGAR. THE MULE WAS QUICKLY DISCONNECTED FROM THE TEST STAND TO RELIEVE THE TENSION ON THE HYDRAULIC LINES. DAMAGE TO THE AIRCRAFT WAS MINOR AND CONFINED TO THE LOWER FIN ON THE PORT TIP TANK WHICH CAME INTO CONTACT WITH THE AFT SECTION STAND NEARBY. THE TEST STAND HYDRAULIC PRESSURE LINE QUICK DISCONNECT WAS ALSO DAMAGED.

"INVESTIGATION REVEALED THAT BOTH PERSONNEL DETAILED TO CARRY OUT THE TOWING WERE CREW CHIEFS. THIS FACT MAY AT LEAST PARTLY EXPLAIN THE OVERSIGHT OF THE CONNECTED CABLES, AS EACH TECHNICIAN FELT THAT THIS DETAIL WAS CARRIED OUT BY THE OTHER. IT APPEARS THAT THIS IS JUST ANOTHER CASE OF NOT ESTABLISHING WHO WAS IN CHARGE AND WHO WAS RESPONSIBLE FOR WHAT".

MORAL: TOO MANY CHIEFS!



Wind Shear



This example of an extreme wind shear illustrates the hazard that could be presented to low level air operations or to aircraft in the landing or takeoff phase. Shearing occurs most frequently on clear nights with light winds, and there can be as much as 180° difference in wind direction. The elevations of the smoke emissions on the tower are 40, 150 and 355 feet.

Weatherwise

The Old Camera Through the Canopy Trick

If you are the type who carries loose items in the cockpit and often wonders why everything should be secured or stowed, then read this.

A T38 was number four in a 4-plane formation. The student in the front seat had received permission to take some movies of the flight while the instructor flew from the rear seat. Everything progressed normally, the student completed his photography, the instructor told him to stow the camera and the student was given control of the aircraft to complete the training mission.

Shortly thereafter, the student allowed the aircraft to get out of position. The instructor took control and *abruptly* pushed forward on the control column. You guessed it! The 8 mm camera rose upward from the student's lap, where he had left it unsecured, and crashed through the canopy. Pieces of the canopy and the camera struck the leading edges of both wings and the vertical fin, and entered the right engine intake causing compressor damage and an engine stall.

The instructor brought the aircraft back for a single engine straight-in approach and landed without further difficulty. Aircraft damage, in addition to the canopy, included dents in the leading edges of the wings and the vertical fin, one hole in a wing, and foreign object damage in one engine. Neither pilot experienced injuries or difficulties from the explosive decompression, but they were lucky. Pieces could easily have entered both engines with resultant double engine failure and loss of the aircraft.

The lesson is obvious. Anything carried loosely in the cockpit is a potential hazard, not only during manoeuvring flight similar to the above incident, but at all times. Loose items can become lodged in various places, such as throttle linkages, control columns, and ejection seat mechanisms, just to mention a few. The results are quite often traumatic, to say the least!

USAF FSO Kit

Believe what you see

A C141 was making a GCA under visual conditions. At 600 feet the controller cleared the pilot to land. At the same time the pilot noticed an aircraft on the landing runway and questioned the clearance. The controller confirmed that the C141 was cleared to land. At approximately 350 feet the other aircraft was still on the runway and the pilot again asked if he was cleared to land. Once more the controller responded "affirmative." The skeptical pilot initiated a missed approach at approximately 200 feet. We just coined a little saying that goes like this, "You can't always believe what you hear, but best believe what you see."

MAC FLYER

On the Dials

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

More on Communications Failure

In the past months we have received several questions in response to "On the Dials" articles. We welcome these questions. Although we do not have all the answers, we will attempt to publish the questions and answer them with the applicable references.

A training flight from Greenwood was heading to Ottawa with planned letdowns at various points enroute. The ATC clearance after Fredericton read, "...Quebec City Airport via flight planned route to maintain 8000 feet." Question: "What is the correct procedure to follow in event of communications failure?"

(1) Should an approach be carried out at Quebec City with intention to land?

(2) Should the flight continue to destination?

The answer is (2). The flight should overfly Quebec in accordance with Round Robin procedure (Art 520 2.c.(1) in GPH 204). This regulation states that "if communication failure occurs prior to acknowledgement of approach clearance at an intermediate location, continue flight to destination in accordance with published communications failure procedures." Don't let the fact that you are cleared to an intermediate airport fool you. This has the same connotation as a clearance to an aid serving the airport and it is not intended that an approach should be carried out.

An attempt is being made to amend our procedures. A procedure in use by Winnipeg Centre for the past year has been found to work very satisfactorily. It changes the initial clearance limit from the point of first intended letdown to the final destination, with the advisory remarks to request further clearance enroute. On nearing the facility on which the first intended enroute approach is to be made the pilot is to request ATC clearance for a specific type of approach and missed approach clearance. Should the conditions at the letdown locations be below VFR, or there is no aerodrome suitable for landing, missed approach clearance shall be obtained before commencing descent.

On missed approach the clearance limit will again be the final destination aerodrome with advisory remarks to request further clearance enroute.

This trial procedure has been submitted for change, but for the present the initial clearance limit for Round Robin procedures will continue to be the point of first letdown.

Still another question with similar implications: "you are flying a turbine powered aircraft IFR and you have been cleared to destination at an altitude too low to enable you to complete the flight. While waiting for higher altitude from ATC your communications fail. What action should you take?"

According to communications failure procedure you would fly to your clearance limit and then ten minutes beyond climb to flight planned altitude. Since this is a ridiculous situation, it appears there is no answer. The safe procedure is to refuse the clearance initially and request either your filed altitude, or if necessary a clearance short of destination.

An example of this problem is the situation often faced by T33 pilots after filing FL 350 from Downsview to Winnipeg. The clearance commonly reads "CAF 1234 is cleared Winnipeg airport via FPR maintain FL 250." Since this clearance is unsatisfactory, pilots should simply request FL 350 or a clearance short to Wiarton Vortac or a suitable DME fix, so that they can comply with lost communications procedures if necessary.

NOTE: The reason this altitude is so commonly issued is that ATC Manual of Operation lists FL 250 as an operationally suitable altitude for turbine powered aircraft and 15000 feet for turbo-prop.

Remember, if you don't like a clearance, refuse it. It's easier on the ground than in the air. (Sometimes!).

Time For Some Things

Why is it that, when there isn't time to do the job safely, there is always enough time to take care of the injured, pick up the pieces, patch up the airplane, fix the damaged equipment, investigate what happened, write up the reports and try to explain to the boss why time wasn't saved!

— Coast Guard Air Station Corpus Christi Safety Newsletter

New Faces at DFS

Major Newport joined the RCAF in 1954 and attended the University of Toronto under ROTP. Following wings graduation in 1958, he flew CF100s with 413 Sqn at Bagotville until 1961 when he was posted to the Air Force Headquarters Directorate of Airborne Telecommunications. In 1965 he attended the USN Test Pilot School at Patuxent River Maryland. He then spent four years at 448 Test Sqn at Cold Lake, where he flew the C47, T33, CF100, L19, CF104 and CF5. He attended the Canadian Forces Staff College in 1970 and comes to DFS to head the Education and Analysis section.

Maj Arnold joined the RCN in 1952 and received his wings at Gimli in 1954. Following operational flying school at Lossimouth, Scotland, he flew Sea Furies and F2H3s in VF871 at Shearwater. In 1960 he graduated from the USN Test Pilot School at Patuxent River, Md., and spent the next ten years employed in flying and sea postings, as LCDR FLYING (Bonaventure) and as XO at VX-10. Maj Arnold recently graduated from the Canadian Forces Staff College at Toronto. At DFS he is the investigator responsible for the CX84, Tracker and Sea King.

Maj Mills joined the RCAF in 1951. On his first tour he flew F86s with 441 Sqn at North Luffenham, England, and Marville, France. He returned to Canada in 1956 as a T33 instructor at 2 AFS Portage La Prairie. In 1959 he joined the RU at Edmonton and in 1962 he was transferred to 6 ST/R OTU at Cold Lake. Following an instructional tour on CF104s at Cold Lake, he was transferred to 430 Sqn, Zweibrucken, Germany. In 1967 he returned to Cold Lake and joined 434 Sqn, the CF5 Operational Training Unit. In Jan 1970 he attended the Flight Safety Officers Course at USC, Los Angeles, following which he was named BFSO at Cold Lake. Maj Mills is the CF5 investigator at DFS.

Major Loubser received his wings in the South African Air Force, and in 1956 joined the RCAF. After completing the T33 AFS, he spent a tour flying the CF100 at 416 Sqn, St. Hubert, from where he went to CEPE, Uplands. In 1962 he attended the USAF Test Pilots School at Edwards AFB and returned to spend two years at Canadair as a CF104 acceptance test pilot. He was then posted to Zweibrucken where for the next three years he was the CF104 Wing Maintenance test pilot. This was followed by a posting back to CEPE, the first year of which he was acceptance test pilot at Scottish Aviation in Prestwick. Maj Loubser was the Test and Acceptance Standards Officer at AETE, Uplands, for three years prior to coming to DFS as CF104 investigator.

Major Hincke joined the RCAF in 1952 at Vancouver. After wings graduation at Gimli, he trained at the Twin Engine AFS at Saskatoon and the Maritime OTU at Greenwood and was subsequently transferred to 407 Sqn in Dec 53. From 1956 to 1958 he was a Harvard flying instructor at RCAF Station, Penhold. This was followed by the USAF Weapons Controller Course and Fighter Controller duties at Mont Apica, Quebec and Kamloops B.C. He resumed flying in 1964 with 415 Sqn Summerside PEI and in 1967 was transferred to Greenwood as an instructor at the Argus Conversion Unit. He was Chief Instructor for Pilots and Engineers at 449 Sqn before coming to DFS as the investigator responsible for the Argus, 707, Buffalo and Dakota.

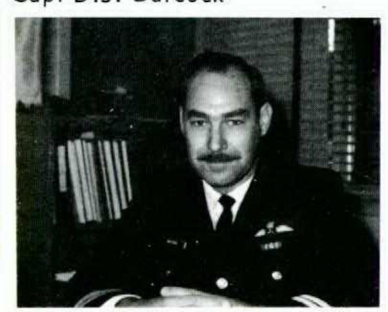
Captain Batcock enrolled in the RCAF in September 1948 and graduated from the RCAF Trade Training School as an Aero Engine Mechanic the following year. He was posted to 408 (P) Sqn, Rockcliffe, where he served as a Flight Engineer until August of 1954. He then spent three years with 412 Squadron followed by a tour with 137 (T) Flight at Langar, England. Upon his return to Canada he became an instructor at the Introductory Trade Training School at Camp Borden. Captain Batcock was commissioned from the Ranks in April 1964, completed the RCAF Tech/AE course at the Central Officers School Centralia, and Subsequently was transferred to 1 FTS, Gimli where he worked in all sections of the Aircraft Maintenance Organization. Captain Batcock was the Deputy Aircraft Project Officer for Argus Aircraft at CFHQ/CTS/DAM prior to his present job at DFS as engineering investigator for heavy aircraft.

Maj O.C. Newport

Maj J.M. Arnold

Maj A.C. Hincke

Capt D.J. Batcock



Maj C.P. Loubser

Maj D.D. Mills

Gen from Two-Ten

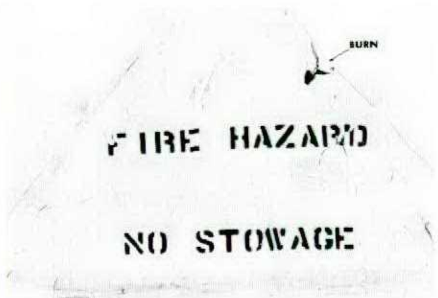
VOODOO, RED HERRING During a low level beam attack, the crew noticed that the engines seemed slightly noisy. The noise gradually increased and, despite a throttle reduction to clear a possible compressor stall, the noise increased to the same level upon returning to full military power. The aircraft was headed for the nearest base and, while all cockpit indications were normal, the crew eventually found that the noise would diminish if power was reduced on the left engine.

The pilot made a straight-in approach and landing. The left engine shut-down proceeded normally and during the subsequent investigation, no source for the unusual noise could be established. The left engine was ground run and eventually declared serviceable for ferry flight to home base.

During the ferry flight, the fire control system overheat light came on, and the system had to be shut down. Subsequent inspection revealed that the equipment cooling turbine - which draws some of its bleed air from the left engine - was severely damaged internally and had seized. Its impending failure had been announced by the earlier engine noise, but the failure had not been detected during desnagging since it was probably seized solid prior to the ground run.

There is a moral to this story: Ensure that all associated systems are cleared before declaring a snag to be "ground checked serviceable". Sometimes those "fishy" symptoms turn out to be a red herring.

T33, BURNING FIRE HAZARD SIGN As the pilot was strapping in, a technician waiting by the energizer to provide power for the start noticed smoke curling up from the back of cockpit. When he went to investigate he found the "Fire Hazard No Stowing" decal was burning. He quickly informed the pilot and removed the smoking decal.

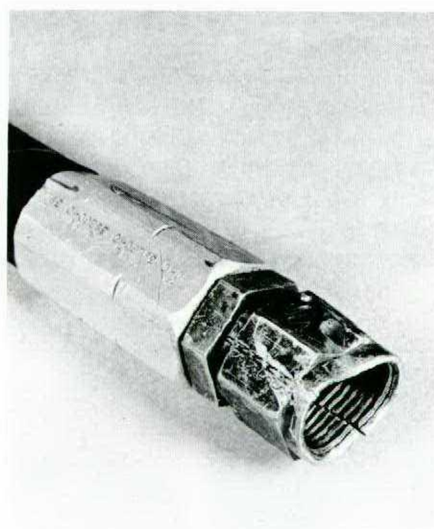


The incident led to an inspection of transient and local aircraft which showed that the warning signs in other T33s were either correctly stencilled directly on the front-facing panel immediately behind the rear seat or that a triangular decal had been used to simplify the task. The material used for the decal was highly combustible. Units have again been advised that the decal should be stencilled directly on to the front-facing panel using fire-resistant paint.

There have been numerous occasions in the past where a concentration of the sun's rays by the T33 canopy has ventilated someone's blue flat hat, but to our knowledge, scorching a "fire hazard" sign is a first.

VOODOO, WHIRLING DIVERSION HOSE During the course of clearing an internal air leak snag in an engine starter air valve, a mechanic at a civilian contractor disconnected the distribution hoses from the keel tee and elbow fittings and capped off the tee. He then attached a hose to the elbow fitting and wired the free end to the keel structure so that the blast of air from the starter would be directed down at the hangar floor instead of into the engine doors.

After warning personnel in the area and having received the "all-clear", he momentarily energized the internal airstart valve. The ensuing blast of air proved too much for the wire lashing. The end of the diverting hose broke free and flailed around inside the left engine bay, damaging the aircraft and the left engine.



hose nozzle

In the aftermath of this mishap, the use of diverting hose has been prohibited.

damaged airframe

VOODOO, FUEL SPILL A technician was conducting a familiarization inspection for a group of technicians taking the Voodoo Armament Course. For his briefing the instructor selected an aircraft which was in storage in the hangar awaiting stabilator repair. No work had been done on the Voodoo since three days previously when the left engine had been removed and the right engine had been disconnected. At one point, while describing the operation of various components, the instructor selected the battery switch "on" and "off" to check the functioning of the battery. When he did so 635 gallons of fuel were pumped onto the hangar floor.

Fortunately, experienced people were on hand and the situation was brought quickly under control. The prompt arrival of the Fire Fighters resulted in the fuel quickly being isolated by the use of foam.

The subsequent inquiry uncovered a combination of circumstances which finally led to the incident:

- The instructor had not obtained authority for the activities he wished to perform on the aircraft and he wasn't fully aware of the possible results of turning on the battery switch.
- Maintenance crews had not capped the open engine fuel lines after one was removed and the other disconnected, nor had they placarded the battery switch, both of which are required by the EO.
- Unknown persons had incorrectly left the throttles in the "open" position and the engine master switches "on". With the engine master switches "on", the momentary application of DC electrical power was sufficient to open both engine fuel shut-off valves and the fuel was pumped overboard through the uncapped engine fuel supply lines.

T33, INADVERTENT CANOPY JETTISON The student levelled his aircraft at 20,000 feet after a night instrument departure. As he began a right turn something caught his eye which gave him the impression that the canopy was unlocked. He immediately reached to lock it, but in the haste of his reaction he moved the handle full forward - *unlocking it!* The canopy immediately departed, exposing the student to explosive decompression, windblast and cockpit dust.

With his eyes stinging from the dust, the student lowered his visor, throttled back to idle, selected speed brakes and reduced his airspeed to 180K. Next he lowered the seat and declared an emergency. Radar vectors brought him to final approach from which he landed safely.

The investigation initially centred on the canopy warning light, however since the student could not recall seeing the light (it would unlikely be missed at night) this aspect was discounted. Human factors eventually came under scrutiny and it was found that the student's concern over personal problems, and a lack of sleep the previous night brought on by these problems, was the most probable cause of his momentary mental distraction.

Subsequent to this mishap all personnel were briefed on the involvement of human factors in aircraft accidents:

- Instructors and supervisors were advised to be on the watch for signs indicating that an individual may not be mentally prepared for flying.
- Students were reminded of the importance of telling their instructor when personal problems are overtaking them.
- Emphasis was placed on ensuring that correct selections are made for all cockpit functions.

ARGUS, MURPHIED LETDOWN HOLDER As the co-pilot was checking the movement of the flight controls prior to takeoff, the yoke on his side caught in the power cable to the letdown holder. The power cable had been routed incorrectly between the holder and the switch bracket, permitting a loop to form which snagged the co-pilot's yoke.

Correct cable routing for co-pilot's letdown holder - cable behind switch bracket.

Incorrect cable routing (in front of the switch bracket) resulted in yoke entanglement.

Comments to the editor

Flashlight Owner Found

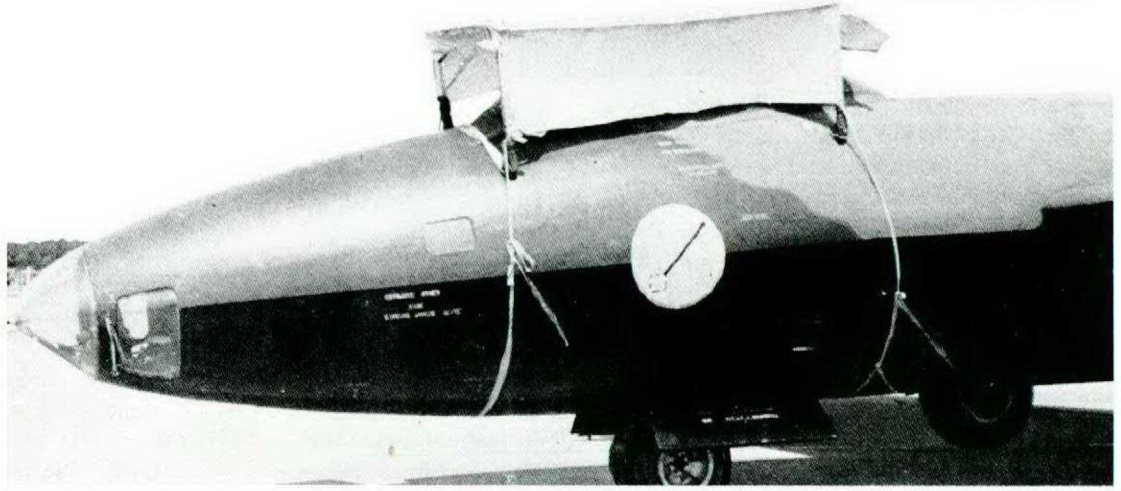
In answer to your BONK! in the Jul-Aug issue, the owner of the flashlight was found the following day. He had the integrity to come forward to claim his flashlight along with its due reward. Readers should realize that the air incident message was sent off prior to any investigation and the following day when the applicable maintenance crew were informed of the flashlight incident the owner immediately realized it was his and accepted his responsibilities.

Recently at CFB Portage la Prairie we have instituted a tool board control system - if the tool board is not complete at the end of job, the technicians do not go home until the lost item is accounted for.

Warrant Officer K. Beckman
CFB Portage La Prairie

"Roger Tower, understood, I'll return to the dispersal..."

RNethAF Veilig Vliegen



Tight Squeeze

The two-ship flight went beautifully - up until takeoff.

Lead took the active and lined up on the right-hand side of the runway, Two close behind and tucked in good and tight. Run-up was normal, all instruments checked good, and Lead turned to his left, got an "okay" signal from his wingman and gave the "GO" signal with a firm nod of his head.

Unfortunately, Lead's brakes didn't release. Two's did, though. CRUNCH!

And on a 150-foot-wide runway....if it's possible, someone will find a way.

AEROSPACE SAFETY

Answers to Wx Quiz

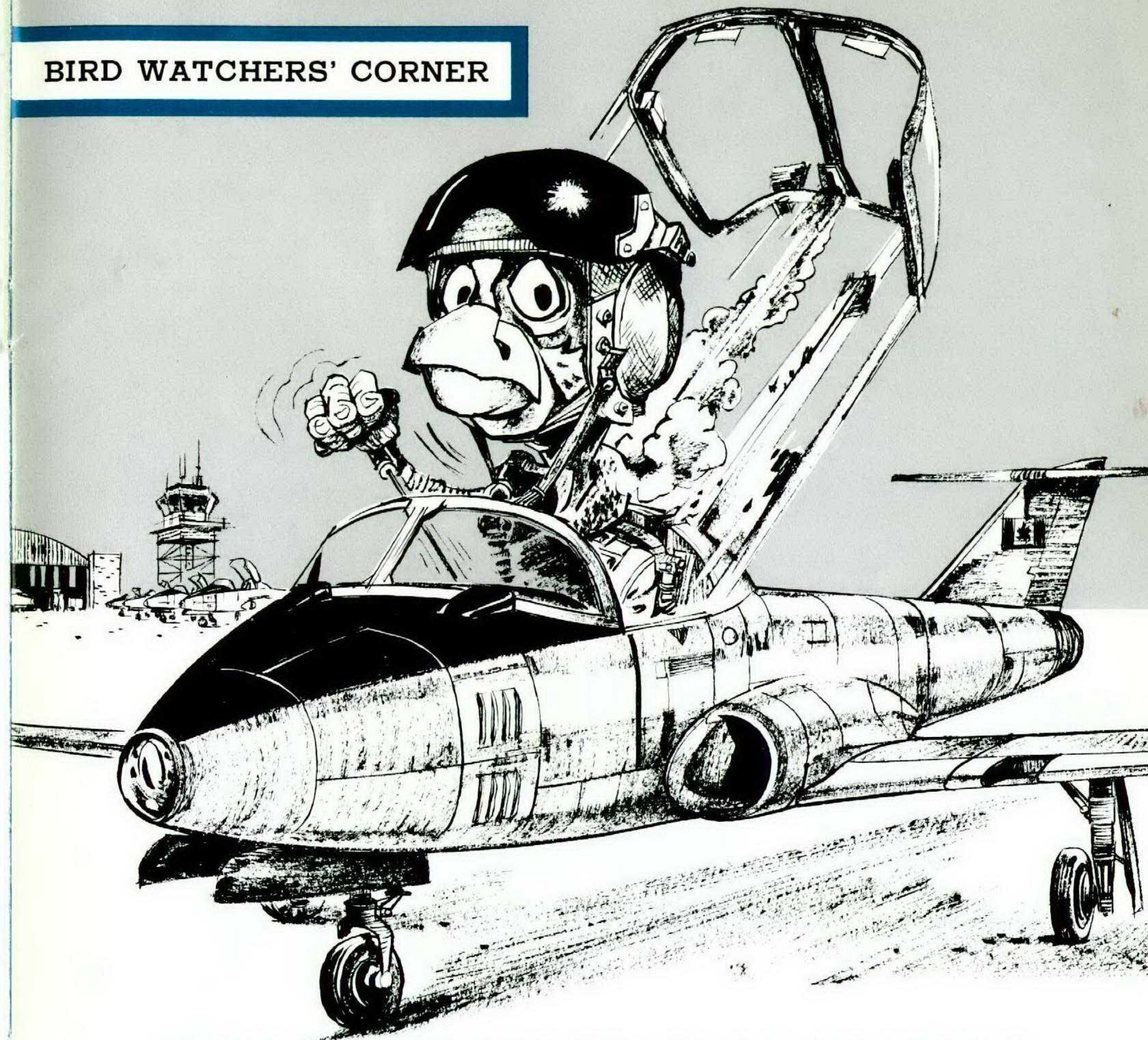
A-YZ B-BG C-VO D-UL E-YB

a shot in the dark?

Do the SOPs in your squadron lay down realistic regulations governing the wearing of winter flying clothing? Last winter a pilot bailed out wearing only a summer flying suit. During the ejection he sustained deep facial cuts and when rescued - fortunately within an hour - he was suffering from shock and amnesia. What would have been the outcome had he been forced to spend that night in the bush where the temperature dropped to +10 degrees F?

The squadron has since changed its orders. Previously, 0° F was the temperature below which aircrew were required to wear winter flying suits.

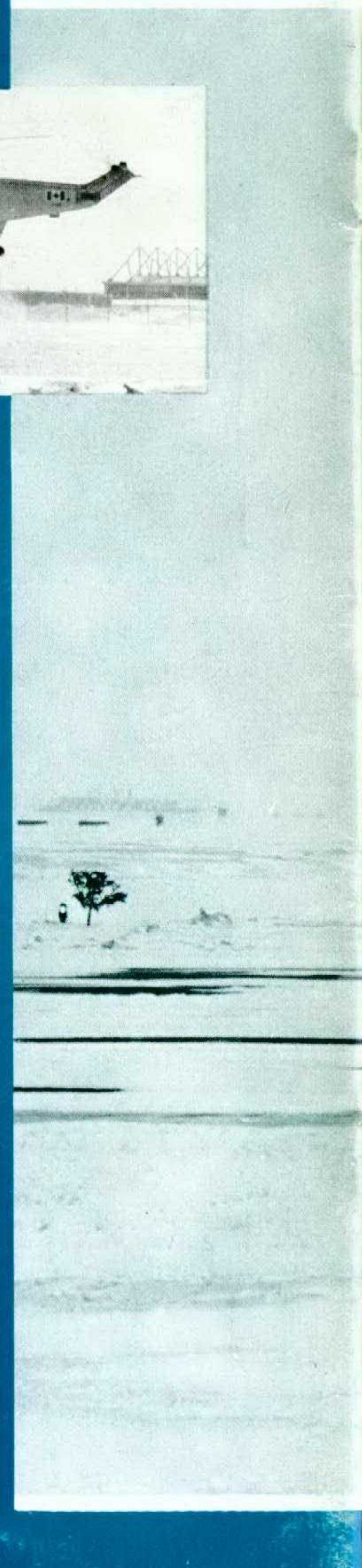
BIRD WATCHERS' CORNER



FICKLE-FINGERED FLAP FLIPPER

The malady afflicting this scarlet-faced curiosity of birdland is finger trouble. Like his near relative, the Far-away Fluster, his problem stems from a mind that can best the described as—elsewhere! Consequently he is given to impulsive cockpit selections—not thinking until after the damage has been done. When airborne, these result in distinctive antics, creating a birdwatchers' wonder as the Flap Flipper makes the scene with absent-minded gear lowerings and flap selections—all at high speed, which accounts for his recurrent groundings to repair oversped feet and bent feathers. Another curious airborne routine of this avian oddity reminds ornithologists, of the venerable Red Baron, as old Flipper wings into the nest with hair and apparel flapping in the breeze—the embarrassing result of an unplanned canopy jettison. On the ground he is often observed perched idly at the controls, just prior to inadvertently firing the canopy—in the act of setting the parking brakes, or raising the gear—instead of the flaps. At this point—if you listen close—you'll hear his characteristic call:

THERE'S NOTHING I CAN SAY MY MIND WAS FAR AWAY

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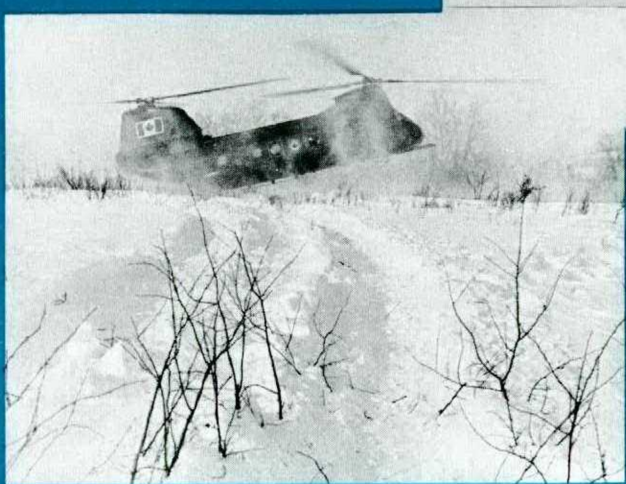

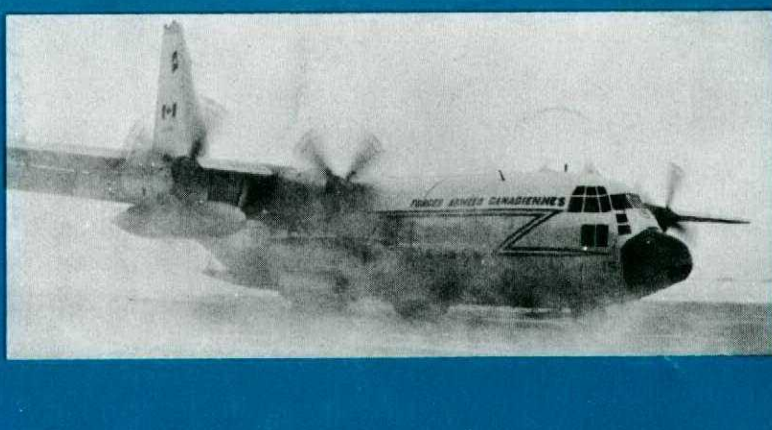
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