FLIGHT COMMENT
MARCH · APRIL · 1967

SAFETY EQUIPMENT
you ask... we answer

Comments

The J79 jet engine would almost certainly have failed on the next flight – yet no apparent unserviceability existed. A $4.00 test saved us a 104. Spectrographic oil analysis had revealed iron particles in the lubricant; this led to the engine being returned to contractor for tearing down. Those iron particles had come from loose bolts in the transfer gear box. There was metal fretting, and evidence of imminent gear box failure. In the May-Jun issue we'll be publishing a full examination of this new tool in combating aircraft accidents – the spectrographic oil analysis program – SOAP.

To date, close to 150 Good Show scrolls have been distributed. This represents over six years of awards. As we proceeded into the fifties we found it increasingly difficult to locate persons, so we called a temporary halt. However, we will be pleased to send scrolls to those who received their award before 1960; just write to:

CFHQ Directorate of Flight Safety
270 Carling Ave, Ottawa
Attn: Editor, Flight Comment

Our Good Show story "Big Day at Borden, Sask" could have left in the reader's mind an impression that the flight engineer, Sgt LV Wood, was personally remiss in having been "... a concern to his crewmates at a time when their services were needed elsewhere". Our only defence is that our account of this accident reflected remarks made in the documents from which the story was extracted. The fact was that Sgt Wood's physical activity in responding to the emergency most likely caused his early lapse into unconsciousness. More authentic than our observations is the captain's remark that the article created... "an unwarranted impression that Sgt Wood neglected to observe basic principles... that aggravated an already pregnant situation..." Our apologies, Sgt Wood; we couldn't agree more with F/L Moore's understandable dissatisfaction.

Since Non-Destructive Testing (NDT) was introduced, we have lacked a common standard of training for technicians in the field who employ Magnetic Particle Inspection and Dye Penetrant Inspection techniques. Many technicians have little formal training and have acquired their skills mainly on the job. This is undesirable – and dangerous. Courses in NDT methods will train sufficient numbers so that accredited technicians will be available to carry out and sign for NDT work on aircraft. Later, if plans pan out, detachments of trained and well-equipped technicians will perform the more sophisticated methods of NDT such as radiography ultrasonics and eddy currents. Several NDT centres will be established to carry out projects beyond unit capabilities.

CANADIAN FORCES HEADQUARTERS — DIRECTORATE OF FLIGHT SAFETY

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ACCIDENT INVESTIGATION

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ROGER DUHAMEL, F.R.S.C.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA, 1967

THE NON–ACCIDENT

In 1965 we revised our technique for assigning causes of accidents and incidents. Rather than having primary and secondary causes, we now regard any contributing factor as having shared in creating the accident or incident. The thinking behind this new technique was:

- If the removal of any circumstance or condition would have resulted in the accident or incident ***not*** occurring, then it must be tagged as a direct cause – no matter how "secondary" it may appear to be.

(Our statistics have already spotlighted supervision as a surprisingly common cause factor.) You will note that central to this thinking is the concept of the non-accident which is, after all, the goal of flight safety.

This may appear to be just toying with words. But why, for instance, are we all capable of comprehending an accident whereas the subtleties of "the safe operation" often elude us? The reason for this is that safety is essentially the non-existence of something. An accident prevention programme is destined to exist in this negative atmosphere. This is why prevention programs are tough to devise and maintain. The successful FOD campaign, for example, is aimed at producing what? – nothing! Too often, enthusiastic and vigorous support for preventive action ***follows*** an accident which persons with insight and a pessimistic bent had long foreseen. Here, "closing the barn door..." comes to mind.

In this issue we announce a project we have strongly supported for some time – the skiddometer – a device aimed at producing the non-accident. Being on the scene with safety devices and measures ***before*** the accident is the most gratifying aspect of our work – and the most productive. As aviation increases in complexity, expense and rapidity of change, we will be compelled to rely less on the wisdom of hindsight and lend more energy to a forward-looking philosophy of the non-accident.

G/C AB SEARLE
DIRECTOR OF FLIGHT SAFETY

SAFETY EQUIPMENT you ask... we answer

Why does the DH41-2 helmet (one piece, jet) sit high on the forehead when correctly positioned over the ears and is loose on either side of the head permitting noise interference?

Complete instructions for fitting helmets and all necessary adjustments are in the manufacturer's instructions that accompany each issue of a new helmet. In every case of complaint about discomfort, an IAM helmet specialist has been able to achieve a satisfactory fit.

Why do some bases have foam-type helmet earseals which other bases are denied?

During winter operational testing of the DH41-2 helmet, liquid-filled earseals were found extremely uncomfortable and even caused mild cases of frostburn to the ears. By replacing the liquid-filled with a foam-rubber type, the comfort factor was improved. However, rubber-filled earseals have been approved for winter use of jet aircrew in Canada only; European weather conditions do not warrant their use. Tests showed the liquid-filled earseals to be much more efficient sound attenuators – the reason why earseals are in the helmet.

If one type of boot cannot meet both winter and summer requirements, why not one type for summer and another for winter?

We do have one type for summer, (boot, warm weather, flying) and another for winter (boot, black felt). During inclement weather, or in severe winter ground conditions, both may be worn with an overboot (overboot, flying, rubber). These boots are made on identical forms; the overboots must be one-half size larger for comfort and correct fit.

What is the thinking behind the testing of a tropical flying coverall? Will this be considered for summer flying in Canada?

The former concept of expecting two flying suits (a winter and summer type) to meet a temperature range of -40° to +100° or more, is obviously unsound – even for Canadian conditions. Canadian aircrew are now regularly in the Carribean, Mediterranean, North and East African areas. A highly air-permeable, fire-resistant synthetic material, alone and blended with other fibres with similar properties, will be assessed and compared during trials in the tropics. Such fabrics can best be demonstrated and assessed under tropical conditions. If these trials prove that heat stress can be reduced by these fabrics, they will be recommended for summer use in Canada as a third flying suit.

Couldn't some form of permanent visor cover be devised which would give way under detrimental airloads?

A permanent visor cover, such as in the helicopter aircrew helmet, (Type 411) will not withstand the massive airloads experienced in highspeed bailout from jet aircraft. One demonstration witnessed in the US resulted in the complete destruction of the helmet in windblast and was caused by the visor cover. A simple visor cover made from stretch fabric, to the design illustrated in EO 55-5B-2 can easily be fashioned on the base. Experience has shown that any permanent appendage introduces undesireable complications. Since covers are not required in flight, they can be safely stowed in a flying coverall pocket.

Why is it so difficult to procure a boot that is comfortable in flight, suitable for walking in the bush, and quick and easy to put on, or jettison in the water if necessary?

The wide range of climatic conditions in Canada, and the high mobility of modern aircraft, make a leather boot unsuitable throughout the year. Flying, which is sedentary work in a controlled environment requires footwear entirely unsuited for winter bush survival. However, the introduction of the eyeletted zipper, which can be laced into the warm-weather flying boot, makes them quick doffing and donning, even in the water, and provides maximum foot comfort during standby periods.

The two-piece winter flying suit is too bulky. Why can't we get a one-piece? Can we not have a survey of all aircrew to determine desirability of two-piece versus one-piece?

We cannot dismiss almost 20 years of development experience in the flying clothing field by conducting an aircrew survey on obsolete garments. A survey is taken every time a new piece of flying clothing is prototyped. The Type III garments, which are a progressive development of the Type I, Type 1A, Type 2, and Type II had overwhelming acceptance. When first introduced during the war, uniforms were worn while flying which was the cause of so much "roominess". Wartime requirements changed; when restricted cockpit aircraft came into use, aircrew resorted to wearing underwear with the flying suit. A complete "streamlining" of the suit (Type IV) has been made; a small number were in the field during the winter of 1966-67 on an experimental basis. The jacket has been lengthened, and the neckline is lower to relieve pressure on the throat when parachute harness is worn. The waist-joining zipper is replaced by buttons; short elastic straps will return the bottom of the jacket to its correct position after bending. An extended bib on the trousers in front is designed to remove the "chill" at present found at the chest with the two-piece Type III.

Based on the results of previous questionnaires, aircrew opinion is difficult to interpolate. Opinions quite naturally reflect the influence of each type of aircraft, a fashion-conscious bias, and the inevitable personal "beefs" and prejudices. All of this has to be screened and evaluated. The one-piece suit was rejected when the insulation produced excessive bulk at a man's waist when sitting. The two-piece was more acceptable for wear on operational readiness; the jacket need not be worn in the standby room.

Why can't we have the low-cost, blue-coloured mukluk?

As the initial purchase satisfied the requirement for the CF104, there was no intention to purchase any more since the feltboot/overboot combination had been adopted. Other than some trouble with the Tutor aircraft, this combination which can be used under the full Canadian climatic range, meets all requirements for winter footwear from the sedentary to the limited survival situation. The re-introduction of the "mukluk" style footwear will be considered only after we have evaluated a USAF boot, (insulated, flying, quick-donning), tested last winter.

Why are aircrew other than officers not entitled to the felt flying boot?

A change in scale for the felt boot is now under review.

Are woollen toque-type hats on issue for winter operations?

Scale C15, CAF 602, authorizes the issue of an aircrew toque (8415-21-805-3187). Several years ago the basic design was established although the demand for squadron colours brought the project to a halt. There is also an entitlement (under the same scale of issue), for an aircrew cap (8405-21-808-2501).

Considerable over-water flying is done by ADC (AW) squadrons; aircrew feel the need for an immersion or anti-exposure suit.

The RCAF has always carried stocks of the two-piece, Frankenstein ventile-cotton anti-exposure suit for this type of flying. The garments are made of untreated cloth which breathes freely until the weave is sealed by immersion in water. These suits are scaled for all search and rescue units, and each pilot and navigator of the AW(F) squadron at Comox, under CAP 602, Scale C15 (8475-21-804-5265). The discomfort experienced in wearing this suit for extended periods is recognized. No other service has developed a suit which is entirely satisfactory. A recent development for the RAF indicates that a suit now being produced is promising. A number have been ordered for user trials by the RCAF and RCN.

The newest Mae West is considered still too bulky!

The RCAF aircrew life preserver (Yoke) is a single thickness, lightweight fabric, single-chamber type, which lies flat on the chest and is the lightest weight of any safe life jacket on the market. It is designed to float a person in a safe position for an indefinite period with a CO2 charge of 19 gramms. In operational use it has proved efficient – it has saved the lives of those in water without a liferaft.

What knives are available to aircrew?

During 1967 three types of knives will be available for two categories of aircrew – for those flying jets (ejection seat equipped), and all other aircrew and crewmen:

- The standard hunting knife (7340-21-806-2674) is available to all aircrew and crewmen of non-jet aircraft. During 1967 a new knife of superior design (see Flight Comment, Jan/Feb) is expected to be delivered and will be forwarded on a replacement basis.
- Another new knife (8475-21-814-4983) for jet aircrew should be in depots this month. This knife is similar in shape to the standard dinghy knife, with the exception that it is razor-sharp the entire length of the blade. Designed specifically for cutting shroud lines and parachute webbing should entanglement occur during a water or treetop landing, this knife will be carried in the groin pocket of the combat flying suit.
- The old reliable clasp knife (7340-21-812-5306), is still carried in emergency seat packs and emergency kits.

Socks are of rather coarse material. Couldn't a little better quality be used?

The type of sock available to aircrew is the same as those used by all branches of the Defence Forces. These are bought in a competitive market in large quantities to a military specification. It is doubtful if any change is possible here.

Why are hot-melt synthetics used in flying clothing?

After World War II a program was initiated to design flying clothing compatible with modern aircraft and the changed role of military aviation. Wartime stocks of Type "E" two-piece flying suits, "the flying suit designed in the air", and electrically-heated garments were declared obsolete because:

- the physical stature of aircrew had changed to such an extent that a complete re-sizing study was necessary
- the new aircraft had much smaller cockpits; unnecessary bulk in flying suits had to be eliminated
- the advent of man-made fibres opened up enormous possibilities to the clothing designer. The new synthetics were stronger and more durable, while the pleasing appearance and better draping qualities appealed to everyone.

However, the RCAF took a cautious approach to the new synthetics. The first postwar lightweight flying suits were made of high-quality gabardine, but this cloth snagged and tore easily. The clamour arose for the use of synthetics in flying suits, stemming principally from the popular acceptance of the new materials, although little concern was expressed about hot-melt or static buildup. Exercising caution, the RCAF introduced blends of cotton and terylene, or wool and other synthetics; this policy has been continued. Only one flying suit, the winter Type III had a 100% nylon outer shell and inner liner – but sandwiched between was a ¼" thick double-faced wool pile capable of absorbing the hot-melt. The latest version of a two-piece fying suit will be a nylon blend.

Are any changes contemplated in the present aircrew jacket?

The summer flying coverall has been redesigned, so a few changes are planned for the aircrew jacket. The former cotton/oxford cloth (French Grey) will be replaced with an attractive material in a colour to match the present dark blue of the lightweight flying coverall. There will be no significant change in the basic design which was established several years ago by aircrew user trials. Full advantage will be taken of any product improvements that have been made in the various components since the jacket was first introduced.

Even on a new pair of aircrew flying gloves the thread breaks and unravels. Why not increase the strength of the thread, avoiding a chain-type stitch?

This high-quality cape leather glove was adopted because it preserves the sensitivity and flexibility required in flying. Getting a good fit is important, particularly as the outer leather glove is worn over a rayon inner. Probably older stocks do have weaker thread but the strength has been increased by amendments to the specification. There is an optimum relationship between leather thickness and thread strength. Although stitching has given way in new gloves, those examined in support of an Unsatisfactory Condition Report have shown excessive wear – difficult to reconcile in a glove used exclusively for flying. Making them rugged enough for purposes other than flying would reduce the efficiency of the glove. The reason for the so-called P-K stitch in this glove is to prevent a ridge being formed at the seam and for elasticity so that the thread has "give" before it breaks.

Fifteen hundred pairs of gloves (army, combat), were used in tests last winter as hand protection for aircrew during pre-flight walk-arounds, etc.

Because survival mittens are in the seatpack and used only in an emergency, the leather chopper mitts and wool inners (the type worn in the lumber business), have been bought for a number of years and are adequate for our purposes. Generally they have been found acceptable.

Lightning Strikes?

This Argus was damaged
in many places – yet
no one saw a flicker...

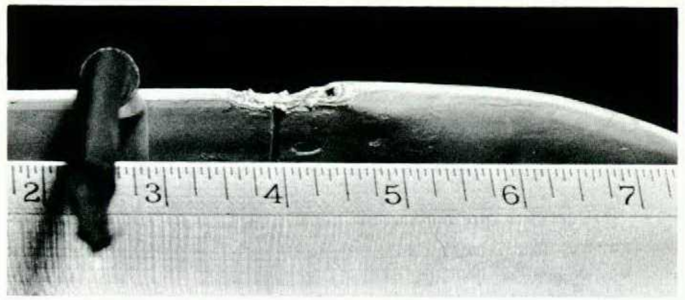
Repeatedly, the aircraft had been reported unserviceable for compass errors. This snag was later found to be caused by magnetism created by static discharge from the wingtips. All this time the aircraft flew with extensive lightning strike damage to the airframe as shown in the photos.

The strikes sustained by this aircraft were doubly insidious:

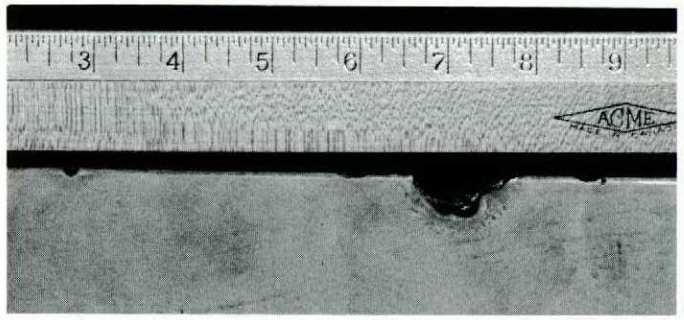
- No reports from aircrew who had flown this aircraft indicated a strike although the damage inflicted to the airframe attests to the severity of the charge.
- During frequent walk-arounds by both groundcrew and aircrew the widespread damage to the airframe remained undetected.

A persistent and unexplained compass error should alert aircrew and groundcrew to a possible lightning strike or discharge damage. The need for a careful walk-around is obvious.

Port side of fuselage was pocked in several places



Starboard wingtip – heat melted the aluminum



Port aileron trim tab damaged.

Why not try the USAF O^2 Mask?

About six years ago the USAF adopted a new oxygen mask designated the MBU-5/P. Under development since 1954, its performance has been monitored by the Canadian Forces Institute of Aviation Medicine.

MBU-5/P

Following its introduction the USAF reported some "teething troubles" such as the exhalation valve would open if a suction were applied to the underside. Sticking valves, inverted valve flappers, and mask slippage under certain conditions of "G" were also reported.

Since the Canadian Forces have not conducted field trials on the MBU-5/P mask we cannot fully compare its performance with that of our current MS-22001 (A13A) assembly. However, inspection of the two mask types would indicate that the valve configuration of the MS-22001 mask should be less subject to malfunctioning. The MBU-5/P mask suspension would appear to be the better retainer during highspeed ejection; however, the Pate suspension is simpler for the wearer to adjust. The MBU-5/P mask is lighter and probably the more comfortable of the two; it is softer and has no lip strap.

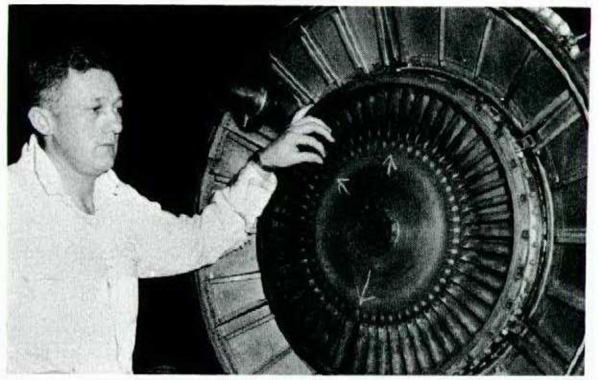
The Canadian Forces decision to further postpone field trials of the MBU-5/P was influenced by reports that neither the US Navy nor the US Army have adopted it. Too, the USAF report that they are currently working on an improved model. The Institute of Aviation Medicine will continue to monitor the further development of this oxygen mask assembly.

MS-22001

GOOD SHOW

CPL J ENNS

On a routine inspection of a T33 engine, Cpl Enns noted a turbine blade out of position. He drew this to the attention of a supervisor, who examined it and thought it normal. Later, Cpl Enns returned to the T33 and was able to remove the blade with his fingers. He then initiated a thorough check of the turbine section.



A large bolt securing the labyrinth seal had broken or come free and rubbed on the forward face of the turbine wheel. The bolt head had worn off several locking lugs permitting blades to move rearwards in their pinetree slots in the turbine wheel. Other bolt heads had been badly scored; the forward surface of the turbine wheel was extensively damaged. None of this damage was visible from the tailpipe.

Failure of these parts could have lost us both the engine and the aircraft.

Flight safety and competence go hand-in-hand; Cpl Enn's act of alert good judgement exemplifies this truth.

F/L M DEMERS

F/L M Demers and a student were flying a clearhood mission in a Tutor. After takeoff the aircraft was set up for a practice forced landing to a runway under construction. At 1500 feet above ground at 220 kts the throttle was retarded and an explosion was heard; the engine had flamed out. Re-light attempts were futile. F/L Demers elected to attempt a forced landing on the live runway rather than eject. Lowering his undercarriage at the last moment, he carried out a perfect deadstick landing under a critical altitude and distance situation.

The compressor rotor had suffered damage from an unknown foreign object, later causing a flameout.

F/L Demers' prompt adoption of a correct course of action reflects a high degree of flying skill. Turning a dangerous situation into a successful forced landing, he not only saved a valuable aircraft but averted the possibly tragic aftermath of bailing out over a built-up area.

F/O WM WRIGHT

F/O WM Wright and a student were climbing their Tutor through 8000 feet with 100% rpm and 220 kts; the oil pressure began to fluctuate from 30 to 60 psi accompanied by a small noise. This was followed by a loud bang, illumination of the high oil temperature light and rising EGT. F/O Wright took control, flamed out the engine, and carried out a successful forced landing on the runway.

The engine oil filter had been blocked by metal particles, indicating a bearing failure. There was also evidence of high overheat.

F/O Wright's skill and judgement prevented a potentially serious accident and saved an expensive aircraft.

FS A STACEY

FS A Stacey, while on duty as GCA controller at Namao, was notified that a small civilian aircraft was lost somewhere in the vicinity of Edmonton in heavy snow which had reduced ceiling and visibility almost to zero. He located the aircraft and brought it in for a successful landing, probably saving two lives.

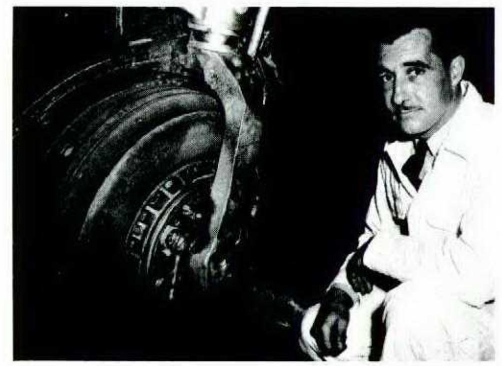
FS Stacey's response to this emergency was made in the face of conditions which may have overwhelmed a less competent controller. The scope was cluttered by precipitation, the aircraft was at very low altitude in an area of bad ground-clutter making pick-up doubly difficult,

radio contact was poor, the plane's compass was unserviceable – and the pilot had never made a radar approach in her life!

A fine job, FS Stacey, in helping a lady in distress on a dark and stormy night.

CPL JA LAWRENCE

Cpl Lawrence, a member of the CF101 maintenance test crew, while on an external inspection prior to a test flight, noticed a very small hydraulic leak on the bottom side of the starboard wheel brake drum. He informed the pilot of the leak, and requested that he start one engine to test the brakes. The pilot did so, with heavy loss of hydraulic fluid through the leak. The brake piston and seal were found to be broken.



Cpl Lawrence's alertness and attention to detail averted a brake failure on landing. Good safety records are made by the contributions of men like Cpl Lawrence.

CPL F GREENE

LAC F Greene, an aero-engine technician on second-line maintenance, noticed that the Albatross fuel system water drain valves were continually leaking. Later pinpointing the problem to drain valves of another manufacturer, he raised an Unsatisfactory Condition Report. In the reply, since no apparent design discrepancy existed with the new valve, only replacement of O rings was recommended.

Still not satisfied as this recommendation did not solve the problem, he resubmitted a UCR six months later. The escaping fuel was a serious fire hazard and his UCR proposal was reviewed. As a result of his second UCR the defective valves are currently being withdrawn from service.

Cpl Green – then an LAC – exercised good technical judgement and a commendable persistence over a long period in eliminating a serious hazard in the Albatross.

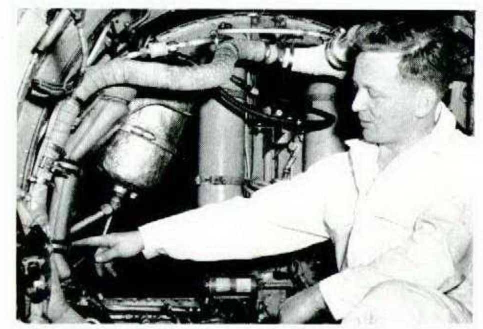
WO2 DF BROWN

At 1 Wing, Marville, France, WO2 Donald F Brown recently completed his 20,000th GCA run.

WO2 Brown, a native of St John's, New Brunswick, completed a tour of operations as an air gunner during the war. In 1946 he re-enlisted in the Air Traffic Control trade. He has served at several stations in Canada and has completed two tours overseas.

Few men have reached this outstanding level; such an accomplishment attests to a long record of valuable support to air operations.

Cpl F Greene

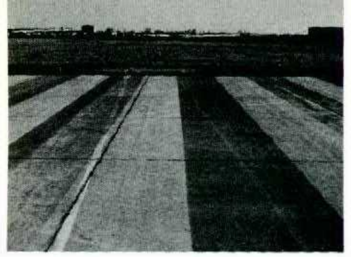


CPL GCV MCNAUGHTON

During a night servicing routine check on a T33, Cpl McNaughton, AFTech, noted the fluid in the fuel de-icer tank was discoloured. This particular check was carried out visually with a flashlight instead of "dipping" which is the customary method. Investigating further, Cpl McNaughton broke the delivery line below the tank and bled off a sample of the tank contents, heavily contaminated with an unknown substance. A standard issue, plastic-handled screwdriver (8 x ⅜) was found inside.

Cpl McNaughton uncovered a potentially dangerous condition and possibly saved an aircraft and crew from a catastrophic situation. It is ironic that an act of commendable thoroughness brought to light a hazard created by someone's deliberate negligence. ■

The pilot landed on a wet runway, too fast for fuel load – he didn't have a chance as the aquaplaning (white lines) continued right off the landing strip . . .



Cement truck on highway brought runaway T-bird to a halt.

STOP!

Paul McLean

The causes were simply runway conditions plus a lack of understanding of the aircraft's "ground-envelope" . . .

That pilots continue to over-rely on wheel braking is no doubt a function of history. We don't have to go far back to the day when a pilot's only decelleration technique – apart from landing into wind – was tramping on the binders. In fact, the Expeditor and Dakota are of that vintage but today's all-metal bird is of a different feather.

Each new machine that comes along is harder to stop. We now are at the stage when wheel braking is last in sequence during deceleration. For example, in century-series birds wheel braking should be reserved only to kill off speed remaining after:

...carefully controlling touchdown speed
...deploying the dragchute
...employing aerodynamic braking.

Brakes are, as some pilots will admit, disconcertingly ineffective for salvaging a bad landing. Black streaks on the runway, flat spots, melted treads, blown tires, white-hot brakes, heat-aged wheels, and aircraft overruns are all symptoms of a belief that wheel brakes are effective through all speed ranges.

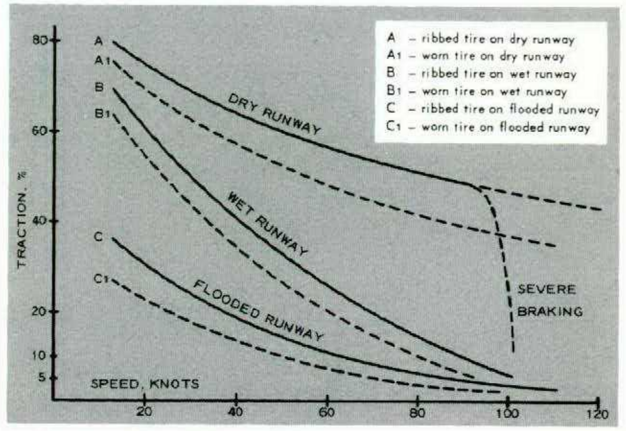
In five years, of the 52 aircraft which ran off wet runways, 44% had blown tires. In no case were the tires, wheels or braking systems defective. The causes were simply runway conditions plus a lack of understanding of the aircraft's "ground-envelope" – the outer limits of safe operation.

Above 100 kts there are many effective devices for deceleration or directional control:

- aerodynamic drag
- reverse thrust
- dragchute
- nosewheel steering
- barriers.

Brakes are not in this list; an aborted takeoff or emergency landing are the only times use of brakes should be attempted at speeds above 100 kts.

Below 100 kts, wheel brake effectiveness increases as speed decreases regardless of conditions. In this range, aerodynamic devices become less effective (see graph) but as the aircraft weight sits increasingly on the undercarriage, the traction rises.



On a dry runway, brakes give deceleration and direction control – as long as the wheel rotates. But as the tire stops rotating, traction disappears and directional stability falls to near-zero giving the effect of a freely-rotating wheel such as in a brake failure. The tire will then slide in a pool of its own melted rubber!

On a wet (or "water lubricated") runway, tires have only half the traction as on a dry runway. This means the stopping distance can be theoretically five times longer than on a dry runway.

On a flooded or heavily-wetted runway another phenomenon appears – hydroplaning. (Remember: hydroplaning with good tread starts while accelerating at $8.6\sqrt{\text{tire pressure}}$, and ceases during deceleration at $7.2\sqrt{\text{tire pressure}}$.) During hydroplaning the tire is stationary (anti-skid or not); if the brakes are ON when hydroplaning stops, OFF goes the bottom of the tire. A Constellation aircraft can take the bottom off a tire in 120 feet, an F86 in 60 feet and a CF104 in 30 feet. Below full hydroplaning speeds, water lubrication continues to give a major reduction in traction with little deceleration and directional control. Hydroplaning in one inch of slush (which is highly viscous) occurs about 15 kts lower than in water.

The marked drop in traction in all conditions – dry, wet or hydroplaning – of a worn tire is now receiving wider attention. A recent decision to reject tires with 80% of tread wear is based on the finding that a tire with less than 20% tread remaining gives roughly half the traction of a new tire.

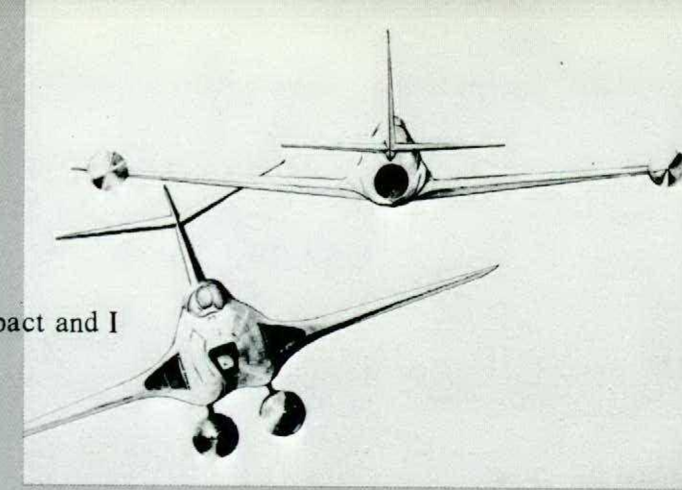
In a previous paragraph we qualified the hydroplaning formula by including tread condition. We now know that tread channels enable dispersion of water and so raise the lower limits of hydroplaning. In other words, the hydroplaning range is narrowed.

Pilots who ran off wet runways have, to a man, misjudged:

- the runway condition
- the aircraft braking limits.

Stay on the runway and off the CF210!

500' Separation at 28000' IS DANGEROUS



". . . The aircraft underwent a tremendous impact and I immediately lost control."

We thought the days of over-the-side aircraft abandonment were over, but here's F/L Ayres' account of a very hairy departure from his tumbling T33.

"I was flying in the rear seat under the blind flying hood . . . and was flying on instruments at FL 280 . . . Everything was normal and we were proceeding in accordance with a clearance previously issued by France control . . . the aircraft underwent a tremendous impact and I immediately lost control . . . I heard F/L Thompson call "let's go!", or words to that effect, after which the canopy left the aircraft and I saw a dark object exit from the front cockpit. I pulled up the right armrest and tried to initiate the trigger but was unable to locate it, or if I did find it, was unable to depress it and initiate the ejection . . .
During this time the aircraft was gyrating wildly and I could see different shades of light and dark as I was exposed to both positive and negative G forces. I became convinced that I was not going to be able to eject normally and I did not want to be stuck in the aircraft because of this. I therefore, undid my seat harness in the hope of getting out by myself. I was flung clear of the aircraft almost immediately and, although I cannot remember for certain, my determination to exit was so great that I probably contributed to the departure in some way."

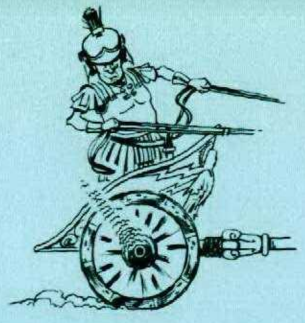
The T33 had collided with a USAF F101 also on a flight plan. In the tightly-organized airspace over Europe, two aircraft had been assigned 500-foot separation at 27500 and 28000 feet. *If the potential errors of each aircraft's altimeter system had been applied to maximum disadvantage, it is possible that the T33 could have been as low as 27360 feet and the F101 as high as 27700!*

It is ironic indeed that long after the establishment of these very close vertical separations the board should have to recommend that "extraordinary efforts should be expended to develop more accurate altimeters and to ensure their installation in all aircraft". Stern warnings have been issued for several years by many agencies about the dangerous inadequacy of altimeters to the stringent requirements to today's high-density traffic control.

The skies over Europe must have taken on a World War II aspect to F/L Ayres who only ten days before, had been obliged to abandon his Starfighter following a birdstrike!

Flash-back

While adjusting the rudder cables, I must have applied too much tension . . .



The SQUEAKY WHEEL

F/L H Jenkins
DFS Statistics Section

A recent serious inflight emergency involved an Argus aircraft. The autopilot was disconnected after indications of aircraft control problems. The elevator control jammed while the aircraft was in a slight nose-up attitude. The pilot regained control by manipulating power and trim and eventually completed a successful landing using this technique. The investigation disclosed a bearing was seized from lack of lubrication.

In the days of chariots it didn't take genius to coin that old adage about "the wheel that squeaks the loudest". The captain of the craft could readily identify the squeakiest culprit since he was planted squarely between the only two rotating parts on the conveyance – and Ceasar help the slave who neglected to apply the grease. The charioteer also enjoyed another distinct advantage; the propulsion unit, a 2- or 4-horsepower rig, came with sealed-in lifetime bearings.

Even to this day our current chariots, equipped with several hundred moving parts, emit the occasional audible squeak from an elevator or aileron, a binding control column, or a sticking selector or latch which is detected in time by our alert stalwarts. But only these obvious warnings will be recognized above the normal howls, groans, whines and roars.

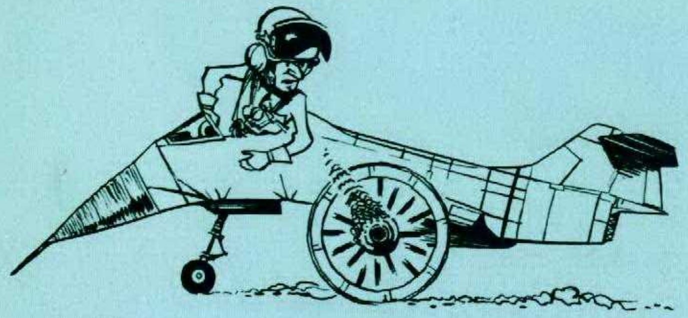
On touchdown, the starboard wheel separated from a CF104. Prompt action by the pilot prevented the aircraft from leaving the runway till forward speed was reduced, limiting the damage to C category. The accident resulted from disintegration of the wheel's outer bearing. Investigators assessed the most probable cause of bearing failure as under-lubrication.

The squeaks are still there but aren't always getting the grease as evidenced by some of our more spectacular accidents and the less-publicized incidents. Unfortunately, too often accidents must occur or incidents become repetitive before our attention focuses on the problem. Even then, the component failure may steal the limelight, obscuring evidence of inadequate lubrication.

A routine unserviceability fix is often quite simple ... "cleaned and lubricated". What may go unasked is the question "Is this snag telling us something?" or "Could this 'minor' snag have major consequences?". If a moving part is found worn, dry, or corroded do we always establish the reason for its being so? The designer may have failed to provide sufficient lube points, or failed to protect the part from the elements, or failed to recommend a suitable lubricant.

Intervals between routine lube schedules may be too great or, in the worst instance, overlooked completely – this has happened. Finally, the individual responsible for applying the lubricant may simply fail to do so or applies the wrong one. Whatever the cause it deserves investigation.

A CF104 flying at 4000 feet suffered complete power loss forcing the pilot to eject. The variable stator vane system failed in the closed position following seizure of a cable. An incorrect lubricant had been used.



Consider the cost to the Canadian Forces or visualize the hazards crews face when components fail from someone's neglect of a requirement as basic as lubrication!

A CF104 flamed out in a bomb delivery pattern. Pilot and aircraft went into the sea; the pilot survived. Flameout was caused by failure of main fuel pump drive splines. Excessive wear was caused by inadequate lubrication.

Admittedly, cleaning and lubricating is a dirty and unrewarding chore and often it's not made pleasanter by a fiendishly inaccessible lube point. Here, the tradesman is on his own; the supervisor may have no way to ensure that the job's been done with integrity. This type of negligence is difficult to sleuth later when the component fails.

Then there's the easy-out such as, "the aircraft is due for a major inspection in another ten hours anyway", or "they'll probably check the oil level on the next flight".

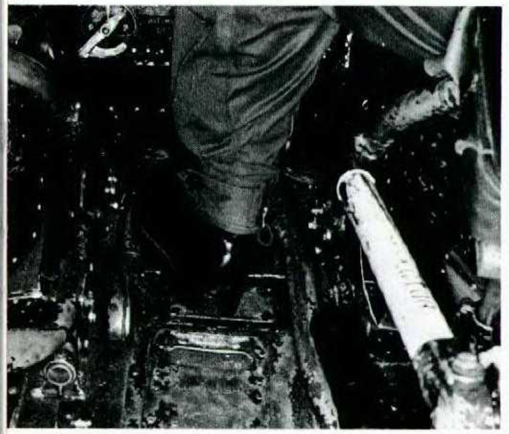
A jet was cleared for a long cross-country training flight involving refuelling stops at five bases. On the final leg to home base the pilot declared an emergency – oil pressure dropping. The oil tank was nearly empty yet no oil leaks were found and oil consumption rate was normal. Those who performed the transient servicing at the last refuelling stop admitted they "had not checked the oil level because the next leg was so short". Obviously, this assumption had been made at more than the last servicing stop.

Of course, this was an exceptional occurrence; our aircraft reliability record attests to the high calibre of our technicians. But lapses do occur:

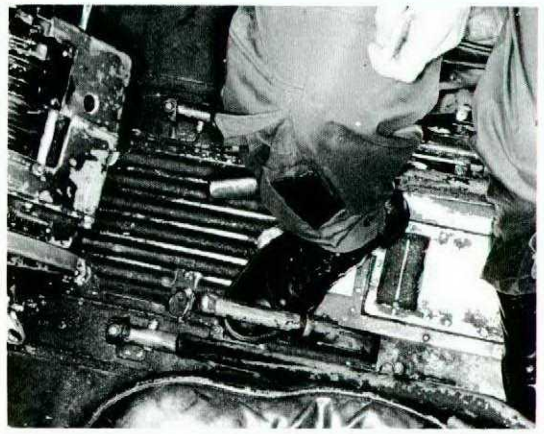
- T33 flaps failed to lower on down selection. Cause – thermal overload on the flap actuator motor due to inadequate lubrication of the flap rollers.
- Expeditor tailwheel collapsed on landing. Cause – improper cleaning and lubricating of slide tube.
- CF101 wheel seized. Cause – lack of lubrication in wheel assembly cone and roller.
- Argus aileron control stiffening. Cause – flight control coupling assembly in wheelwell corroded due to lack of lube.
- T33 main gear failed to lower on normal system. Cause – improperly lubricated uplock roller.

The man with the grease gun can provide another vital service by being alert for signs that all is not well in the lubricating business. In addition to the obvious

(cont'd on page 16)

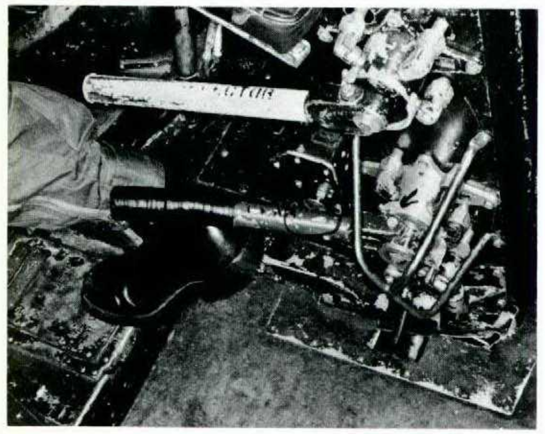


...I raised myself out of the right seat

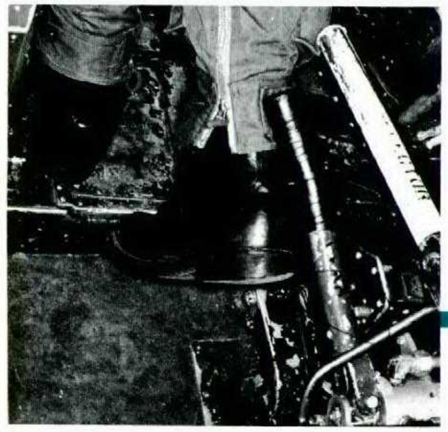


to look out the left window, at which time

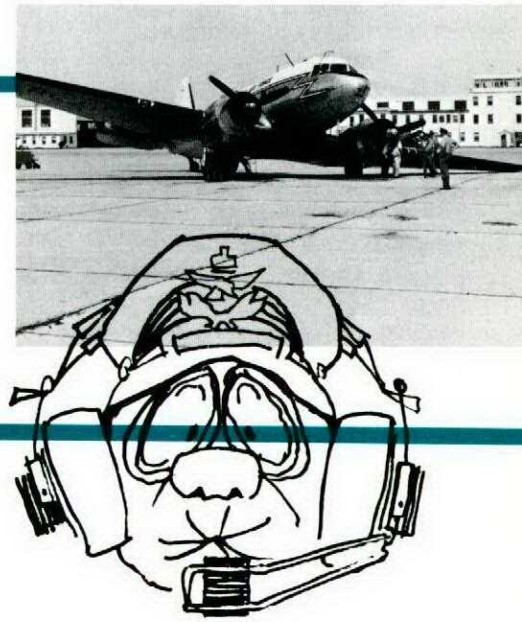
I kicked the locking latch on the floor with my left foot.



I heard a click which didn't sound right and I brought my foot back with a reflex action



and the heel of my foot struck the gear selection lever...



Forces to get Skiddometer

In a few months you'll see this curious-shaped three-wheel trailer being hauled up and down the runway. What is it? What does it do? How will we benefit from the information it supplies?

S/L MD Broadfoot
CFHQ/DFS

Not too long ago it was the practice to taxi to the end of a runway, have a look down it, and through a complicated process of applying experience and calculated guesses, come up with the decision that "it looks long enough". Similarly, runways eyeballed from the air were assessed by the same sort of metal gymnastics, and were judged: "Plenty of room", "Should be all right" or "Pretty damn short". And occasionally aircraft and pilots ran off the far end or off the side.

We have progressed a long way since the bad old days. Today, a look in the dash-one will yield figures which tell us exactly how much runway is required for takeoff and landing, the value of V1 or critical engine failure speed, maximum refusal speed, line speeds, etc – all very scientific and correct. And occasionally aircraft and pilots run off the far end or off the side. How come?

The trouble starts with the figures that come from takeoff and landing charts; with the exception of the actual takeoff run, these are predicated on stopping distances. These distances are calculated for and tested on hard dry runways, but if the runway is other than dry we are back to the guessing game again. This is not because we can't predict what an aeroplane will do on a slippery runway but because we have had no way of measuring exactly how slippery the runway is.

Braking action is reported by the pilot as "good", "fair" or "poor". But to get this information he has to actually land, or at least taxi fast and try stopping. His report will depend on whether he was in a Dak and had to put on power to make the cut-off, or whether he was in a 104 hanging on watching the barrier come up. In the past five years 75 pilots who were expected to give a report on the braking action ended up in the boondocks and made their report on a CF210. That's why we need some way of accurately measuring the runway coefficient of friction.

There is enough written on the subject of slippery runways and braking technique to fill several volumes so we won't dwell too long on the physics. Suffice to say that the amount of friction force between two surfaces – the tire and the runway in this case – will depend largely on the type of surfaces in contact and the magnitude of the force pressing the surfaces together. The proportion of the friction force to the perpendicular (normal) force defines the coefficient of friction, usually identified by the Greek letter mu (μ); or

$$\frac{\text{Friction force}}{\text{Normal force}} = \text{coefficient of friction } (\mu).$$

The inherent friction value of tires in good shape does not change much, but runway friction characteristics vary widely; this affects the proportion in the formula, and causes a marked reduction in the value of μ. The highest coefficient of friction for most aircraft tires on dry, brush-finished concrete is of the order of .6 to .8. On smooth clear ice the value of μ may be as low as .15 – a very slippery business indeed.

The skiddometer measures the coefficient of friction but most aircraft dash-ones have takeoff and landing charts corrected for Runway Condition Reading (RCR). RCR is reported in two-digit numbers from 01 to 26; these numbers are the measured deceleration values expressed in feet per second, squared. However, the recorded deceleration values obtained from decelerometers are dependent on the runway coefficient of friction, and the two are correlated. Figure 1 shows RCR numbers and the corresponding coefficients of friction, along with some typical runway conditions.

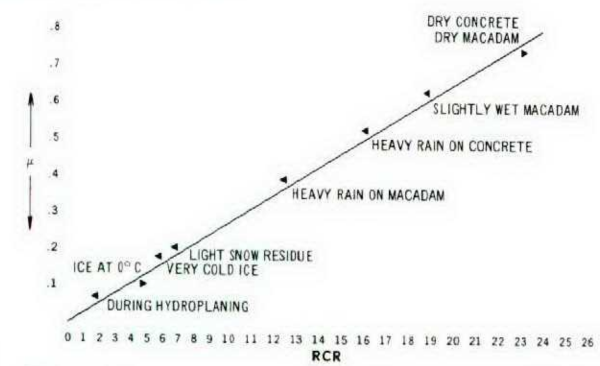


Figure 1

The centre wheel of the skiddometer carries the test tire and does the actual measuring of the coefficient of friction. This wheel is slightly smaller than the outside wheels but is connected to them by shafts. Thus, while the rpm of the three wheels is the same, the peripheral speed of the centre wheel is less, forcing this tire to slip at a constant ratio of 12%. This slip ratio closely approximates the optimum braking condition for aircraft. The torque caused by the friction force between the tire and the pavement is sensed and transmitted to the recorder. A moving pen plots the coefficient of friction on a rolling chart. The recorder has the capability to average the results of each run, making it unnecessary to interpret the charts. This information can be read by the vehicle operator and transmitted to the tower. Detailed analysis of the chart can be done later.

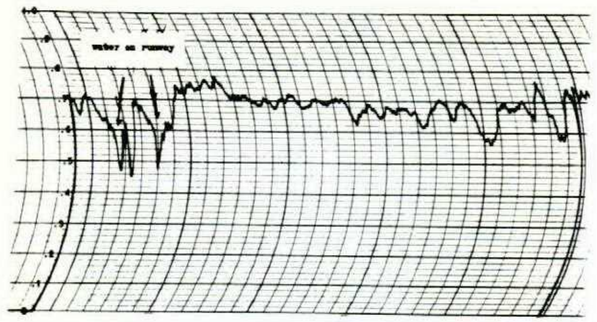


Figure 2

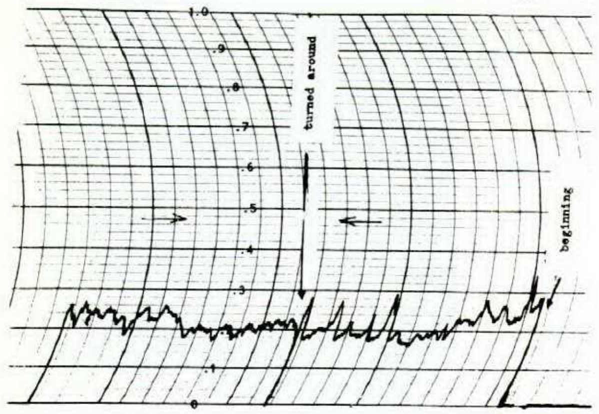


Figure 3

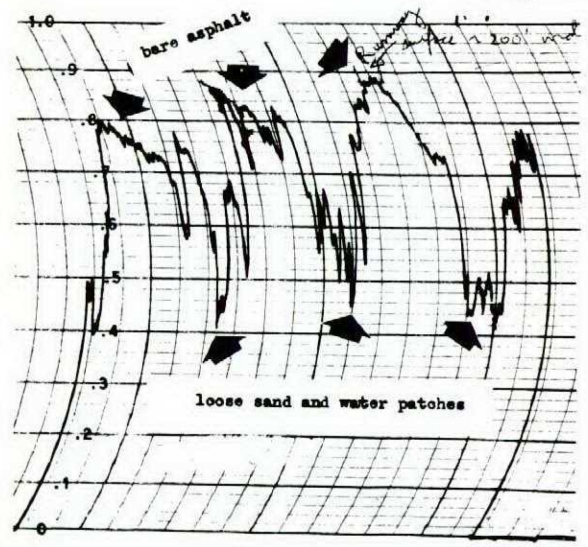


Figure 4

The skiddometer is pulled along the runway in three equally-spaced parallel runs. Any vehicle with a towing hitch can be used; speed is limited only by the horsepower of the towing vehicle – and local speed laws. Even at 90 mph there has been no reduction of the friction measuring capability. Runs may be made routinely once or twice a day during good weather and stable runway conditions. During changing runway conditions and following runway clearing, the runs should be increased to approximately one per hour, or as directed by flying requirements.

Figure 2 is a typical trace produced by a run on a 10,000 foot mostly-dry asphalt runway. The average coefficient of friction on the dry portion is .65. Note how water areas show up at the 1000- and 1700-foot marks, (each division represents 330 feet of runway). In this case, the BCEO can take prompt and appropriate steps to remove the water remaining on the runway.

Figure 3 is the trace from a slush-covered runway with an average coefficient about .2. Figure 4 is the trace when patchy conditions exist. Again, the BCEO can accurately locate the problem areas and direct his efforts to the sections of the runway that need it most. And another run after clearing operations will show exactly how successful the efforts were.

Now that we have accurate information on the runway condition, we need only apply it to aircraft operation and we're in business. Equipped with this knowledge the pilot can adjust takeoff weight, V1, max refusal speed, landing weight, landing roll, and max crosswind component. The supervisor will have accurate data on which to base his decisions to launch aircraft. The pilot who carries his charts with him will have no problem in applying changing conditions to his plans as he goes along. However, the pilot of a one-man aircraft would be well advised to calculate a go, no-go coefficient for the destination runway before he flight plans.

The only point remaining to be covered is crosswind effect. The same low coefficient of friction that will allow you to slide off the far end of the runway will also allow the wind to blow you off the side. Figure 5 gives the maximum crosswind component, for all aircraft, for the applicable coefficient of friction.

Crosswind Component	
10 knots	0.27
11	0.28
12	0.29
12.5	0.30
13	0.31
14	0.32
15	0.33
16	0.34
17	0.35
17.5	0.36
18	0.37
19	0.38
20	0.39
21 and over	0.4

Figure 5

Current plans call for equipping most of our bases with the skiddometer during 1967-68. At the same time those dash-ones that do not already have charts corrected for varying coefficients of friction will be amended.

A word of warning about these corrected stopping distances – lest you conclude that it will now be impossible to slide off the far end! *All aircraft performance charts are based on optimum efficiency of the aircraft and pilot.* If you goof your approach or ignore recommended braking technique, no chart on earth will save you.

Happy braking. ■

Looking back

THE BIRD WATCHERS' CORNER

No longer the problem it was eleven years ago – artist Dubord's first bird in Jan/Feb 1956 issue

Aside from the Gigantic-Thrash aspects of a centennial, the present historical interlude does provide the excuse to pause and look back. And looking back a scant ten years, only two Flight Comment features remain unchanged – the Good Shows and the Corners. Only a decade old, it's now indisputably a cherished institution.

Our apparently indestructible birds have historic interest as the last vestiges of a flight safety promotion technique very much a la mode a quarter-century ago. In those days the cartoonist was the indispensible adjunct to any flight safety organization. The flight-safety-can-be-fun school is still around but the blatant hilarity/tragedy blend is no longer to everyone's taste – at least in peacetime.

In every Bird Watchers' Corner there's an artist. Although a succession of editors and others have contributed their ideas and words, the artistry of John Dubord is unquestionably the source of its appeal. Our foibles, foolishness and flubs – but very seldom the virtues! – are cleverly portrayed as ink and imagination come to life on the inside back cover.

Over the years – and that amounts to about 60 birds – Mr Dubord's feathered fancies have broken every rule in the book. The book, a few of whose pages we print here, could serve as a flight safety manual by itself – a delightful world in reverse inhabited by those zany but all-too-human birds of a feather.

How does John Dubord feel toward his feathered flock?

"They were originally sparked by the inside back cover of a USN Approach back in 1955. The page contained about six 'booboo birds' creating mayhem such as flying into a mountain or bouncing off the flight deck. S/L Clark and Mr Jack Nugent who at the time were the editors of Flight Comment decided we should start a series of our own, thinking it would be an excellent way of pointing the finger at culprits without being too nasty about it. Both of them, with people in DFS and in the field, provided the ideas and text – the artistic interpretation was left to me. As it turned out, the birds have been a success and I'm still grinding them out.

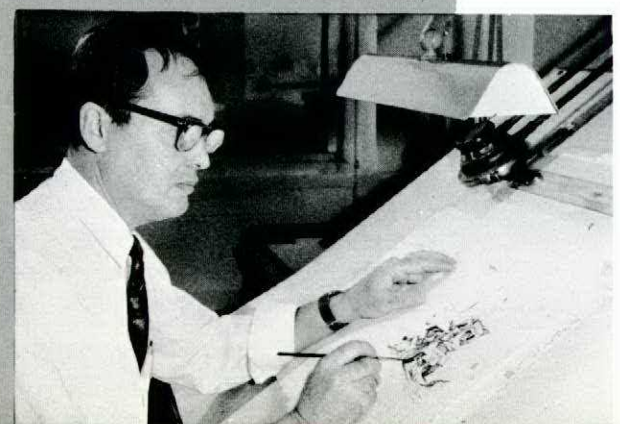
They haven't all been easy and some were the cause of severe labour pains before the egg was laid. Fortunately in those cases the editors, past and present, or someone from the AIB staff assisted me with kind "midwifely" advice.

I'm happy to see that these ornithological fancies are appreciated and still flying, and hope they'll keep on hatching." ■

John Dubord has been with Flight Comment since joining the Civil Service in 1953. A native of Shawinigan, Quebec, he attended De La Salle Academy in Trois Rivieres and the Beaux Art art school in Quebec City. "Having shown more interest in aviation than in art", he went to Toronto's Central Technical School for an aircraft mechanic's course.

He joined the Canadian Army in 1942 and served as an artist with the Canadian Camouflage School of the RCE, and was later transferred to the Armoured Corps. Sent to England, he trained as a wireless operator and later served with the Ottawa Cameron Highlanders in the occupation forces.

He graduated from a two-year commercial arts course at Sir George Williams College at Montreal – the start of his career as a commercial artist. A licensed pilot, John has a keen interest in the historical aspects of military aviation.



Another "Isolated" Accident

The damage led to some strongly-worded observations on maintenance management . . .

The EOs warned that it was necessary to "insert safety pin with streamer through valve safety bolt" before work could proceed. All those questioned later were certain this precaution had never been taken at any of the bases having this kind of bird. This omission, intentional or not, resulted in one damaged aircraft because someone had inadvertently (during lunch hour) kicked a switch.

The details of the occurrence itself need not be related here but should prompt some of us to ask "Could this happen to me?"

Also, the increasingly complex burden of engineering orders came in for some candid comments by a senior officer:

It would be easy to transfer the responsibility for this accident to the least common denominator... the technician. However,... this unilateral assignment of responsibility would not advance the common cause of accident prevention. Admittedly... it can be argued that the use of the -7A and -2 EOs at the working level would have prevented this accident, but in view of the statements that the safety pin had never been used... one is forced to conclude that this malpractice is epidemic... the malpractice in question does not represent an isolated instance but in reality emphasizes the inadequacies of the Engineering Order system.

The Engineering Order system many years ago was a very efficient and effective system but over the years it has grown to such dimensions that it is now completely unwieldy and impractical for use at the working level. The technician, saddled as he is with a multiplicity of maintenance activities and working under the pressure of operational requirements, finds that he has less time to verify... his actions with the EOs, he is therefore forced to rely on experience – which may or may not be current. Obviously the present system must be updated to provide both the technician and immediate supervisor with current and realistic maintenance instructions so that they can discharge their responsibilities in the most reliable and expeditious method possible.

The method which has been proposed in CAP 78... is essentially a duplication of the method of "shop traveller" cards which has been used by industry for many years. The availability of shop traveller cards or work order cards permits a large project to be broken down into entities... This form of work control will permit technicians to discharge their duties in an efficient and economical fashion...

The traditional system of military management is based on command supervision, and performance by the book. However, those who write the orders and instructions which comprise the book, share equal responsibility with those who execute it. In consequence, it is considered that... this accident... would not have occurred if proper Inspection Cards had been available in accordance with CAP 78.

(Diverse opinions have been heard on this subject. Comments from the field would be appreciated.)

(cont'd from page 11)

(dry, binding, or squeaking parts), high rate of spares consumption due to wear, corrosion, signs of overheat, or unexplainable component failures may indicate unsatisfactory lubrication. The man who sounds the alarm is a real asset here.

The responsibility doesn't end with the man on the line, either. Cautious planning of maintenance cycles, careful scrutiny of components during inspections, continuous monitoring by the overhaul contractor and conscientious aircrew recording of what might appear to be very minor unserviceabilities all ensure that the wheels wont grind to a halt.

With POL – everybody has to carry the can . . .

F/L Jenkins, DFS Statistics Section analyst, was recently transferred to the directorate following 16 years of uninterrupted flying duties. F/L Jenkins has been employed in test flying since 1956 when he first flew high-performance jets with the USAF. His most recent assignment was as CF104 maintenance test pilot and flight safety officer at one of the overseas wings. This article is based on observations made during these years.

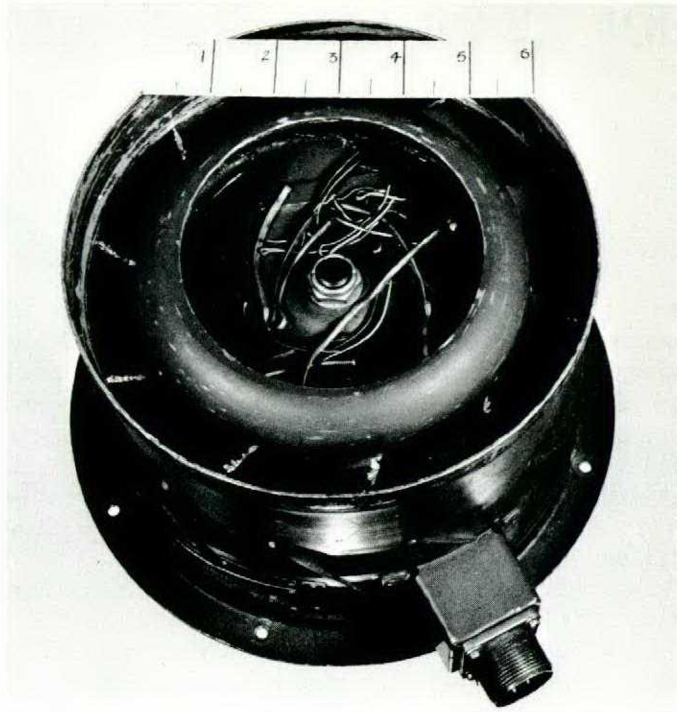
Blower Blow-up

The pilot of a CH113 reported the blower "very noisy and vibrating" - and well it might have been. Inspection uncovered:

- *leading edge of the fan blades badly nicked*
- *inside wall of the blower casing scored*
- *a number of assorted split pins in the fan cup.*

This one was hard to trace; only the day before a considerable amount of maintenance work had been done which could have contributed to this incident. The screen over the blower intake is located in a small well - a handy place for technicians' tools, etc. The blower itself is regarded as "not a component whose failure would be detrimental to flight safety"; nevertheless, this fan turns at over 11,000 rpm making it subject to extremely high stresses when exposed to foreign objects of this sort.

A suggestion to cover the air intakes with plugs was rejected as compounding the problem. Again, only competent maintenance practices stand between success or disaster.



Who's in Charge Here?

A CF104 was on snag recovery during which technicians of two trades were working on the aircraft. The two groups were unaware what specific jobs each was to perform; in fact, one was an APC check and the other a BFI. The hydraulic test stand was connected to the aircraft; an airman from the other group, not being alerted to the danger, was hit and pinned beneath an undercarriage door which cycled when hydraulic pressure was applied.

Fortunately, the injuries this man sustained were not serious, but lack of co-operation and supervision can have disastrous results in a maintenance hangar.

FLIGHT SAFETY FLASH

C45 TRIMS REVERSED!

Following a tailplane change, another maintenance crew gave the work an independent check which included inspection of the elevator trim cable installation. The independent check done, the aircraft was signed out serviceable for an airtest. The pilot checked the trims on his pre-external check and saw that when he applied nose-down elevator trim the indicator gave an nose-up reading. When the trim wheel was turned the indicator showed an opposite movement. Had this been an aileron change the result could have been fatal. (We had an example of this actually occurring – see Flight Comment Jul/Aug, page 14.)

The elevator trim cable was crossed, allowing trim reversal.

If the independent checkers overlooked the mistake – would a pilot also miss it? Possibly. The need for complete external checks by pilots cannot be overemphasized. Even though two experienced maintenance crews were involved, carelessness crept into the picture.

901 Years after Hastings

S/L NA Galbraith
CFHQ Directorate of Food Services

As may well have been intended, the Food Services Branch is highly incensed with the statements and implications in the Nov-Dec Flight Comment editorial. We stand accused of providing poisoned food, "inadequate or unsatisfactory meals" and poor service.

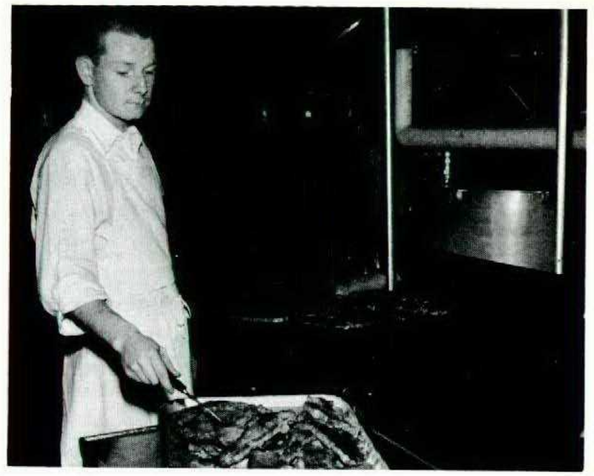
On the first count, and with direct reference to the editorial statement, we have searched diligently for the reports of the "four close-calls from tainted food provided our modern knights" by those despicable "food handlers". It appears one incident can be fairly and squarely laid at our door; in two other cases it was concluded that "the criteria for firm diagnosis of food poisoning from flight meals were not satisfied from a bacteriological or epidemiological standpoint, and that the preparation and handling of the flight meals met the required (high) sanitary standards"; no record of the fourth incident can be found.

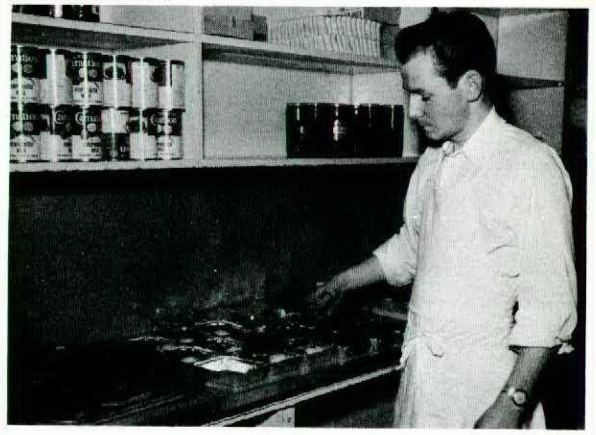
The September issue of the Canadian Food Journal states:

> ***Food Poisoning can strike in strange and dramatic ways... The reported figures are just a fraction of the actual cases in a rising world-wide incidence of food poisoning.***
>
> ***In a recent year nearly 90,000 cases of food poisoning were reported in the United States.***
>
> ***It cannot be stressed too often that food poisoning is an increasingly serious problem in Canada and other countries.***

In the face of these alarming quotes and the statements made in Flight Comment, these statistics may be reassuring:

> ***From a total of well over one third of a million RCAF flight meals and 850,000 between-meal supplements issued each year, there have been only three reported cases in which food poisoning was suspected.***





Over one third of a million per year!

We naturally deeply regret both the incident specifically attributable to Food Services and the two which may or may not have originated with us. Within our organization a continuous effort is directed at:

- the use of only prime quality food
- the maintenance of high sanitation standards throughout Canadian Forces kitchens and dining rooms
- the preparation, cooking and packaging of flight food issues – and all food served – under carefully controlled and inspected conditions
- the inspection, and education of all Canadian Forces food services personnel on safe and correct food handling procedures.

To quote further from the Canadian Food Journal:

> ***"Only a moderate percentage of food poisoning cases occur in restaurants. Food processors, distributors, cattle breeders, dairy and vegetable farmers, and others, also contribute to the increasing misadventures."***

We too, have occasional trouble with our food supplies. However, the point here is that, after careful preparation, it is equally important that the food receive care in transporting to, and handling aboard the aircraft. In relation to flight feeding, the others include flight crew, air movements and fleet servicing personnel. They must share with food service staffs the responsibility for ensuring flight meals and between-meal snacks are wholesome and safe for consumption. Close attention to these practices is necessary:

- ***Transfer flight meals from food services to the aircraft as quickly and as close to flight departure time as possible***
- ***Stow flight meals in the correct galley area or, in aircraft lacking galleys, in the coolest section of the aircraft available***
- ***Use the insulated food carriers authorized by RCAF CAP 601, Scale A36***
- ***Return or discard all food at end of flight or following the period for which it was provided***
- ***Never consume it after the flight or on the next day's trip***
- ***Select carefully all food procured from civilian sources en route***
- ***Wash hands with soap and water, whenever possible, before eating; otherwise use the solvent-impregnated towelettes. Persons with sores, boils, or infections must not enter the food preparation area. The personal cleanliness of the crew member responsible for food service aboard the aircraft is of urgent concern***
- ***Order flight meals 24 hours (or the maximum time possible) in advance of requirement. Immediately notify Food Services of cancelled or delayed flight meal issues***
- ***Discuss problems with the officer or NCO in charge of Food Services and the flight safety officer.***

Every aspect of flight meal production and handling requires careful attention. A coordinated effort is essential to the provision of safe and appetizing flight meals.

On the other counts, and with specific reference to Flight Comment's statement concerning "the availability of good meals in the mess halls for the traveller who lands after the 1815 meal-hour closing", the Food Service organization willingly cooperates with air movements, base administration and aircrews in providing the required service whenever possible. Again, this takes continual coordination plus cooperation and goodwill.

Kitchens and dining rooms are manned by persons as anxious as any other group to get home at the end of the day's work. With this day ending about 1930 hours for the late shift, it is usually imperative that they not miss their bus or car pool departures; transportation is hard to come by and the time is brief between then and early shift duty at 0630 hours the next morning. Consider, too, the many occasions when overtime is mandatory for special functions, unit parties, exercises, and emergencies. Other work forces also contend with emergencies entailing additional effort, but food services staffs are among those with a lion's share of the overtime.

Too often the dining facilities are kept open but the aircraft crew, already adequately fed during the flight, decide to have a drink and go to bed. No one appears in the dining room and no one bothers to tell the cook he can also call it a day. We wonder – does the captain always check with the crew and passengers whether or not they are going to use the facilities before he requests they remain open? If there is a snack bar at the hangar line or near the quarters would it not be adequate? Is an honest attempt always made to give the Food Services section advance information about meal requirements so that staff and food supplies can be arranged to handle the situation? How often do operational staffs sit down and discuss their food requirements with the Base Administration, the Food Services Officer or the Senior NCO cook?

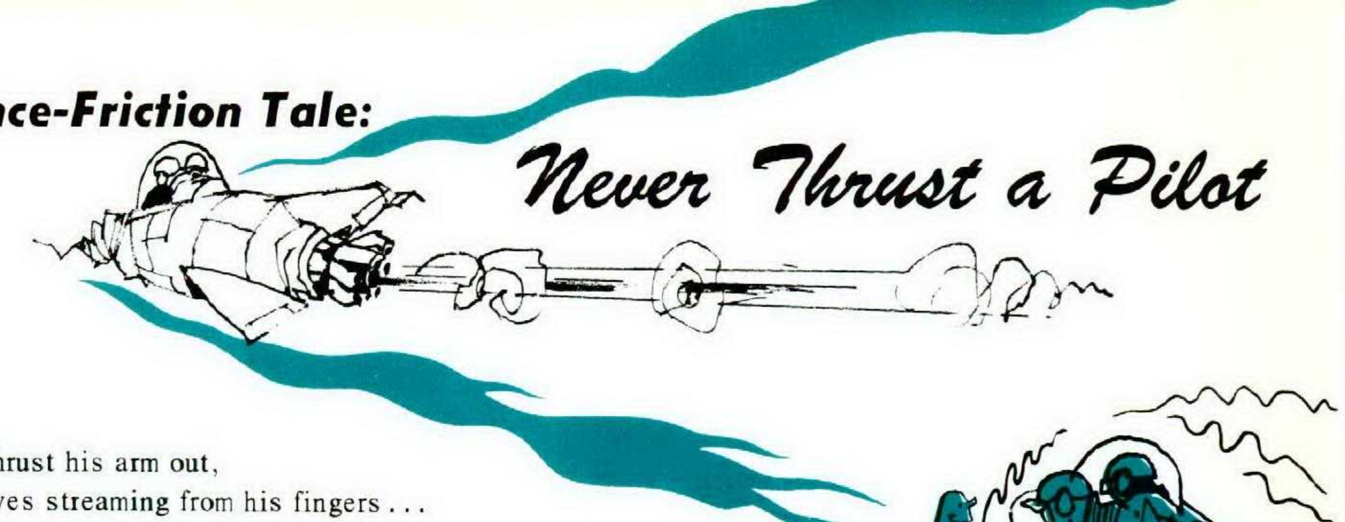
Any justifiable complaint or reasonable request concerning meals and their service receives careful attention. There is a Directorate of Food Services at CFHQ, Staff Officers of Food Service at each Command Headquarters, and Food Service Officers or Snr NCO cooks at bases and units. At all levels, we strive to feed you well and graciously. With your cooperation and goodwill, our "modern day knights" should not be subject to "inadequate or unsatisfactory meals". ■

S/L Galbraith, a graduate of McGill University, completed her dietetic internship at the university of Oregon Medical School, and after several years' commercial experience in food services joined the RCAF in 1952. She served as food services officer at Aylmer, Clinton, and 3 Wing at Zweibrucken.

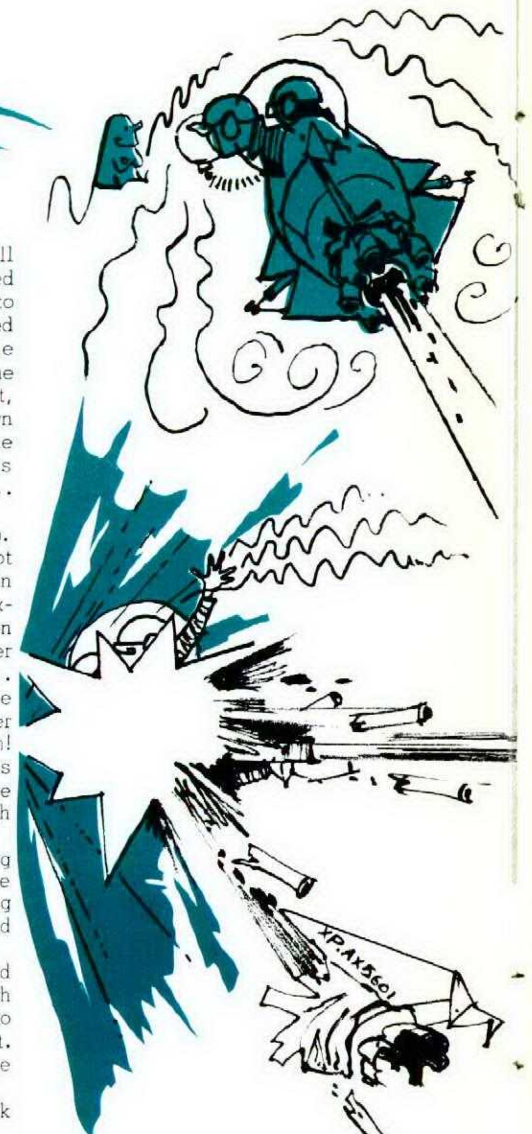
In 1957 S/L Galbraith was transferred to AFHQ as flight feeding staff officer where she was employed in the development of flight ration and equipment scales. S/L Galbraith was instrumental in the designing of galleys of a number of current aircraft, and in the introduction of women flight attendants. Flight feeding remains one of her primary responsibilities in the integrated Directorate of Food Services at CFHQ.

A Science-Friction Tale:

Never Thrust a Pilot



Quickly he thrust his arm out,
the shockwaves streaming from his fingers . . .



We were slipping smoothly through the air at 540 mph. I'd always liked the little XP-AX5601-NG with her simple controls and that Prandtl-Reynolds meter tucked away in the upper right corner of the panel. I checked over the gauges: water, fuel, rpm, Carnot efficiency, groundspeed, enthalpy – all OK. Course 270°. Combustion efficiency normal at 23 percent. The old jet was rumbling along as smoothly as always; Tony's teeth were barely clattering from the 17 buckets she'd thrown over Toronto. Only a small stream of oil was leaking from the power module.

This was the life.

I knew the engine was good for more speed than we'd ever tried. The weather was so fair, the sky so blue, the air so smooth, I couldn't resist letting her out a little. I inched the throttle forward a notch. The regulator hunted a trifle then steadied after five minutes or so. At 590 mph I pushed the throttle again. Only two nozzles clogged up – I pushed the small-slot cleaner. Open some more – 640 mph. Smooth. The tailpipe was hardly buckled at all; there were still several square inches open on one side. Itchy fingers pushed the throttle again. She worked up to 690 mph, passing through the shaft critical without breaking a single window in the craft. The cockpit was warming up so I gave the vortex refrigerator a little more air. Mach 0.9! I'd never been that fast before. I could see a little shocklet through the port window so I adjusted the wing shape and it disappeared.

Tony was dozing now. I missed the smoke from his pipe. I couldn't resist letting the ship out one more notch. In ten minutes flat we levelled off at mach 0.95. Back in the combustion chambers the total pressure was rapidly falling. This was the life! The Karman indicator showed red but I didn't give a damn.

Dizzy with the thrill – just a little more! As I grasped the throttle Tony stretched and his knee struck my arm. The throttle jumped a full ten degrees! Kaboom! The little ship shuddered from stem to stern. Tony and I were thrown into the panel by the terrific decelleration. We seemed to have struck a solid brick wall! I could see the nose of the ship was crushed. I looked at the machmeter and froze – 1.00! My God, I thought, we're on the peak! If I don't get her slowed down before she slips over, we'll be caught in the reverse power curve of decreasing drag. It was too late – mach 1.01 . . . 1.04 . . . 1.09 . . . 1.13 . . . 1.18!

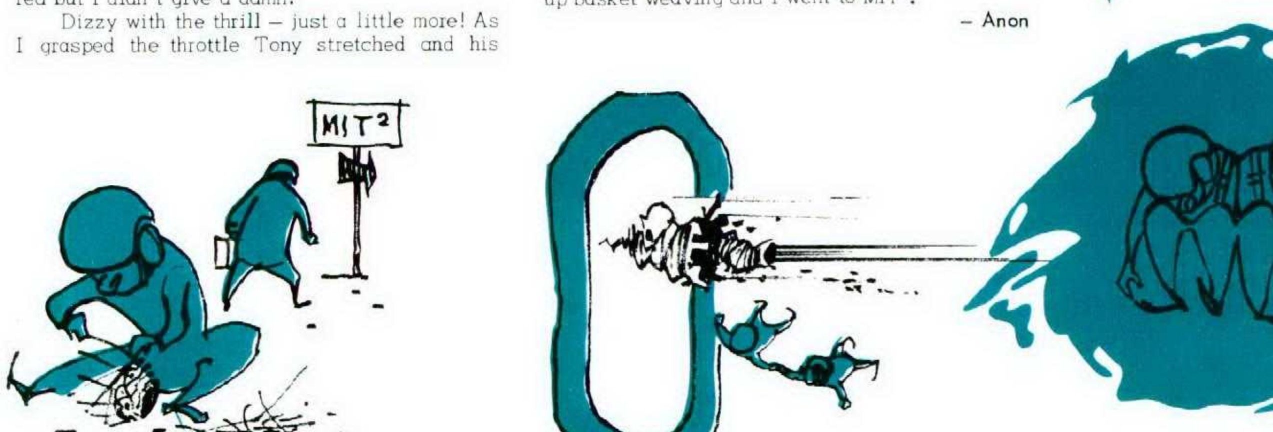
I was desperate but Tony knew what to do. In a flash he threw the engine into reverse! Hot air rushed into the tailpipe, was compressed in the turbine, debusted in the chambers, and expanded out through the compressor. Fuel began flowing back into the tanks. The entropy meter swung full negative. Mach 1.20 . . . 1.19 . . . 1.18 . . . we were saved. She crept back, she inched back. Tony and I prayed the flow divider wouldn't stick. 1.10 . . . 1.08 . . . 1.05. Kaboom! We had struck the other side of the barrier! As we cringed against the firewall, the tail of the little ship collapsed. Trapped! Not enough negative thrust to break back through.

Tony shouted "Fire the JATO", forgetting they were turned the wrong way! Quickly he thrust his arm out, the shockwaves streaming from his fingers, and rotated them forward. I fired them! The effect was stunning. We blacked out.

I came to as our gallant little ship, ruptured from stem to stern, was just passing through mach zero. I pulled Tony out and we slumped to the ground. The ship decellerated off to the east. A few seconds later we heard the crash as she hit the other wall.

They never found a single screw. Tony took up basket weaving and I went to MIT².

– Anon



On the Dials

In this column we hope to spread a little new gen and try to answer your questions.

And we do get questions. Our staff members in their travels are often faced with, "Hey, you're a UICP, what about such-and-such?" Rarely is it a problem that can be answered out of hand. If it were that easy the question wouldn't have been asked in the first place. The required answer is often found only after some research and consultation. Also, often the follow-up of a particular question reveals aspects which would be of general interest to all airframe jockeys. We hope to answer this type of question, and any can of worms opened up in the process can be sorted out for everyone's edification.

Any questions, suggestions, or rebuttals will be happily entertained and if not answered in print we shall attempt to give a personal answer. Please direct any communications to the Commander, CANFORBASE Winnipeg, Westwin, Manitoba, Attention: UICP Flight.

Area control, already in use for some time in the Northern Control Area, is now in effect in the recently-designated Southern Control Area. This means some changes in separation; all pilots should be aware of these. We hope that the few points mentioned here will enlighten those who have not had the opportunity to read Class II NOTAM 8/66, 16 May 66. Quotes from this notam will be used.

High Level Airways previously had specific lateral dimensions but are now depicted as specified tracks between navigational aids, with no lateral dimensions. Lateral airspace protection, although not depicted on the High Level En Route FLIPS, is provided within specific limits. For exact figures reference should be made to Class II NOTAM 8/66. Generally speaking, the lateral airspace protection is:

- High Level Airway sections of 500 miles or less – protection is given from a minimum of 5 nm either side of track at the navigational aid out to a maximum of 20 nm either side of track. The angle at which the protected area increases both sides of track depends upon the aid being used for track guidance and varies from 7½° (Fig 1) to 8½° (Fig 2).

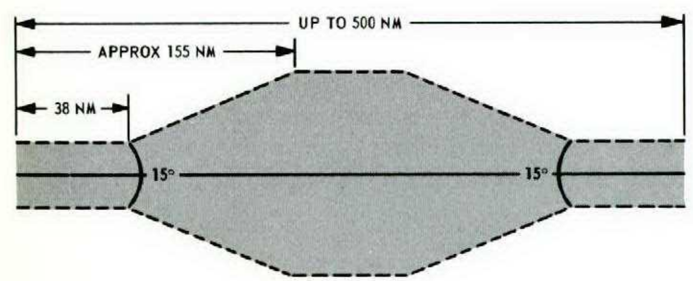


Figure 1

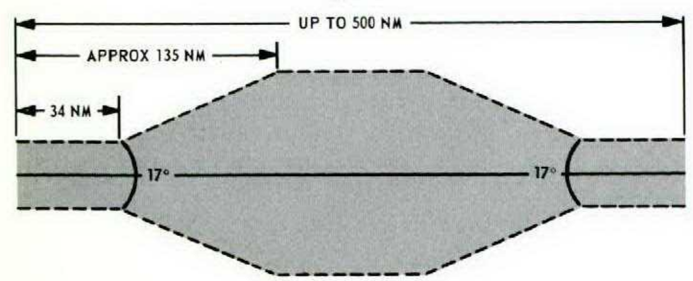


Figure 2

- Other than High Level Airways where facilities are 500 miles or less apart – protection is provided in the same manner, except that the protected area always increases at an 8½° angle either side of track.
- Facilities more than 500 miles apart and/or tracks to geographical reference points – 45 nm protection either side of the entire approved track is provided.

Additional airspace is provided on the manoeuvring side of track for turns of more than 15 degrees overhead navigational aids and intersections.

The points to be stressed as a result of these lateral separation changes are:

- It is the pilot's responsibility to remain on the approved track in order to be assured of adequate lateral separation from other air traffic.
- Normally, the airspace to be protected for any approved track is assigned assuming the change-over from one navigation reference to another will take place approximately midway between facilities. ■

Ground Handling

The consensus of the meeting was that the calibre of ground handling and marshalling of aircraft has deteriorated and is in need of improvement. Too often inexperienced persons are sent out to marshall aircraft and do not know exactly what is expected of them. Ground handling equipment is often late in arriving . . .

– ***Flight Safety Committee minutes***

IMPACT SURVIVAL

F/L W Tytula
CFHQ

...Restraint devices – too often the product of piecemeal engineering, installation, and modification – have been in an administrative backwater...

"In general, safety harness is designed to prevent personnel from becoming detached from an aircraft while in flight. During level, steady flight in the normal attitude of the aircraft, such personnel would be retained in their normal positions by the force of gravity; due to the change in direction, the force of gravity may no longer be sufficient to restrain the personnel from becoming detached . . .

In the case of a crash, pilots' belts must withstand the sudden force placed on the belts in a forward direction. Since he must retain control of that aircraft until the last possible moment and cannot therefore protect himself with his arms, as can other members of the crew who will have been forewarned, so allowing them to relieve the force on their belts. It is estimated that such a sudden force due to deceleration would be approximately 7 Gs . . ."

The paragraphs above are extracts from a Canadian official military document printed in 1966. The concepts outlined reflect an attitude towards restraint systems that have been prevalent in commercial and military flying for some time. Today, a reappraisal or at least a re-definition of these concepts is necessary. The inescapable fact is that passenger restraint systems are the predominant causes of injuries and fatalities in potentially survivable aircraft crashes.

Impact survival depends basically on:

- the cabin remaining sufficiently intact to provide survival space.
- the passenger must be protected from striking objects in his immediate environment.
- the crash forces transmitted to the passenger must not exceed human G tolerance.

Today's pressurized aircraft require a very rugged fuselage; combined with the usual low-wing configuration there is potentially good protection against cabin crushing and disintegration.

If he is to survive, a passenger will inevitably be exposed to deceleration and linear forces similar to those undergone by the aircraft structure. The difficult problem here is to decelerate the body within the limits of human G tolerance and at the same time retain him in the immediate survival environment. A spring-loaded seat belt, for example, might gently decelerate the passenger but at the cost of crushing him against the seat in front!

Passenger restraint by seat harness is nothing new but there is evidence that harness designers have evolved devices whose strength far exceeds the framework to which they are attached. A similar hazardous imbalance occurred during the early days of automobile seat belts. The passenger tie-down chain – seat belt, seat, seat tie-down, and the floor – is as strong as its weakest link, and must therefore be engineered as a complete unit.

Most fatalities and injuries occur from failure of the passenger tie-down system. Specifications for commercial aircraft are contained in two documents. These standards, to which most US civil aircraft are built vary slightly:

	CAM 4b	NAS 809
Forward	9G	9G
Upward	2G	2G
Sideward	1.5G	3G
Downward	4.5G	6G

The USAF specifications include a 16G rearward-facing seat requirement. Today, many of the seats now in use in the RCAF have been built to one of the commercial specifications above.

The restraint device may fail in two ways. If it separates from the floor, the passenger in accordance with the laws of physics, moves smartly to the front of the cabin to almost certain death or serious injury. The passenger may be restrained on impact, but the restraint devices may bend, twist, or stretch, permitting the passenger to injure himself on some object near him.

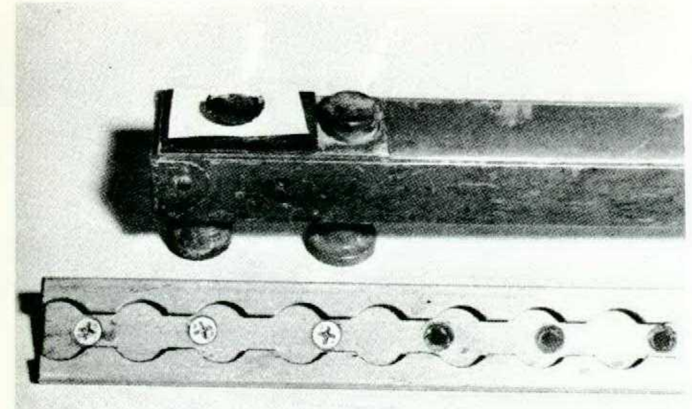
There are areas that are prone to failure; it is not surprising that these exist where one link in the restraint chain is attached to another:

Seat Tie-Down Failures

We employ several commonly used commercial tie-down systems. A favourite is the track system which permits quick installation of seats.

Some RCAF aircraft employ single point tie-downs like the one used in the Dakota – the Wedgit.

Most seats have little lateral strength (1.5 to 3G), and seat legs will readily bend sideways placing a large prying load on the track and particularly on the tie-down buttons. Both of these components are of non-ductile metal and will fail suddenly and completely if their load limits are exceeded.



Typical anchorage failure. Button failure (solid arrow) as a result of side load. This type of seat anchorage has low resistance against floor distortion and/or bending of the seat legs. The dotted arrow indicates the locking pin which engages the floor track to prevent fore and aft movement of the seat.

Seat Failures

The chair structure itself usually fails at the welds, or at the seat-belt attachment points, or by lateral buckling of the legs. In these cases the seat itself may be the weak link in the restraint chain.

Ideally, the seat must not only withstand impact forces protecting its occupant but must not, in turn, injure another passenger. The seat ahead has proven to be a hazardous obstruction. A poorly-designed restraint harness may permit a passenger to strike his head or chest on some unpadded or rigid part of the seat in front of him. Of course, a loosely-buckled seat belt will nullify the designer's best efforts.

Legs (handy things to have for hasty evacuation) need protecting. Inertia will force the legs to swing forward but must not be permitted to strike a rigid or non-padded component of the seat ahead. Proper padding of seats, the use of ductile materials, and designing the seat to fold forward at 2.5Gs and have the passenger still clear the seat in front, would reduce the many injuries now being inflicted.

Can we increase our chances of impact survival? A very fruitful area in achieving increased safety is a hard critical look at today's underdesigned seat. Most seats now in service were designed to the then-known G tolerances of humans. Notoriously intolerant on occasion, human beings have surprisingly high tolerance for brief periods of high G. We can tolerate 45 forward G for 1/10 of a second or 25 forward G for 1/5 of a second, and 25 G downwards for one tenth of a second. At these values minor injuries are almost certain but should not impair an escapee's chances of survival. This information indicates a sizeable increase in the strength of the entire tie-down network.

The introduction of new equipment involves money. A seat to withstand 25 G would be not only heavy but costly. Our challenge is in the design and procurement of acceptable compromises. Refitment of existing aircraft may be prohibitively expensive; it is better to strive for equipment of a new order for the aircraft now being procured. The future belongs to the planners and purchasers.

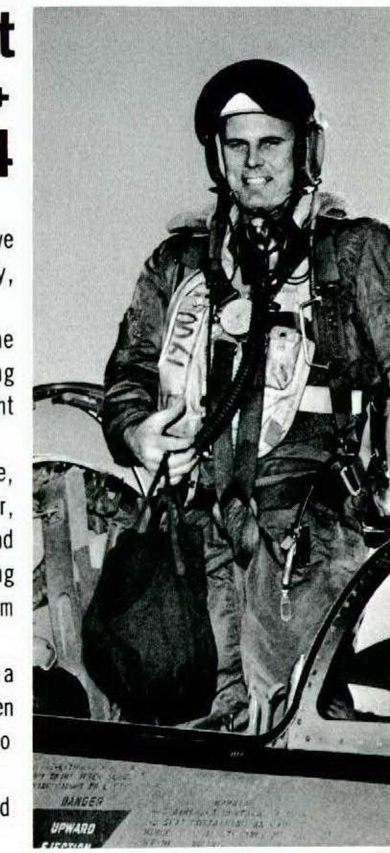
CFHQ and MATCOM, in addition to reviewing all new procurements of seat systems in the light of latest scientific knowledge, are now attempting to standardize all safety harnesses. This will eliminate the multiplicity of equipment presently in use and may bring to light unsatisfactory indiscriminate use of seats and belts. (The Dakota, over its long history has an almost unbelievable variety of seat and belt installations, often employing any equipment that could be found handy at the time.) This review of the fleet is more than half finished, and includes the necessary paperwork to actually bring about the improvements.

Can improvements be made to existing equipment? Here's a check list of trouble spots:

1. Tie-down fittings can be inspected to ensure all are serviceable.
2. Seat belts checked to ensure proper webbing with proper buckles.
3. Shoulder harnesses available for all crew members.
4. Use only approved seats built for that aircraft.
5. Discourage unauthorized seat repairs.
6. Avoid using forward-facing seats in a rear-facing position.

Your contribution is vital. Look around and if your appraisal of equipment isn't flattering, take corrective action: submit a UCR and ensure that flight safety authorities are made aware of any shortcomings. ■

Cold Lake Pilot Flies 1000+ hours in 104



A smiling F/L Howie Rowe climbed out of a CF104 recently, with 1000 hours in the bird.

Now maintenance test pilot, he has multi hours as a 104 flying instructor and was previously flight commander of "A" flight.

In his six years at Cold Lake, F/L Rowe has been PMQ mayor, and is chief flying instructor and manager of the Cold Lake Flying club. Private flying has given him experience on 15 more aircraft.

Another accomplishment was a record-breaking flight in 1960 when he piloted a T33 from Toronto to Montreal in 24 minutes.

Congratulations on that grand total, F/L Rowe.

Practice Crash

An order previously released prohibiting practice engine failures below 500 feet in the Otter, had somehow been either mislaid or lost. The restriction had not been incorporated in this unit's flying orders; one day, an instructor decided to chop power on a student to simulate an engine failure at 200 feet after takeoff. What ensued was painful substantiation for the wisdom of the order.

The student at the controls misjudged, rounded out too high, sensed his predicament and applied power to halt a developing rapid rate of descent. The engine failed to respond in time and another aircraft was unnecessarily badly damaged.

Overstressed Otter at rest.

Food For Thought

The Sixteenth Annual Survey of Research Projects in the Field of Aviation Safety, of the Cornell-Guggenheim Aviation Safety Centre – items:

A modified fuel which will not burn explosively is the most striking potential development to eliminate the hazard of crash fire. "Tragic accidents have shown that outside assistance is usually not available within the critical minutes before fires become lethal," the survey notes. "Research is underway on suppression of ignition sources, containment of fuel under impact conditions, and fast acting extinguishants."

There is a need for research to determine why highly trained and motivated aircrews with the most modern equipment, commit errors that result in accidents. "Variation in aircrew discipline and efficiency caused by environmental and social factors, along with improved monitoring should be considered. This should be approached as a research project, and not in any case as a disciplinary investigation."

Intensify development on airborne collision warning devices to anticipate increased congestion.

Cost effectiveness analysis should be encouraged to support adoption of safety developments.

(The Cornell-Guggenheim Aviation Safety Centre was established in 1950 to foster improvements of aviation safety through research, education, training and dissemination of safety studies to the industry and of air safety information to the general public. Its ultimate objective is to make flying the safest form of transportation.)

SINKING FEELING

Having landed at a civil airport in Canada the pilot of a loaded Herc was given taxi clearance and complied.

Imagine his distress on finding the aircraft literally sinking into the ground!

Looks like the airport operators don't know the strengths of their own taxiways and hard-stands.

Brakes vs Tires

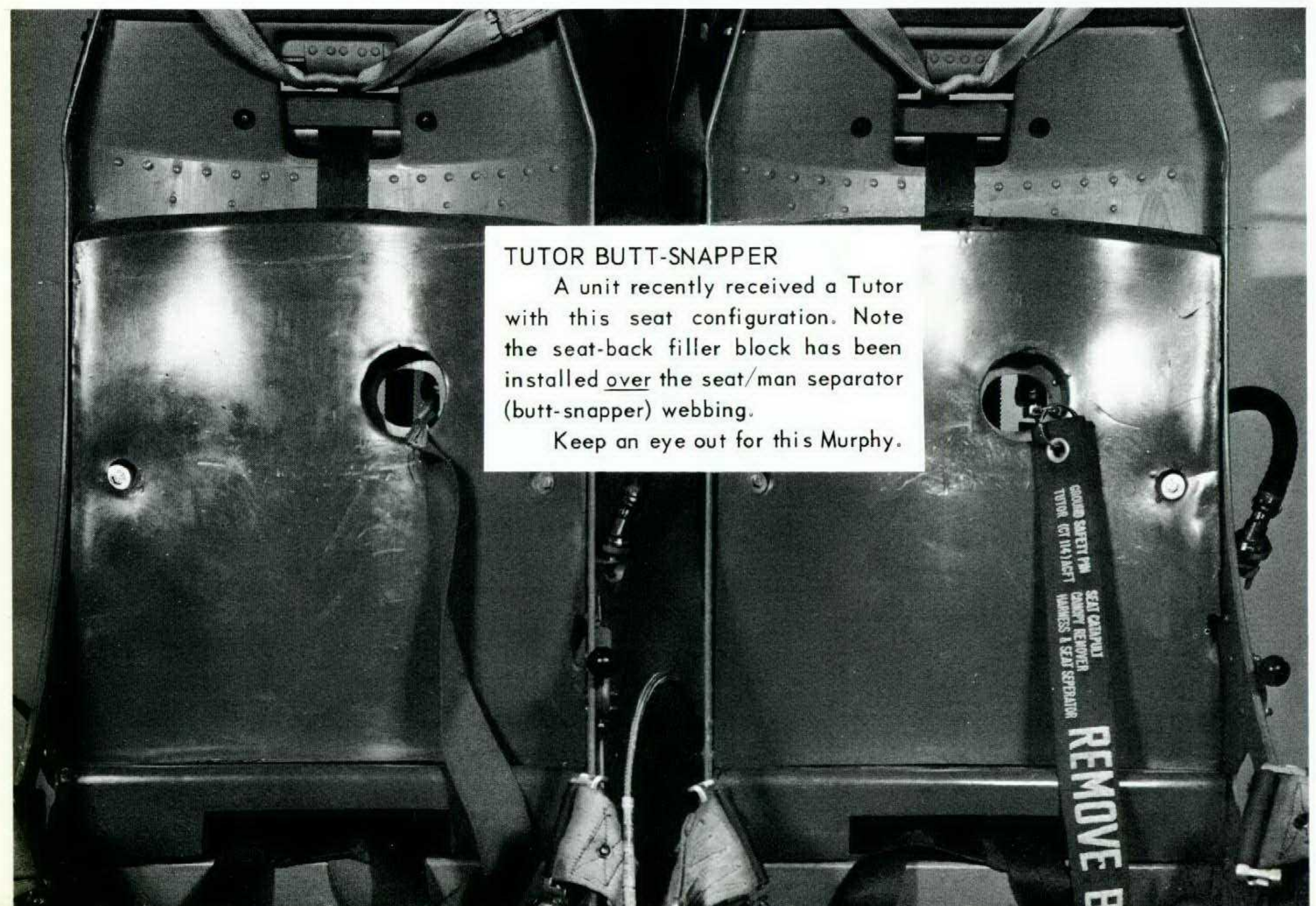
The aircraft rounded out 20 kts too fast from a very steep approach off a TACAN. Full left rudder was applied to compensate for a 15 mph crosswind. The starboard gear touched but in addition to full left rudder the pilot inadvertently applied brake. The result is seen here – all four tires on the port gear blew.

Will they take it? No they won't.

FOD Avoidance

The flight safety officer stated that the least amount of stones and FOD is near the centre of the runways and taxiways, and that pilots whenever possible should attempt to land using the centre of the runway and should taxi back using the painted centre line . . .

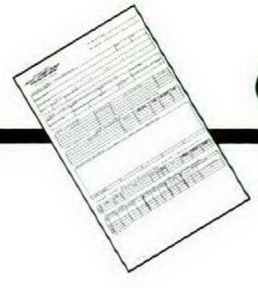
– Flight Safety Committee Minutes



TUTOR BUTT-SNAPPER

A unit recently received a Tutor with this seat configuration. Note the seat-back filler block has been installed <u>over</u> the seat/man separator (butt-snapper) webbing.

Keep an eye out for this Murphy.



Gen from Two-Ten

COSMO, NO BRAKES The shearpins on the towbar broke. Out of control, the aircraft continued to roll, striking the hangar door with the wingtip. The airman riding the controls called for emergency braking but it was inoperative.

What emerges out of the investigation is that insufficient briefing had been given to the tow crew, plus the absence of an NCO as required in EO 00-50-19.

ARGUS, BURST FUEL CELLS The aircraft was at a contractor's plant for depot inspection and repairs. Fuel cells had been reinstalled and a leak check was required. This check is specified by a work card which in turn refers to an EO outlining the correct testing procedures. The technician assigned to carry out the check on the starboard wing had carried out previous leak checks on individual cells; the work cards were not used.

A pressure line was connected to the forward fuel cell vent line in number 4 nacelle and a manometer connected to the FMCU vapour return line. Air pressure of about 50 psi was then applied to the system. Before any movement in the manometer occurred three loud bangs were heard. Major wing components were torn and the number one fuel cell had burst.

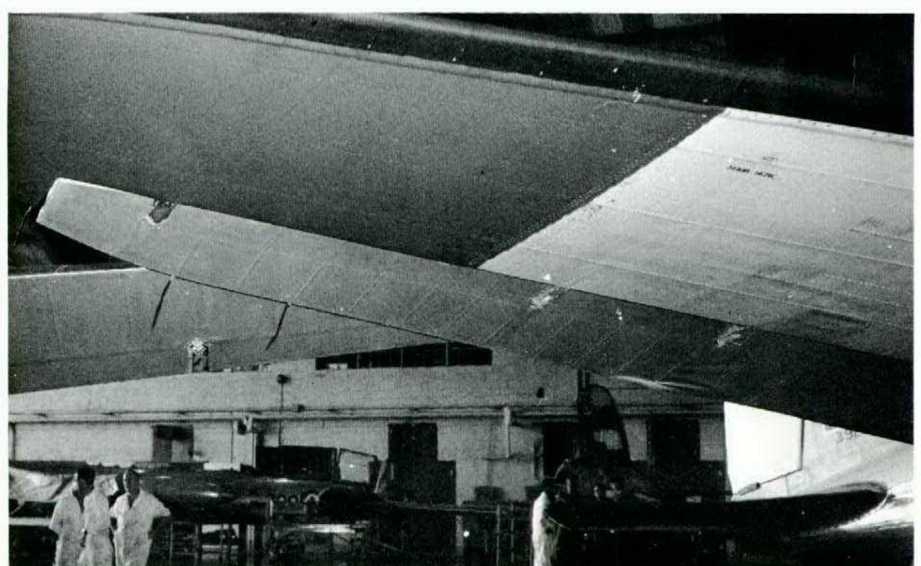
Extensive and costly damage to an aircraft resulted from a technician reversing the connections, ie, the manometer and the pressure lines – an error made possible by not referring to EOs although these were readily available.

L19, EMERGENCY LANDING The pilot, having been warned of dangerous hail-bearing thunderstorms in the area wisely elected to seek an emergency landing ground when confronted by an approaching storm.

He reconnoitred one field finding it unsatisfactory but returned to it as the best of several others he inspected. He attempted a landing from the *opposite* direction of his earlier inspection flight; as his main wheels touched he bounced and attempted to overshoot. In doing so he omitted an essential step – raising flaps from 60° landing position to the 30° takeoff position. Consequently, the aircraft failed to climb striking the top of a fence at the end of the field. The sudden descent initiated by the fence inflicted the damage seen in the photo.

In addition to poor pilot technique and judgement, insufficient use was made of weather briefing facilities.

DAKOTA, WIND DING A gust of wind entering a double-ended hangar blew one Dakota into another damaging the ailerons on both aircraft. The doors at one end were wide open and inoperative; when the other doors were opened to move an aircraft a gust of wind did the damage. The winds reported were 14 mph gusting to 20. The station's weather warning limit is double this figure; if aircraft are going to be damaged at 20 mph, 40 mph is too late a warning.



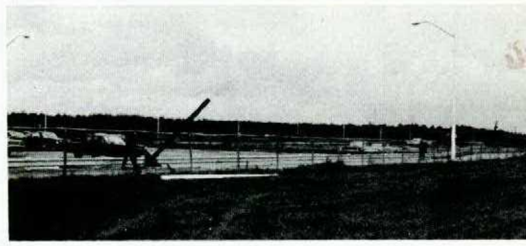
OTTER, NOSE-UP ON LANDING After stopping for lunch at a small airport between departure and destination the two pilots decided to do a few circuits before resuming the journey. The takeoff was eneventful; the wind was down the runway although strong and gusty.

On the first (and last) approach with landing flaps down the aircraft touched nicely with no bounce. About 50 feet later, the starboard wing began to rise and could not be controlled. Despite vigorous opposite controls being applied (including an inadvisable burst of power "to regain control") the aircraft groundlooped and wound up with its tail up. With these wind conditions and full flap it was understandable that a crosswind gust would initiate an out-of-control wing rise.

The full-flap wind condition limitations appear in EO 05-100A-1, page 50.

HERCULES, HITS LAMPPOST The aircraft landed at another base following a paradrop. While taxiing, the aircraft struck a lamp standard erected to illuminate a parking lot. The concrete post was knocked over as the port wing struck it about five feet from the tip. The pilot claimed that brilliant sunlight coming from near the horizon made the unmarked pole invisible.

Apparently this pilot will be the last to have the opportunity of striking these poles. The other post will be removed as it is deemed an obstruction.



T33, GENERATOR FAILURE With a full fuel load on board, the aircraft lifted off and the pilot selected flaps and undercarriage up. Both pilots then observed the generator off warning light and the loadmeter reading zero. The generator switch in both cockpits checked on and all other breakers and battery switches were checked on. Electrical services were immediately switched off and an emergency declared.

Up to this point the captain was in a good position to cope with the emergency. Although having limited recent experience on the bird he correctly elected to remain beneath the 4000-foot overcast and burn off fuel. Five minutes later his battery was dead; no further transmissions were heard. The pilot, who had earlier requested advice, was now on his own.

In the meantime the pilot performed a limited control check down to 165 kts. The nagging problem was: when to land? While in radio contact he had discussed briefly the possibility of dropping his tanks (which is not recommended in AOIs) and the need to comply with the EO to land "as soon as possible" after a generator failure.

With 550 gallons on board the pilot elected to made a full stop approach. With a good runway, he reasoned, and a touchdown speed of 155 kts flapless, there should be little difficulty in confining the landing roll to the runway length. He miscalculated on two points:

The 30-degree takeoff flap was still in position; the flap position indicator was inoperative.

With that fuel load and 155 kts his landing roll would be close to the limit of the runway length.

The port main wheel blew on touchdown and the aircraft continued to float far longer than the pilot had expected. A slight porpoising was experienced but with the throttle at idle the pilot ruled out an overshoot attempt. The aircraft came to a stop 50 feet off the runway's end, cutting both runway barriers with the wheels – now without tires. The main wheels which had been on fire while the aircraft was in motion, were still smoking, creating a fire hazard. The canopy was blown externally to assist the rescue of the aircrew.

After the smoke had cleared and the paper-work processed, the consensus emerging was that the pilot was involved in a serious error in judgement.

But why, we ask, was the pilot denied the opportunity for combatting this emergency? The generator circuit breaker is inaccessible in flight – at this late date a fix is underway to enable the pilot to attempt to regain electrical power.

In the T33, loss of the generator poses a serious inflight hazard in poor weather. We know that random transitory overloads can trip the circuit breaker – it's of little use back there in the plenum chamber.

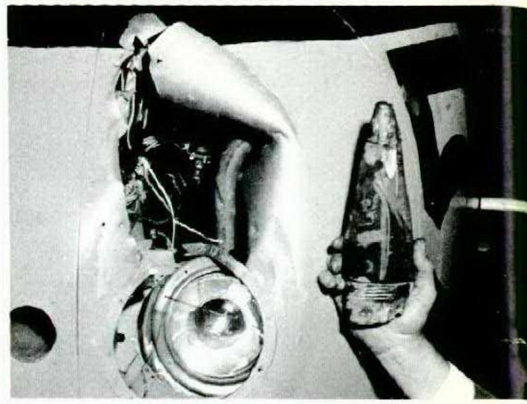
TRACKER, ROCKET RICOCHET

Following rocket release the pilot executed "a rather smooth level-off", followed by a 30° bank climbing turn. At that moment the aircraft was hit on the nose section by the rocket head causing very extensive damage to instruments and wiring. The pilot returned to base where fortunately the aircraft was landed safely although the elevator control was nearly jammed. The pilot was drenched with hydraulic fluid.

The "isolated" occurrence was inevitable; a previous rocket strike less than two years before had prompted introduction of a higher rocket release altitude. Actually, the rocket was released 200 feet below the minimum, followed by a very leisurely pullout and escape manoeuver.

So it's back to the regulations.

(The range itself was fouled by remnants of metal targets which have since been removed.)



Comments – *to the editor*

F/L AF McDonald's letter to the editor (Flight Comment Jul-Aug 66) leaves the impression that only the CF101 aircraft performs a "deke" manoeuver when landing. This is not correct. A minimum of research through past issues of the USAF Interceptor magazine and a more authoritative magazine such as Astronautics and Aerospace Engineering (July 64) would confirm that all century-series jet aircraft – even the T33 – perform a deke manoeuver when landing from a GCA. Longer runways and improved training techniques for landing are ill-considered suggestions for eliminating the deke.

The deke itself is not new but it is only recently that the problems of the deke have begun to be recognized. The USAF, FAA and certain civilian companies have expended a considerable amount of time and effort conducting research into ways of eliminating or minimizing the problems of the deke. Positive results from part of this research were illustrated in an article in Aerospace Safety (Aug 66) entitled "The Greatest Thing Since the Wheel".

F/Ls Robinson and Murray would certainly agree with F/L McDonald's statement that built-in safety features are demanded in GCA. It was with this in mind that they proposed a change to GCA. Whether or not the 2-degree GCA glideslope will provide an adequate solution for the deke remains to be seen; however, any serious proposal should not be dismissed lightly. Flight trials are being conducted on a 2-degree glideslope and when the results are assessed any real or apparent limitations will be known.

Finally, this writer must also agree with F/Ls Robinson and Murray on the subject of airfield approach lighting. There has been little visual improvement in these systems at a majority of RCAF airfields during the past ten years or more. Of all the modern systems available, sequenced center-line strobe beacon lights appear to meet a majority of the operational requirements. It is hoped that only the hard facts of economics prevents this worthwhile approach aid from being installed as soon as possible.

S/L DE Carney
CFB Chatham

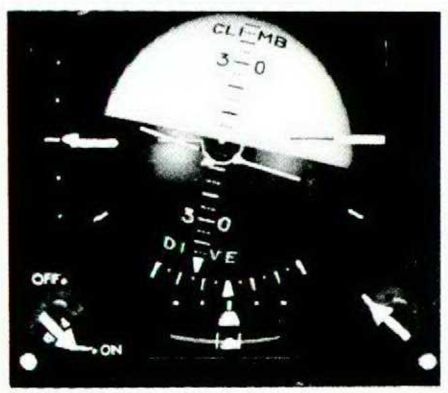
There seems to be agreement on the last point – see F/L McDonald's "Lighting and Limits" (Jan/Feb). ■

May I suggest that you reprint the lead illustration from the article, "The T Display" and ask the question, "Which way is the aircraft turning?"

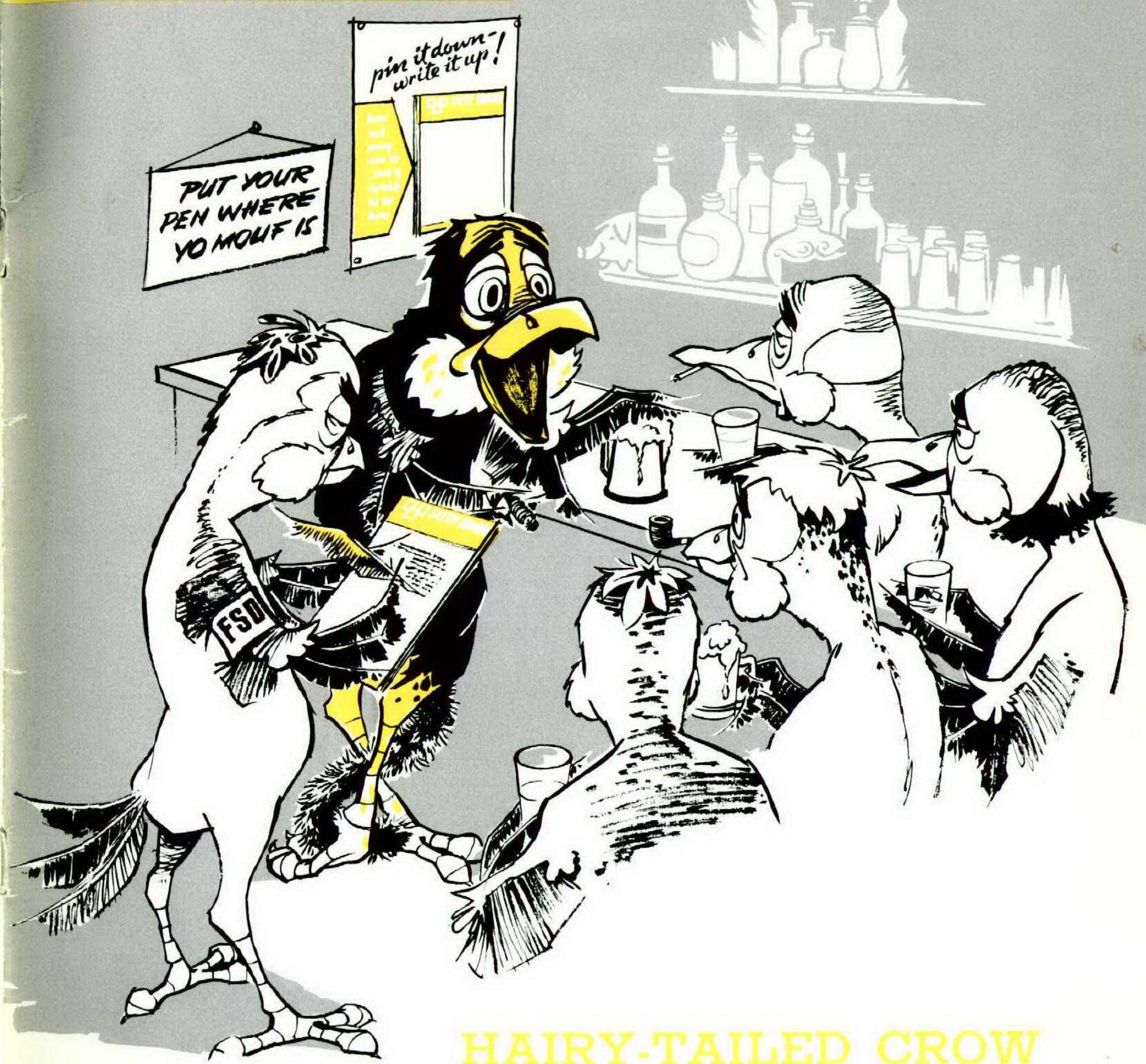
On a black night in the mad trap, an instrument like that I don't need.

LCDR TH Copeland
Shearwater NS

Agreed. The instrument, however, will have command info in colour. To add to the confusion the hangar photograph shows the toppled gyro indicating that the pilot has elected to turn left when commanded to go right. ■



BIRD WATCHERS' CORNER



HAIRY-TAILED CROW

This Crow is the safety bird's despair, but to his captivated audience he's the close-call raconteur without peer. At birdcall after the day's derring-do, a cry of piercing clarity rises above the clinking glasses, each utterance prefaced by "You think that was close—this morning, I . . .". Unfortunately, Crow's one great passion is anonymity. The hairy tale at an end, he withdraws; the lesson-laden account lingers momentarily in the smoky air then vanishes without a trace. During an occasional interval he regales the flock with lively variations of a favourite crow caw-ll:

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