FLIGHT COMMENT

MARCH · APRIL
1968

Comments

The article "The Shape of Things-to-come" in this issue is heartening news. The concept of "life-ing" powerplants, etc, has long been the only sensible substitute for monitoring the performance of aircraft components. But technical advances are here, and more are on the way. The present way is not only expensive but commits us to gamble that a part will not fail during its "life"-time. The airline which traded life-ing its engines for a computerized monitoring system claims substantial savings. Important, also, is the substantial increase in flight safety derived from the monitoring this program requires.

A base FOD Control Committee recently received a report that a refuelling tender had no fewer than 53 stones caught in the tread of one tire. And on a vehicle with 10 tires! The reason? – this vehicle is parked on a gravel lot behind the MSE section. We're pleased with the progress of these FOD Committees and sympathize with what must seem to them at times a conspiracy to commit FOD!

A jet engine with "most of the turbine blades marked by what we believe to have been small stones 1/8 inch in diameter" was duly noted following an inspection on an engine snag. In another section of the report appeared this observation: "Both runway sweepers have been unserviceable during a great part of the past month. One has been serviceable of late. The problem of FOD has decreased since the sweepers have come serviceable." Looks like an unserviceable sweeper is a real hazard to aircraft.

A pilot heard an unusual "clunk" noise in his aircraft prior to takeoff but continued the flight, anyway. This meant, that as a result of an unreported incident on the previous flight, the aircraft was flown with C category damage. Good fortune alone prevented additional damage. This pilot could well have been heard to mutter, "I Wish I Had... checked that unusual noise".

Onto the ramp at a major airfield a transient aircraft crewman unceremoniously dumped his garbage consisting of box lunch remains and clean-up material. Neither the host station's FOD program nor bird control measures benefited from such a thoughtless act, which surely warrants a flight unsafety Bad Show award.

CANADIAN FORCES HEADQUARTERS — DIRECTORATE OF FLIGHT SAFETY

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SAFETY IN ATC

Since Air Transport Command is featured in this issue of Flight Comment, it seems appropriate that I should indicate some of the more important principles upon which our flight safety program is based. To most of you these principles will have a familiar ring, but in my view they cannot be re-stated too often.

In any military organization concern for safety must never inhibit the successful completion of the assigned wartime or emergency tasks. Nevertheless, safe operations – even in wartime – must always be an important consideration; to eliminate unnecessary risks is to preserve critical resources. I stress the word unnecessary, for although risk is inherent in many, if not most wartime operations, even under these conditions one must always estimate the degree and consequences of the risk. In so doing the acceptance of the risk becomes a conscious act, not the result of impulse or emotion. In peacetime operations the risk must always be minimal; in Air Transport Command our flight safety goal is zero accidents.

Flight Safety is not something that is the concern only of commanders and flight safety officers. A goal of zero accidents cannot be achieved unless everyone feels that he or she has a flight safety responsibility. A safe operation does not just happen; it is the result of a professional approach to every task associated with the operation. It occurs in organizations where everyone, whether he is a member of the operating crew or a section which provides technical and administrative support, does his job correctly the first time.

This professional approach can only be achieved when every supervisor (unit commanders, section heads, crew chiefs – in fact, everyone who is responsible for the work of others) develops an atmosphere in his group where an attitude of "good enough" is not good enough. Supervisors must develop a desire on everyone's part for improvement, not only in the safety record, but in the way in which each job is carried out. This desire is the essential element of any effective safety program; one that has the support of the personnel and is always active.

When a piece of equipment goes unserviceable, or an aircraft component does not operate within limits, someone somewhere has failed. It may have been the original designer or a worker in the manufacturing process, but more likely it is someone closer to the time of failure – an operator or a maintainer. Since accidents are usually the result of a series of failures (equipment and personnel) occurring in a short space of time, it is probable that the accident would not have occurred if only *one* of the failures had been prevented. Therefore, we must always, within the limits of our resources, try to identify who has failed – not to apportion blame but so that we may determine the action (the improved procedures, training, or supervision) which will prevent a recurrence.

Since Safety is everyone's business where does the officially appointed safety officer fit into the program? In my view his primary task is that of safety education and the source of expert advice in all aspects of a safety program. Without knowledge of trends, failure rates, modifications, as well as the lessons to be learned from others' experiences (such as can be gleaned from accident/incident and close-call reports), supervisors cannot make the kind of decisions that will ensure continued safe operations. The safety officer, although not always the source of this information, must ensure that a system exists in his unit to make this information available when it is needed. Also a safety officer must develop the kind of rapport with supervisors so that they will seek his assistance and special knowledge whenever there is a requirement for a safety survey, an investigation, or the preparation of a unit or section safety program.

In summary, then, Safety is the product of a professional attitude and it is the safety officer's job to do everything possible to assist in the development of this attitude in his unit.

AC Hull

AC HULL
AIR VICE-MARSHAL
COMMANDER AIR TRANSPORT COMMAND

AIR TRANSPORT COMMAND

—versatile and ready

ATC

S/L L Reid
SOFS/ATCHQ

"Air Force 305 – this is Mould Bay Radio, latest Mould Bay weather is sky partially obscured, visibility one-half in snow and blowing snow. Temperature is minus 31, dewpoint minus 20, wind 300 degrees true at 18 gusting to 27. Altimeter is 29.96. No other traffic reported; advise field in sight."

High above the frozen wasteland of the Canadian arctic a C130 Hercules' engines drone on. Its cavernous hold loaded with supplies, the aircraft is enroute to the remote outpost at Mould Bay. Located 1370 nautical miles north of Edmonton, Mould is one of many isolated northern bases that rely on the trusty "Hercs" – their lifeline of supply to the outside world. Spring and Fall re-supply operations are a familiar part of Air Transport Command's operations. Crews from 435 Squadron at Edmonton and 436 Squadron at Ottawa fly into these hostile climes – participants in Canada's pioneering venture into the great North. When we "Southerners" bask in an Indian Summer sun or dig the season's first divot, C130 crews can frequently be found matching wits with the Arctic's deepfreeze. For it is not uncommon to encounter winter blizzards at these destinations as early as September and again during the Arctic Spring. Anyone experienced in the rigors of operating aircraft under these conditions will readily sympathize with the crews who fly the North.

Meanwhile, 2300 miles to the south a search-and-rescue Albatross from 103 Rescue Unit at Greenwood, Nova Scotia, patrols the monotonous coastline of south-eastern Newfoundland searching for a missing trawler. In answer to an alert from the Atlantic Area Rescue Co-ordination Centre in Halifax, the Albatross and crew are part of a concentrated effort to locate the overdue vessel. Now in its second day the search will continue until all possible avenues have been explored. To the men in the aircraft this is another of many similar missions that they are called upon to undertake throughout the year in support of ATC's Search and Rescue role. From 1 May to 31 Oct last year for example, this particular Rescue Unit flew 790 hours on Search and Rescue patrol duty.

Earlier the same day a CH113 Labrador helicopter from another ATC unit removed a stricken Indian from a remote hamlet in northern Ontario. The pick-up and return flight to a medical centre required detailed planning, for the flight had been conducted under conditions that were far from ideal. The crew's reward for their efforts was the knowledge that this rescue had saved the trapper's life.

To many servicemen – and probably to a large percent of Canadians – the image of Air Transport Command is one of glamorous flights to inviting foreign destinations. It is true that in living up to its motto of *Versatile and Ready* ATC aircraft can usually be found in all corners of the world. Nevertheless, the foregoing accounts show that exotic excursions to far-away pleasure spots are not a part of the regular fare. Indeed, of the 100,000 hours flown annually by the aircraft of this Command, many are spent on difficult and often tedious flights similar to those described.

The primary role of Air Transport Command lies in its capability to react quickly and effectively in response to any emergency situation; the entire operation of the Command is premised on this requirement. Every operation conducted is in fact an extension of our training to support this commitment. ATC participation in support of United Nations operations in Cyprus is a good example of our reflex capability in action. *Flexibility* then, becomes a keyword in our way of life.

The parliamentary White Paper on Defence (1964) described the Canadian Forces basic raison d'etre – "It is essential that a nation's diplomacy be backed by adequate and flexible military forces to permit participation in collective security and peace-keeping, and to be ready for crises should they arise". In this context, Air Transport Command has been assigned five distinct tasks in addition to its primary function. Briefly, these additional tasks are:

Air Transport Flying Standards ATC is responsible for the monitoring and standardization of all RCAF aircrew – both Regular and Auxiliary – involved in transport, communications, and search and rescue flying. To perform this function the Aircrew Standards Unit was formed in 1955. An ASU aircrew team visits annually, every flying unit in the command. The team checks and reports on the progress of the flying unit's continuation training program, it examines and reports on the flying safety program, and it makes recommendations on all matters directly associated with improvement of operational efficiency and safety of operations within that unit. An ASU visit may be from three days (for an auxiliary squadron), to three weeks for a long-range transport squadron. In addition to these visits (about 20 annually), the ASU visits several other RCAF units as authorized and directed by CFHQ. Sixteen people make up this ATC unit; when they are not on the road they are based at CFB Trenton.

Joint Doctrine, Training and Operations Air Transport Command units train directly with the Regular and Militia ground forces on transport and tactical support exercises so that in an emergency the joint operation can be done with a minimum of delay. ATC's training hub is 4 (Transport) Operational Training Unit. Formed early in 1952 at

Lachine, near Montreal, it was first equipped with Dakotas and North Stars, and later with the C119 Flying Boxcar. The Stars and the C119s are retired, their places taken by the Cosmopolitan, Hercules and Yukon. The Caribou is a newcomer to the transport fleet and is currently in use at the OTU. The "workhorse" Dakota is, of course, still used in the medium transport training role.

During its sixteen years 4(T)OTU has trained 5500 men. In 1967 alone, 700 personnel were graduated from the 25 different courses that are currently being taught.

One of the more pleasant aspects of being an instructor at the OTU must lie in the training of Aeromedical Evacuation students. RCAF flight nurses used to be trained by the USAF. To meet the increasing demands for flight nurses, the OTU in June 1963 began training nursing sisters and medical attendants from the three services. Today, over 400 of these medical personnel have completed their OTU training.

Air Search and Rescue Operations ATC is responsible for all policy and training of SAR units in Canada. In 1947 the RCAF accepted responsibility for search and rescue duties in this country. The area was later extended to include Canadian coastal waters in addition to the inland waterways. Canada is divided into four major search and rescue areas:

- *Pacific Area* Headquarters in Vancouver – 121 KU in Comox BC has five Albatross and two Labrador helicopters.
- *Western Area* Headquarters at Winnipeg – 111 KU at Winnipeg has three Dakotas and two H21 helicopters.
- *Eastern Area* From Lakehead to Quebec and from the US Border to the Arctic Islands – headquarters at Trenton – 102 KU at Trenton has two Dakotas and two Labrador helicopters which can be supplemented by other aircraft if required.
- *Atlantic Area* Headquarters at Halifax – 103 Rescue Unit at Greenwood has four Albatross and two Labradors. The 101 KU at Shearwater – another ATC unit – can supplement the 103 unit's search capability with its Dakotas although these are primarily used in a Transport role.

Although commitments for the Pacific, Western, and Atlantic areas are not an ATC responsibility the Search and Rescue Units located within these areas come under ATC command and control.

RCAF Auxiliary ATC is responsible for all units of the RCAF Auxiliary. Their job is emergency and survival operations for which they are equipped with Otter aircraft. To help maintain a high standard of preparedness the auxiliary squadrons are assigned, in addition to their regular training, limited air transport operations under the control of ATC. The squadrons – located at Montreal, Winnipeg, Toronto and Edmonton – flew over 12,000 hours last year.

Air Support for Survival Operations Air Transport Command is charged with the co-ordination and control of all air support for the Canadian militia during national survival operations – such as ATC airlifting men and equipment to fire-ravaged areas of Newfoundland, or relief of flood victims in southern Manitoba. On numerous occasions ATC has despatched planes to make emergency relief air-drops of food and supplies to isolated northern outposts. These are but a few examples.

We are well aware that Canada has offered aid from time to time to alleviate foreign or international disasters. ATC is no stranger to these situations; it has flown relief supplies to earthquake stricken Turkey, well-drilling equipment to India to relieve the drought, delivered aid to Pakistan and Chile for flood and earthquake relief. Units of Air Transport Command must indeed be *Versatile and Ready*.

Many pages of Air Transport Command history have been filled with the exploits of its long-range transport squadrons. Not the least of these is 437(T) Squadron at Trenton. Re-activated in January 1962, the "Husky" squadron with its ten Yukons has become known in aviation transport circles throughout the world. The North Atlantic routes to Europe are this unit's main operating medium. An average month may see the squadron completing as many as 38 round trips for Canada's Forces overseas.

S/L Reid enlisted in the RCAF in 1946 and served as an aero-engine mechanic at Central Experimental and Proving Establishment and 426(T) Squadron until 1951. In 1951 he applied for pilot training and since his graduation in 1952 S/L Reid has spent all but three years in Air Transport Command. An instructing tour in Training Command was interrupted when he was called back to ATC to participate in the United Nation's Congo airlift in 1960. S/L Reid has, during the past six years, served at Trenton with 437(T) Squadron and as Base Flight Safety Officer. In 1967 he completed the USAF Aerospace Safety Officers' Course at the University of Southern California and recently assumed the duties of Staff Officer Flight Safety at Air Transport Command Headquarters.

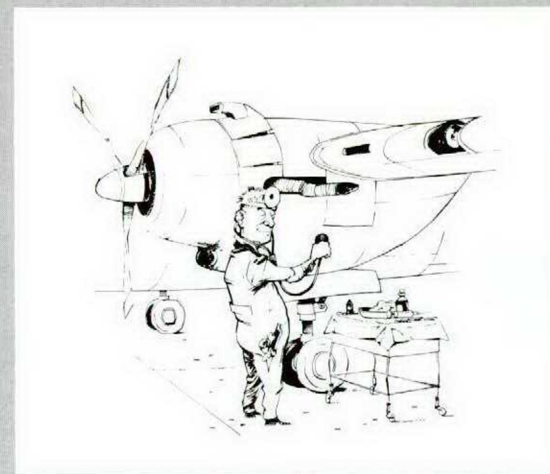
412(T) Squadron based at CFB Uplands has a long and noteworthy history that dates back to the formation of the Command itself. Predominantly a passenger carrying outfit, it is renowned as the VIP Squadron. 412 Squadron's role of distinguished passengers includes the names of many world dignitaries. Flying the Yukon, Cosmopolitan, Falcon, Dakota and Cessna 182, this unit accounts for 10% of ATC's flying.

The two Hercules squadrons – 435 and 436 – previously mentioned, complete the list of long-range transport units. With the acquisition of the C130E model, the men on these squadrons are becoming familiar with overseas routes in addition to operating within Canada.

All these aircraft would never leave the ground were it not for the support personnel. Unfortunately, in a short resume it is impossible to credit, let alone describe in any detail, each of the various elements these people represent. This, however, is not to minimize their importance. There are the personnel of the Technical and Maintenance organization, the Air Movements Branch, the air services and medical staffs, the food service staff, the ground transportation personnel, the administrative and clerical staffs, recreation and accounting personnel – and the list continues to become as long as the trades structure list itself. Each member is a vital part of the Air Transport Command team.

The future of this Command holds many promises. Advances in the aerospace technology have resulted in the appearance of many new and sophisticated items of equipment. Plans have been announced for the procurement of larger, pure-jet transport aircraft. More than ever before, Air Transport Command will need to work together as a team to maintain the safe and effective service that is our tradition – a tradition which has as its watchword *Versatile and Ready!*

The Shape of Things-to-come



Powerplants are the heart of an aircraft, and American Airlines has developed a "doctor" technique for keeping a continuous check on the "health" of that heart.

Thanks to computers and electronic recording devices, an engine maintenance technique has been devised which provides continuous surveillance and indicates when engine parts need replacement. This, in effect, eliminates the airline's having to take aircraft out of service at previously designated overhaul times.

This new maintenance system, called "monitored maintenance," replaces the TBO (time-between-overhaul) method which called for an engine to be automatically torn down after so many hours of flight, checked, and then rebuilt and returned to service. Under the new "monitored maintenance", a system of sensitive electronic devices checks all areas, parts and components of an engine; this is reported and stored in computers which also "store" performance reports from the flight crews as well as "past experience" knowledge. Any abnormality in the engine is detected immediately, and defective parts replacement is indicated. **But if the engine continues to function normally, it is allowed to remain in service beyond the previously stated time for overhaul.**

Mr. George A Warde, Vice President – Maintenance and Engineering, likened this new system to maintenance of good health in the human body.

"On our jet engines," he said, "we monitor their 'heartbeat' continuously, keeping a constant watch on hundreds of engine functions, and thus are able to pinpoint immediately and scientifically any irregularity in engine performance. Monitored maintenance allows us to determine accurately which specific parts need replacement . . . and all without having to take apart the complete engine."

Although this system is now employed only with 707s and their Pratt & Whitney JT3D jet engines, it is expected to be applied to the entire fleet of aircraft within a short time, and to include other aircraft systems, eg, hydraulic, autopilots, etc.

The new system already has resulted in a 40% reduction in the cost of engine maintenance and has made possible a $24-million saving in the annual cost of spare parts.

This new concept in maintenance has been developed over the past six years in cooperation with the FAA which officially gave its permission to use it this past spring. The FAA, however, plans to monitor the program for a period of time to assure its meeting FAA requirements.

– Flight Safety Foundation

Good Show

MR D ARMOUR

A Tutor with a long history of false overheat warnings had cost us many man-hours expended on fire warning system checks and numerous air tests. No one was able to find the reason.

The factory had installed a louver in an engine access door so that it formed an exit rather than an inlet scoop for cooling. Four other Tutors were found with this louver installed backwards.

Mr Armour, a Canadair field service representative, displayed a thorough knowledge of the Tutor and commendable application in solving the problem which had baffled so many.

A tip of our hats to Mr Armour for a significant contribution to flight safety in uncovering a hazardous "Murphy".

FS WS ROBBINS

With coolness and precision, FS Robbins, a radar operator, guided to a safe landing an inexperienced student pilot lost on a night navigation mission.

Above cloud and without a compass or TACAN, the anxious student was assigned to FS Robbins for emergency assistance. The young pilot's anxiety had increased to the point where it appeared that he was having difficulty maintaining control of the aircraft. By asking various questions FS Robbins assured himself that the student's oxygen system was functioning; then, in a calm reassuring manner the student was vectored for a no-compass homing and recovery.

FS Robbins' high degree of competence throughout this tense situation reflected pride in his work; he has paid numerous visits to the flight simulator, gaining an intimate knowledge of emergencies in the air. This dramatic occurrence enhances the aircrew's continuing high regard for radar controllers.

FS JA KERR

Hearing that a pilot had declared an emergency, FS Kerr vectored the aircraft using surveillance radar to an area where precision radar coverage was available. The pilot was experiencing either erroneous or nil readings on his altimeter, vertical speed indicator, airspeed indicator and mach meter. The weather was overcast from 300 to 500 feet with a visibility of 3 to 6 miles in light rain.

FS Kerr advised the pilot to descend very slowly and continued shuttling the aircraft across the precision radar on-course until a radar return was observed on the elevation scope. By this time the pilot was identified approximately 4000 feet above ground level. From here he was instructed to maintain altitude until the final radar approach.

FS Kerr's competent handling of this emergency was a fine example of controlling at its best.

CPL WG FARQUHAR

During a routine BFI on a 104, Cpl Farquhar noticed that the upper panel on the right-hand side of the rudder appeared deformed and cracked. His investigation revealed that the rudder actuator was fractured and the attachment bolt broken – damage which would have been extremely hazardous.

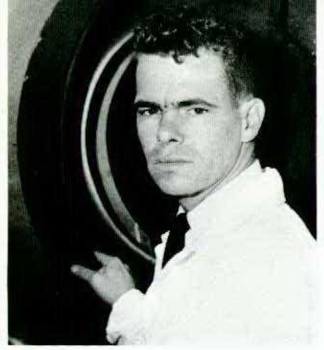
Displaying the qualities of a first-class technician, Cpl Farquhar performed his inspection with thoroughness and diligence – a fine example of maintenance technicians making vital contributions to flight safety.

FS WS Robbins

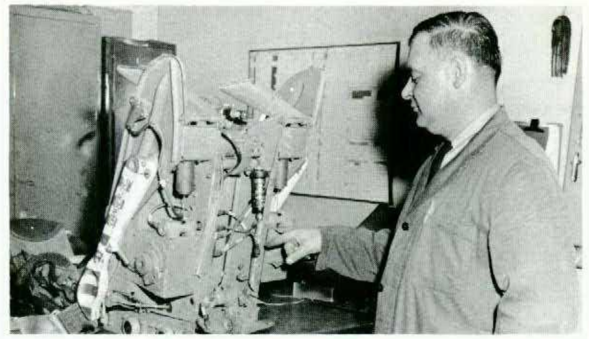
FS JA Kerr

Cpl WG Farquhar

Cpl JW Lundquist



Cpl JS Gibbs



Cpl CR Collard

CPL JW LUNDQUIST

During a #1 inspection on a Yukon, Cpl Lundquist noticed what he suspected to be a hair-line crack on the lower keel section of the port undercarriage. The crack was not easily discernible due to the location and extent of the fracture, and further because it was covered by a protective coating of paint.

Cpl Lundquist performed a dye penetrant inspection on both the port and starboard undercarriage and confirmed that both lower keels were cracked. A Special Inspection was then ordered, resulting in the replacement of all Yukon keel members.

Cpl Lundquist's sharp eye and professional approach to a routine inspection was alertness and competence at its best. His discovery led to the elimination of a hazard which could have caused a serious accident.

CPL JS GIBBS

On two separate occasions during BFIs on a CF104, Cpl Gibbs has discovered damaged engine compressor blades. His first discovery was at night; alerted by evidence of a birdstrike in the intake duct, his intensive examination with only a dim flashlight uncovered a cracked stator blade in the engine compressor. The next instance took place after a test flight; his BFI revealed a cracked IGV and several slightly bent. Two of the IGVs were discovered broken off, held in position only by their end mounts. These inspections under adverse conditions undoubtedly prevented engine failures leading to loss of an aircraft.

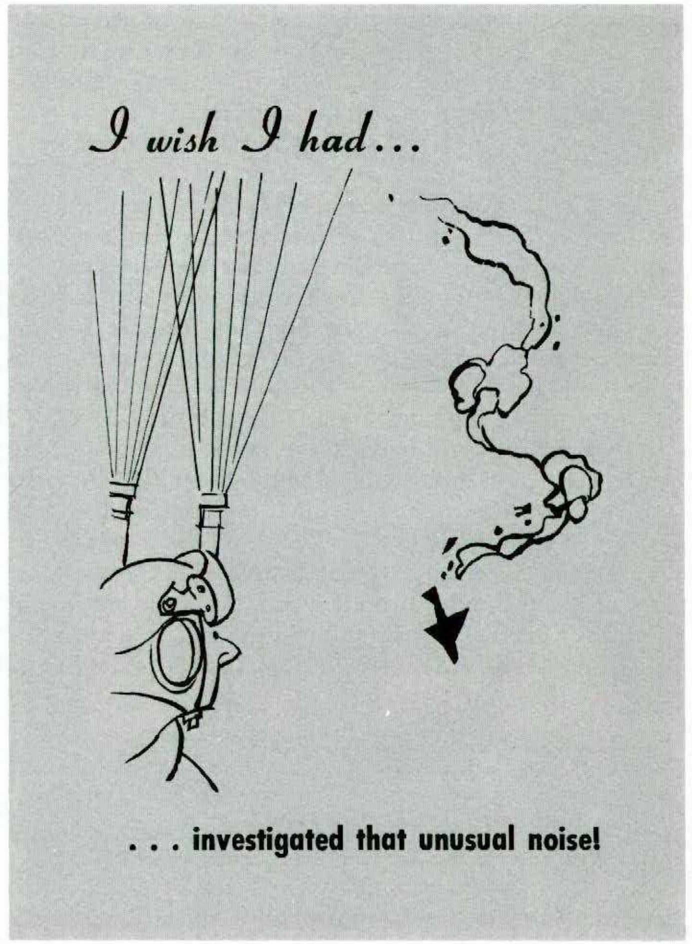
Cpl Gibbs has demonstrated a continuing high level of alertness and integrity. For the pilots, it is satisfying to know that men like this NCO are putting out top-notch work. Both his findings, if undetected, could have lost us aircraft and jeopardized the pilot's lives – commendable work indeed.

CPL CR COLLARD

While supervising the re-arming of a CF104 ejection seat, Cpl Collard noted that an airman – who was new to this equipment – was connecting hoses to the initiators incorrectly. Having uncovered this Murphy he inspected other seats to determine the nature of the problem. The flexibility of the hoses permitted improper positioning, and this was compounded by the manufacturer's identification tags being mutilated and unreadable – in other words, an accident waiting to happen.

Cpl Collard advised his supervisors and raised a UCR on the unreadable markings and the possibility of error. A special inspection on all aircraft was made immediately because a seat incorrectly armed would not sequence properly with possible fatal results.

Cpl Collard's alertness while supervising an inexperienced airman averted a potentially serious accident. The fact that Cpl Collard put an end to an unacceptable hazard which had been tolerated for some time demonstrated a mature attitude toward his work and responsibilities.



SPR - Semi Permanent Repellant

It may be only one ten-millionths of an inch thick – but it works!

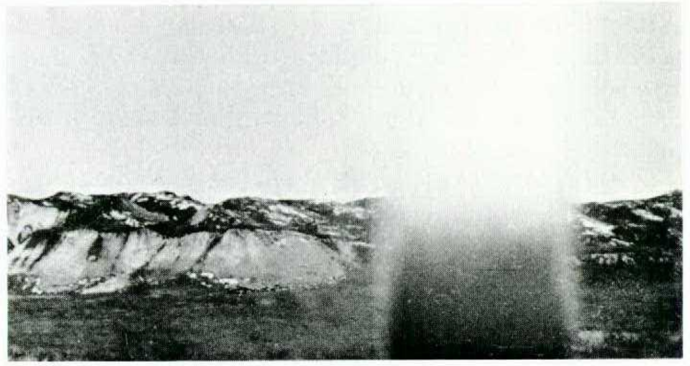
Especially important during low-level flight – including takeoff and landing – is rain on the windscreen. It plays havoc with visibility; it destroys detail, and can dangerously displace an image seen through the windscreen.

Wipers or airblasts are standard equipment on most aircraft but both have weaknesses; that's why much research has gone into finding something better. The latest – and most promising – is a glaze coating called Semi-Permanent Repellant (SPR). Applied to the windscreen, it prevents raindrops from spreading over, or wetting, the surface. The rain remains in droplets and is immediately blown off. Developed by the National Research Council under the direction of the late Dr DF Stedman, it took 27 years and two million dollars to perfect.

How good is SPR? Six-month trials on a variety of aircraft employing SPR on one side of the windscreen, brought in pilot reports ranging from *"Made no difference at all"* to *"Visibility on final approach was very good through rain repellant; other side was impossible to see through"*. Involved in the trials were pilots of the Tutor, Yukon, Dakota, Hercules and Cosmopolitan. In no case was the treated side worse than the untreated one; several pilots said visibility was not helped at cruising speeds but did improve considerably at approach speed.

Bad visibility is one thing – image displacement or deflection is another. Each raindrop forming on the windscreen causes an optical deflection of the image *downwards*, as the photograph demonstrates. This creates the impression that the pilot is higher than he actually is. The image is similarly displaced downwards when blurring takes place; not only is the horizon detail lost but it is shifted downwards (see photo). The flight safety implications of this are obvious.

◁A bead of water deflects horizon image downwards.



Untreated section of windscreen not only blurs image but displaces it downwards.

The glaze is simple to put on. When rubbed on vigorously it bonds with the glass or plastic windscreen. The amount remaining after rubbing is so small that it will apparently have disappeared. The time required to cover an area of one square foot is about 20 minutes.

The glaze is not permanent; during the trials some windscreens lost no effectiveness for two months but a solvent for removing bugs, for example, will remove the glaze. The easiest way to check the condition of the surface is to pour water over it; if the water sticks and spreads, the surface needs reglazing.

Glass and plastic windscreens require different treatments. For glass the kit contains cleaner, glaze, wiping paper and a set of instructions. For plastics, the cleaner is omitted – plain water is to be used. Both kits are available from the supply section (6850-21-840-1479). Later, aerosol cans will make for easier and faster application.

SPR is the simplest, lightest, and most effective method yet developed for increasing visibility in rain. Wipers cannot cope with heavy rain, and the airblast system loses its efficiency just when it is needed most on final approach. Too, these mechanical systems require space, plumbing, wiring, pilot-operated controls, and inevitably – maintenance. SPR has none of these disadvantages – it is always there ready and waiting to do its job. As a testimonial, SPR is the one and only rain removal system for the CF5.

Other countries have tested SPR. A USAF report on T38 trials states: "In-flight performance is excellent. The repellant was tested in very light to heavy rain and afforded excellent visibility. Treated areas appeared as clear sections of an otherwise rain-obscured windshield."

SPR is ideally suited for helicopters. Their large expanses of plexiglass would otherwise require an extremely complicated system of wipers or airblasts. The British army, after trying two other systems for their Sioux helicopters used SPR in trials extending from drizzle to heavy rain. They found "SPR improved visibility considerably in all types of rain . . . No ill-effects were noted at night or in bright sunlight". There was a complaint: "...(SPR) produced a clear space on the canopy on which there was a tendency to concentrate at the expense of the remaining untreated portion of the canopy". The report recommends introduction of SPR for the Northwest Europe and Far East theatres.

The photo at the top of the article shows what SPR can do for your car – conscientious application and maintenance can make our aircraft windscreens a far sight better than ever before. ▣

"Good Show" – then, Merit Award

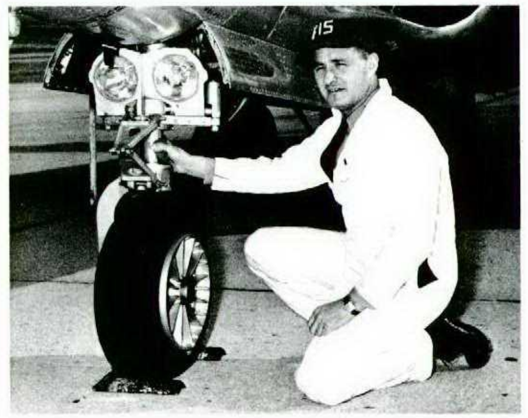
A 'Good Show' award was made to Cpl (now Sgt) Lefebvre and LAC (now Cpl) Johnson in Flight Comment Jul-Aug 1966 for extinguishing a fuel fire in a T33. Their selfless act averted destruction of a hangar full of valuable aircraft and ME equipment. Further recognition of their action – DND Merit Awards – are made to Sgt Lefebrve and Cpl Johnson by G/C Stuart, Base Commander, CFB Portage.

LAC RE JOHNSON
CPL JTGY LEFEBVRE

While preparing to repair a T33, Cpl Lefebvre and LAC Johnson were using recognized methods of removing fuel from the fuselage tank. Static electricity suddenly ignited fuel on the mop. Fire raced up the wing and into the fuselage tank. By quick thinking and coolness throughout this occurrence, the two airmen prevented the fire from spreading, and put it out. Had they not fought the fire with such effectiveness, the hangar and its contents could have been lost.

At the time, the hangar contained four and a quarter million dollars of aircraft, over $280,000 of MSE equipment – plus the value of the hangar and other equipment estimated at $300,000.

Their integrity and courage averted what could have been a major loss of valuable equipment and hangar.



"... I saw a large seagull in front of me and felt it smash into the left intake. A distinct loss of thrust followed and there was a loud rumbling coming from the rear ..."

Sea and Survival

At that moment, a witness saw the characteristic plume of flame at the tailpipe. The pilot F/L GRJ King, ejected near the Danish east coast at 300 feet above the waters of the Kattegat. "The opening shock was quite mild and I was aware of the closeness of the water... I hit the water about 5 seconds after the chute opened. I landed right in a large foam patch which I believe was the aircraft sinking below me." F/L King later expressed the opinion that, since he was at low level, he should have ejected rather than remain to attempt a second re-light.

It had all happened so very quickly that there was no time to prepare either physically or psychologically for the ordeal to follow. The 60 degree water later chilled his body but the prime "survival" aspects of his experience were spent largely in surviving his survival equipment! In fact, the pilot states "I definitely feel I would not have made it if I was not a strong swimmer".

"Once in the water I was immediately pulled along on my back by the parachute. I released myself from the chute and began to sink at once. I swam to the top and tried to inflate my Mae West without success. My helmet was bothering me so I released the chinstrap and took it off. I was underwater a fair amount during this period due to the sea swell breaking over me and the difficulty of treading water with all the weight attached to my legs. During my struggle I thought the release cord had either broken off or was caught on something. On my last effort I sank quite far underwater, pulled the bottom of the Mae West up, and visually found the line and inflated the Mae West... I noticed the Mae West was leaking at the inflation valve so I tightened it up and it helped. There was still a ring of bubbles around the valve so I suspected it was still leaking slightly."

Twenty-five minutes later a Danish helicopter hauled him aboard and took him to a hospital where he was treated for mild exposure.

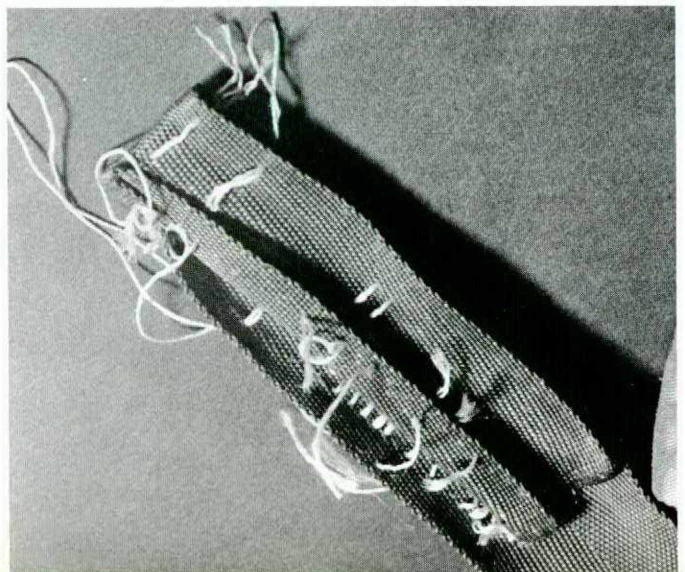
This occurrence and several others recently sparked a discussion in two areas:

- The complex and perhaps misunderstood water emergency landing procedures in the CF104.
- An automatic water survival system (see USAF Aerospace Safety, November 67, "More and Better Life Support Equipment for Aircrews") - and whether the Canadian Armed Forces will soon follow suit.

Although under discussion at CFHQ at present, no decision has been made for purchase of automatic water survival equipment. In the meantime however, recent experiences have pointed out several problem areas of particular importance to aircrews:

- The sequence the parachutist must perform prior to and upon entering the water is complex – considering his probable state of mind and unfamiliarity with the equipment under actual operating conditions. Such things as difficulty in finding a particular component or lanyard, or even to activate these components is a common complaint. Fear of drowning, for example, will be conditioned by your competence as a swimmer, the weather, water condition, and whether you are injured or not. Instinctively, the first reaction is to struggle to keep head above water; it is here that the inadequacy of the equipment manifests itself. For the 104 pilot there are no fewer than 15 points to remember – and most of them are in sequence.

The stitching was first thought to have been too weak. Actually, its limited strength was deliberate.



- Being dragged through the water by the parachute is a common occurrence. This brings up a point about the pilot's lanyard. Designed to prevent loss of the dinghy after landing on water, the lanyard *and* seat pack lanyard are connected to the parachute harness. If the pilot is unable or neglects to disconnect the fastener between the two lanyards and the harness, he will remain attached to the parachute even after shedding the harness. When this occurs, the pilot remains attached to the parachute by his Mae West lanyard.
- F/L King's Mae West lanyard broke; this was at first attributed to faulty or understrength stitching (see photo). This stitching, however, is deliberately of limited strength – it is better to lose your dinghy than your life! If the parachute continued to drag the pilot by his lanyard, he would, quite literally, be made a victim of a piece of *safety* equipment.

F/L King's predicament stemmed from his low-altitude ejection. He had no time to perform the pre-landing sequence – which includes disconnecting the airlock fastener on his right. (A man with an injured right arm would have a problem here.) This highly-undesirable characteristic of the lanyard hook-up in the 104 is by itself a good justification for automatic equipment. In addition, a man with wet gloves over cold fingers – not to mention possible injury – would have difficulty in separating this lanyard in the water. This and other factors point the way toward an automatic system.

Not all pilots are strong swimmers...

ONE, DAMMIT!

Line Servicing at CFB Uplands had a unique Centennial project. The NCO in charge, Sgt KR Porter, decided to get into the swing of the Centennial year by building a board to display the number of aircraft tows and the Centennial target – a zero accident rate. By December 31 the total number of towing jobs had reached 9,861 or an average of 1.1 tows every hour throughout the year.

The section does all the towing on the base (except AETE and 414 Sqn Detachment) and handles the fuel, oil, oxygen, ramping and de-icing of all transient aircraft. Transients average 250 aircraft per month – complicated this year by the great variety of aircraft types carrying visiting Heads of State. A partial list includes the VC 10, IL 18, Boeing 707 and 727, Douglas DC 9, Short Belfast, Handley Page Andover and Hastings, DeHavilland Comet, and every type of aircraft used by the Canadian Forces except the Chipmunk.

For 24 hours a day every day, duties are done by 15 men per shift plus the NCO in charge, a dispatcher, and a safety supervisor. The safety supervisor is a senior corporal and is responsible for training and checking out all drivers, spot checking towing procedures and vehicles for the required safety measures, and carrying out a continuous safety program.

(Unfortunately the Centennial project was marred by one accident in June and the section finished the year with a rate of 1.01 accidents per 10,000 tows.)

Almost 10,000 tows – and almost no accidents. A top-notch try for Uplands line servicing.

The Tracker's Phantom Fumes

Malaise, fatigue, listlessness, lightheaded feeling, were the basic symptoms. Some reported tears, blurring of vision and shortness of breath. One radio navigator apparently lost consciousness; others were dazed for three to five minutes. Complaints of sweating, abdominal cramps, vomiting were recorded.

These complaints by crew members flying the recently introduced mid-life version of the Tracker triggered a long and painstaking investigation involving medical specialists from Command, CFHQ, and the Institute of Aviation Medicine.

Suspected from the outset was contaminated air; the complaints were symptoms of hydro-carbon or toxic gas poisoning – including carbon monoxide. Blood samples from each affected crew member tended to confirm hydro-carbon fouling of the air from burning materials but the actual source eluded investigators. Fume sources suspected were the aircraft heater, the long-range fuel tank in the bomb bay, and the newly installed electronic equipment. The search uncovered minor items such as an electronic pen on a paper recorder which produced ozone – a gas having an unpleasant smell and toxic when concentrated.

Incidents occurred at random; some aircraft flown immediately after an occurrence created no problem. Fuel, oil, hydraulic, electrical and electronic systems were all checked out in turn but investigators drew a blank. The search broadened at this point to physiological factors such as motion sickness and vertigo; also, psychological factors were examined. A more cramped cockpit, new equipment – and an understandable concern over previous incidents – complicated the issue, making the cause more difficult to find.

With no answers to satisfy the continuing questions, a high-priority methodical scientific investigation was launched. VX10 Squadron was given the job. Simultaneously an educational program began; explained in detail were the nature and effects of toxic fumes. Crews were briefed on each incident as it occurred. The incidents decreased.

In retrospect it is obvious that a serious level of contamination had occurred in some of the incidents. Although no one source could be singled out, a recurrent problem was spilling hydraulic fluid (when topping up the tank) on the AC voltage regulator and over-voltage relay. Also, in certain flight configurations air seeps – carrying heat by-products, oil and fuel vapours – from the engine nacelles through the wing root to the cabin. One case led to an over-zealous maintenance man who had greased the sliding louvres in a forward cabin heater vent. The new electronic equipment in the aircraft was given a clean bill of health.

VX10's recommendations are now being processed. These include improved cabin ventilation, modifications to prevent nacelle air from reaching the cabin and improved design of the seats and arrangement of survival gear. All Tracker crews have been thoroughly briefed on the subject of toxic fumes, hence a better understanding of the problem has resulted in increased confidence in the new equipment.

The lesson is clear – aircraft must be kept totally free of fumes. Insidiously, they can anaesthetize the sense of smell after the first breath or two leaving crews unaware of the hazard. The frequency of complaints of fumes in aircraft is common enough to alert us to the continuing hazard – and a real hazard it is because fumes can interfere with vision and balance organs as well as causing malaise. Your flight surgeon can give you a briefing on the subject.

Briefings should include maintenance technicians; after all, keeping aircraft meticulously clean is their responsibility. They should be aware that POL materials left on or near heat sources can be dangerous.

Commendations go to those who participated in the quest for the phantom culprit. Their persistence and patience resulted in a program of positive action to fix the Tracker's fumes – a real contribution to flight safety.

FOD

BATCO reported that various items of FOD have been discovered on the maneuvering area of the aerodrome. These included fuel tank filler caps, bolts and golf balls.

– Flight Safety Committee minutes

For the sake of argument...

Maintenance - and flight safety?

S/L BB Finn SOAE/ATCHQ (retired)

. . . there is a growing weight of evidence that the real reason why aircraft serviceability improves as utilization increases is simply because the aircraft spends less of its life in the hands of the maintainers!

Aircraft maintenance has a pretty good record – insofar as involvement in the more tragic aspects of Flight Safety is concerned – but the record is not as good when viewed in terms of the frustrations and minor panics which are generated by delays at takeoff time or in-flight equipment failures. Since such disturbances to the nervous system may well contribute to those miscalculations statistically recorded as *pilot error*, it might be timely to review why these things happen and see what can be done to keep them to a minimum.

In today's language we usually describe an aircraft as complex – which it is – but our use of the term tends to imply that it is complicated, difficult to understand, and very tricky to keep in top shape. This is not true. The modern aircraft is basically very much safer than aircraft built as recently as ten years ago. Its alleged complexity stems in large measure from built-in redundancy (which is a fancy name for back-up systems and structures), not to mention warning devices and on-board automatic diagnostic equipment. The real problem with modern aircraft is not reliability but speed and its effect on the decision-making processes.

These days, the pilot is becoming a jack-of-all-trades; he absorbs the functions of navigator, radio officer and systems operator – not to mention a preoccupation with a raft of documents, rules and procedures, flip charts, diplomatic clearances, customs declarations, imprests, *ad nauseam*. But a jack-of-all-trades' depth of knowledge in each trade tends to become superficial; couple this to a shrinking time span for decision-making and the probability of an accurate diagnosis, and response to an in-

flight anomaly is reduced. We buy decision-making time with duplicate or even tertiary systems and by the installation of various diagnostic warning devices. However, in so doing we add to the chances of an unserviceability in the aircraft as a total system without necessarily having an unserviceable aircraft in terms of its safety for flight.

Which brings us back to the maintenance dilemma. There is no way of guaranteeing that every item in an aircraft will be 100% serviceable at takeoff and there is even less chance of the aircraft completing the flight without some malfunction. In spite of this there is an extremely high probability that the aircraft will be completely safe for flight because of the built-in redundancy; therefore the problem becomes one of finding a mutually acceptable standard. This boils down to a question: at which point does routine maintenance become over-maintenance?

Most of us who are connected with aviation are aware of the truth of the statement that the best way to keep an aircraft serviceable is to keep it flying. Some consider that this theory is based on the double standard which in Canadian parlance may be expressed as "serviceable for a trip up North" and "serviceable for the return trip South". There is no doubt that this double standard exists, just as there is equal certainty that the longer a pilot stays with one particular aircraft the more familiar he becomes with its peculiarities. But there is a growing weight of evidence that the real reason why aircraft serviceability improves as utilization increases is simply because the aircraft spends less of its life in the hands of the maintainers! To many of us who have spent a lifetime in the aircraft maintenance business it is a bitter blow to find that our work has to some degree resulted in an aggravation of the very condition we hoped to cure!

Where did we go wrong? The answer is simple. In trying to ascertain the state of health of the aircraft without possessing even the most rudimentary diagnostic equipment we periodically disembowel the machine to poke and pry into its innards. The residual disturbances, plus what may be termed *post-operative shock*, results in the aircraft being more defective immediately after our inspection than it was before we started. Our other "crime" is that we change components on an arbitrary life basis. This routine removal-and-overhaul cycle keeps components within the critical stage of life. To use a medical analogy, we retain aircraft components only during their *infant mortality* range instead of letting them progress into stabilized middle life and changing them as they approach the period of old age.

Our problem now is to find an answer which satisfies our own consciences that we are providing optimum safety and that this will be recognizable as such by our customers – the flight crews. It is fairly certain that suitable non-destructive diagnostic equipment is a long way off, and the limited diagnostic equipment which is presently available is prohibitively expensive for small fleet operators. Furthermore, even when this equipment becomes available, there is no guarantee that we can eliminate all in-flight/pre-flight failures; predicting the precise failure time will remain very much a matter of educated guessing.

The only logical answer at present is to limit our maintenance processes to those which can be completed without causing residual damage and to place greater emphasis on statistical analysis to determine the right time for inspecting each item. This will require some radical revisions in our thinking as well as a major information program to explain the problem to our customers.

This part of the job will be extremely difficult since we have brainwashed both ourselves and our customers into a belief that an aircraft is a rather unreliable beast which has to be torn asunder at surprisingly frequent intervals if the flight crews are to have a reasonable chance of survival. Furthermore, it will require an honest appraisal of our concept of a reasonable and consistent workload to ensure that our attitude towards inspections is not more closely related to one of Parkinson's Laws than it is to engineering requirements.

One of the most suitable forums for generating discussion on the subject and creating a mutual understanding of the problem is this magazine. If we all get together to talk about maintenance and really get to understand just what it can do and what it cannot do, we will make greater strides in the direction of Flight Safety than we have done in the years gone by.

(For a demonstration of S/L Finn's point see the article "The Shape of Things-to-Come" in this issue.)

S/L (Mickey) Finn who retired from the RCAF in December 1967, is no stranger to the ways of aircraft operators and maintainers. He served in the RAF from 1938 to 1955. Starting off as an airframe apprentice, he remustered to flight engineer during WW II, was a POW in Germany for two years, and then resumed flying with the RAF Transport Command mostly in far eastern (Northern Pacific) operations. In 1955 he joined the RCAF as a Tech/AE officer and served on several helicopter units until 1960, then went to CEPE at Uplands. For the last three years of his service he was a member of the emergency operations planning team. His technical specialist knowledge and experience in flying from out-of-the-way airfields contributed much to the success of such operations as the Zambia oil airlift, and the emergency evacuation of our UN detachment in Gaza.

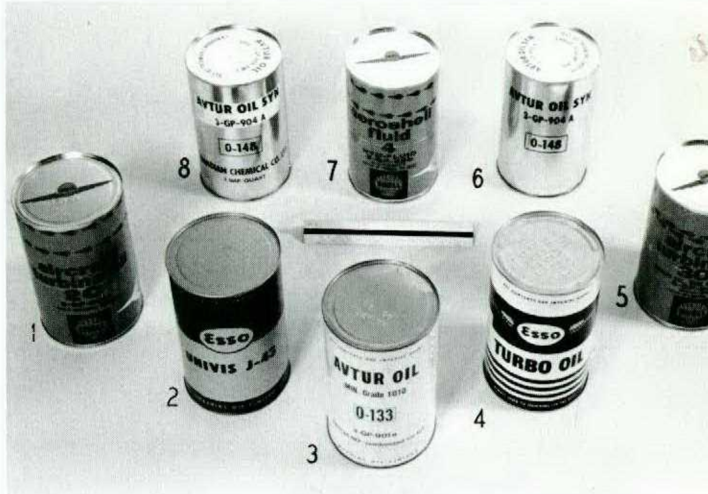
These cans contain the *same* oil . . .

. . . these cans contain *different* liquids!

– and these all are stocked at one base!

Reach for the right can

Prettied-up cans are a hazard . . .



". . . so many complaints have been raised on this score that additional UCRs would serve no purpose."

The photograph is a sampling of the various fluids and containers in stock at one base. One can (#8) even has a detachable sticker containing the military number – this tends to come loose when exposed to oil.

Take a look at cans 1, 5 and 7; they contain different fluids but unless the lighting is good and the technician alert to the similarities, the wrong fluid could easily be put into an aircraft.

Well, this UCR got action. Underway are negotiations with oil suppliers to provide cans with clear differentiation of marking. Most of the companies agreed that it would be no great problem to provide containers with clear markings.

In the meantime, however, the hazard's there – keep alert.

Pilots are requested to . . .

Although the taxiways and runways are inspected regularly by operations personnel, debris, gravel, etc., frequently gets blown around between inspections. Pilots are, therefore, requested to advise the tower immediately whenever such material is sighted.

– Flight Safety Committee minutes

Science, sleuthing, and safety

Measure in millionths of an inch?

Flavour-test coffee?

Why did that undercarriage collapse?

Will that weld stand up?

"Quality Assurance" is what they call themselves – and they work amid the darndest accumulation of scientific testing equipment in Canada. Their job is to make sure that the goods and services we buy meet the standards we demand. As the weapons and gadgets we employ, get more intricate and precise, the work gets tougher – and more vital.

The chemists, metallurgists, engineers, physicists, technologists, technicians and tradesmen – both civilian and servicemen – who make up Matcom's Quality Assurance Laboratories are for the first time gathered under one roof. Three organizations: the Canadian Military Electronic Standards Agency Laboratory, the DND Inspection Services Laboratories, and the RCAF's Materiel Laboratory have combined their resources. This provides an imposing accumulation of scientific know-how and testing equipment, creates an opportunity for unprecedented cooperation and pooling of resources within the Department of National Defence.

The centralization makes sense; for example, a component may well be tested in half a dozen laboratories for such things as electronic performance, resistance to vibration, purity of materials, precision of manufacture, and performance in severe environments.

With this capability for the exacting inspection and analyzing work, the QA laboratories obviously can help the accident investigator. Into the office of the Special Projects coordinator comes a continual stream of boxes and cartons containing, perhaps, the grim smashed remains of an aircraft component, a broken part, a burned wire, or fluid samples. The outcome of chemical tests, microscopic examination, or metallurgical analysis often yields the key evidence in an aircraft accident investigation.

The work of QA labs for the Accident Investigation Branch is essentially finding answers to questions. With this in mind – and with emphasis on flight safety – these pages contain some typical questions. The answers show the type of work being done – and reveal the unceasing vigilance that goes into giving us the best possible assurance of quality.

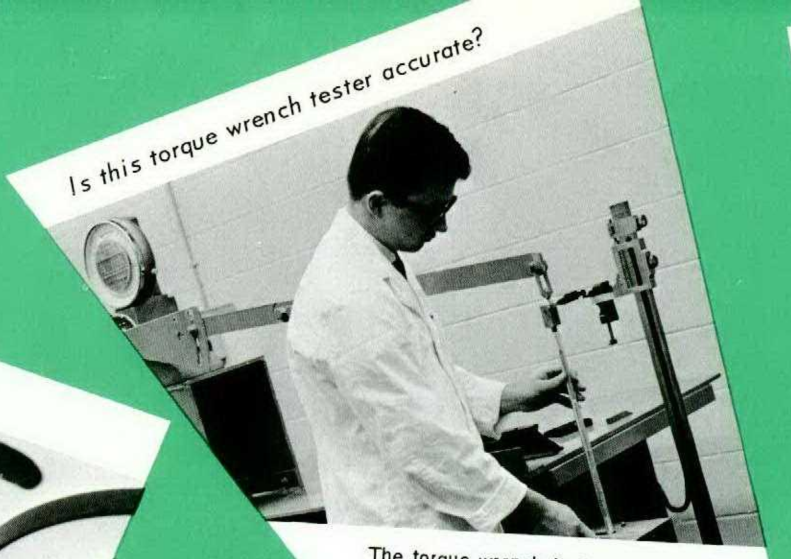
What caused the fire hazard?

Technician points to tiny magnet in a helicopter cross-tie relay which created a serious fire hazard. This instrument – hermetically sealed at the factory – was sent in for analysis. One small magnet had lost its power.

The ejection failed – why?

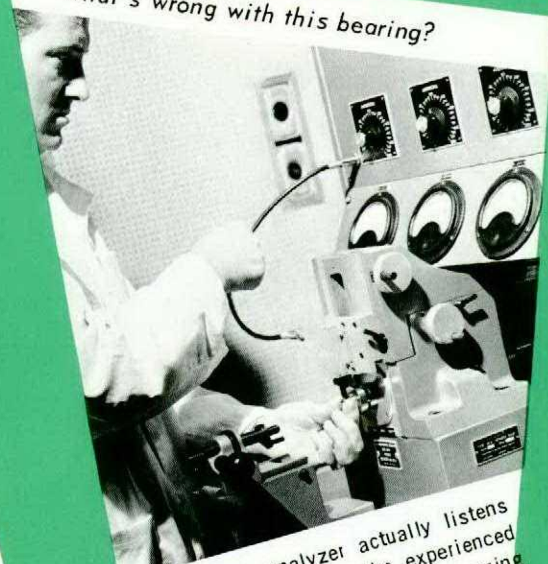
CF104 harness inertia reel which restrains the pilot in the seat on ejection failed, probably contributing to pilot and chute becoming entangled after ejection. The spring end on the right was found bent straight – a small but vital detail.

Is this torque wrench tester accurate?



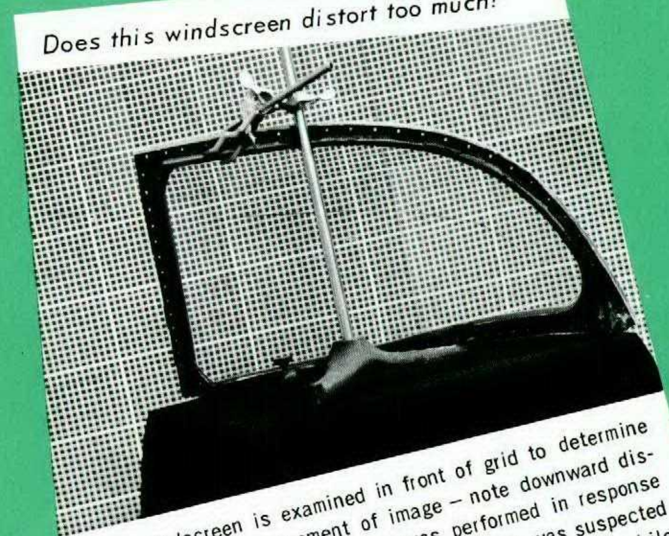
The torque wrench testers at both Canadian Forces Bases and industry are calibrated in the Metrology Laboratory. Here, a technician adds precision weights to an arm attached to a torque wrench tester.

What's wrong with this bearing?



This bearing analyzer actually listens to a bearing rotating; the experienced operator can interpret amplified bearing noise heard over a loudspeaker. Rotating bearings have characteristic clicks and hisses; this one (in technician's left hand) had a damaged ball.

Does this windscreen distort too much?

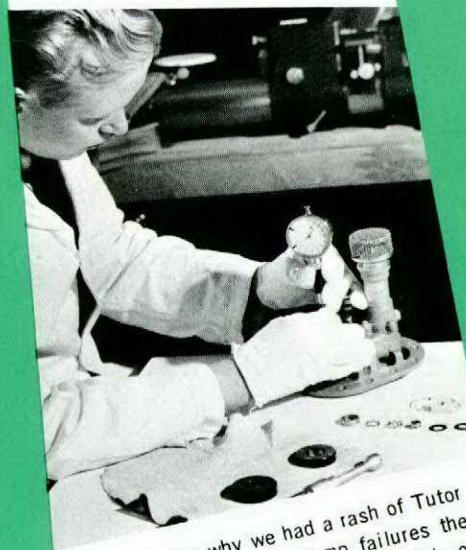


Tutor windscreen is examined in front of grid to determine distortion and displacement of image – note downward displacement. This particular test was performed in response to a UCR from CFB Portage. The windscreen was suspected of having an unacceptable amount of distortion but while distortion is present, this windscreen was within specifications.

Heat-treatment means precise temperatures.

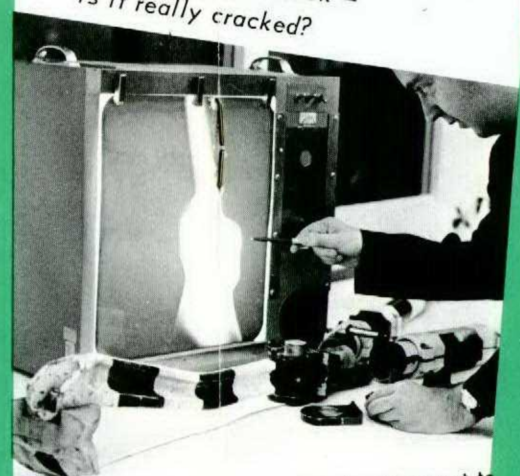
Students of the Heat Treatment of Metals course are given practical test such as the one pictured here, before returning to the field. They will monitor the equipment and quality of heat-treatment at manufacturing establishments.

Why did this Tutor fuel pump fail?



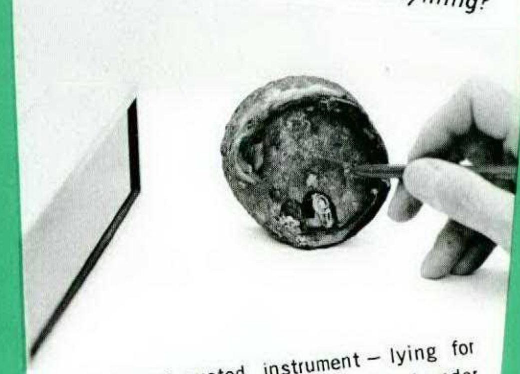
To determine why we had a rash of Tutor fuselage fuel booster pump failures the Metrology lab was given the job of measuring and examining the suspect bearings of this pump. A technician uses high-precision gauges to measure motor bearing mount. On the table is the bearing, taken apart for microscopic analysis.

Tracker arrestor hook – is it really cracked?



Tracker arrestor hook arm casting has been cut to reveal cross-sections. A routine inspection of these hooks by X-ray revealed what appeared to be small imperfections developing at the edge of the casting. This hook was sent to the QA's Metallic Materials lab where it was given a clean bill of health.

Can this rusty piece of junk tell us anything?



Smashed and rusted instrument – lying for four years in the bush – is examined under ultra-violet light to establish instrument reading at time of impact. Often, valuable information is derived from post-crash analysis of instruments.

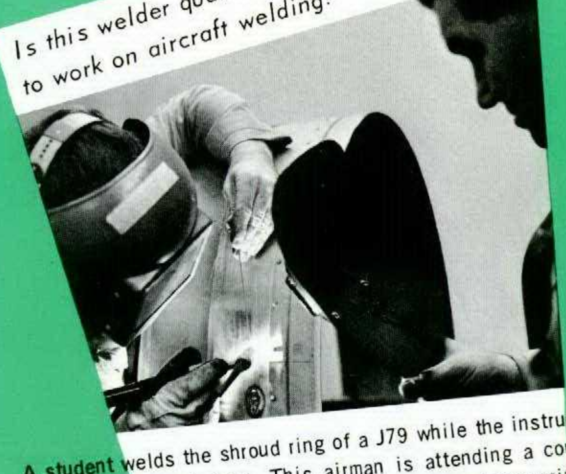
Why did an Argus "hot cup" explode?

Technician examines a suspect cup. (The cup in the background is connected to a pressure gauge to reveal internal pressure.) This commercial item can cause a dangerous explosion, particularly if left plugged in with little or no fluid inside. Tests established that the cup had inadequate overheat protection – resulting in purchase of a new model.

This tire blew on landing – why?

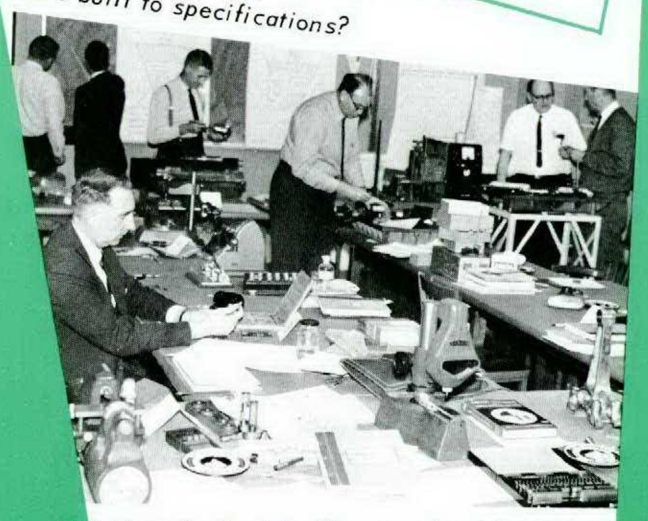
An aircraft tire, often as not, will tell its story to the experienced examiner. This Buffalo tire was sent to the Rubber and Plastics lab for analysis. (The experts concluded that the pilot had applied excessive braking at excessive speed, tearing off the tread and causing a blowout.) Decisions such as age limits, re-tread limits and manufacturing quality are determined in this laboratory.

Is this welder qualified to work on aircraft welding?



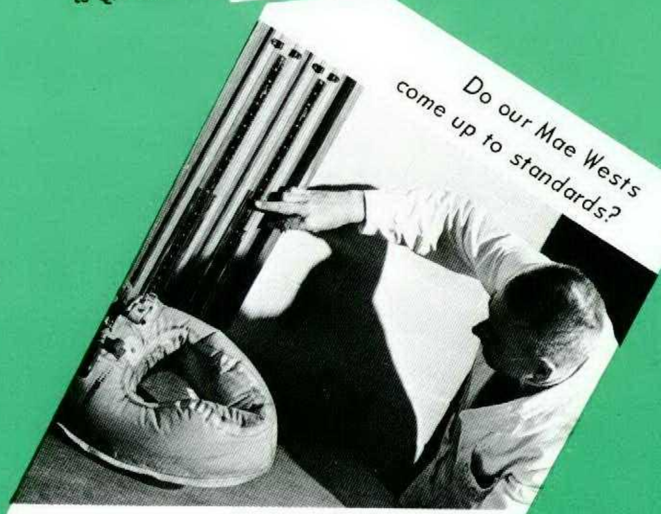
A student welds the shroud ring of a J79 while the instructor observes his technique. This airman is attending a course on the specialized techniques required for welding critical areas. The skill requires precise temperature control as well as accurate manipulation of the torch and welding rod. This technician on graduation will be "qualified" to work on critical areas of an aircraft; this qualification must be renewed every six months by submitting samples of his welding to QA for microscopic analysis and strength testing.

Can we be sure our aircraft are built to specifications?



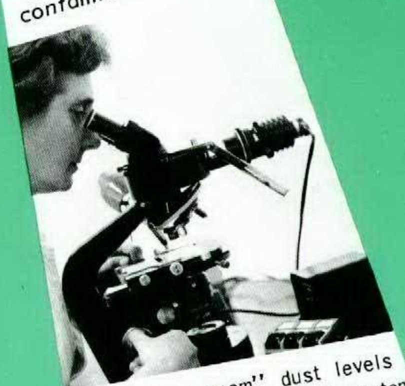
Students in the Precision Measurement and Gauging course are busy at work on precision measuring projects – part of their final examination. These men are trained to use equipment which will measure in the millionths of an inch. On returning to their jobs at a Technical Service Detachment (TSD) they are our watch-dogs who ensure the accuracy of machine operations in aircraft and component manufacture.

Do our Mae Wests come up to standards?



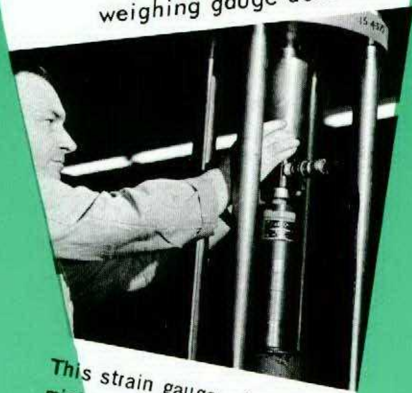
This over-age Mae West was submitted for routine examination and found unacceptable. Samples of new Mae Wests are also sent to the QA labs for testing.

Was the helicopter's hydraulic fluid contaminated?



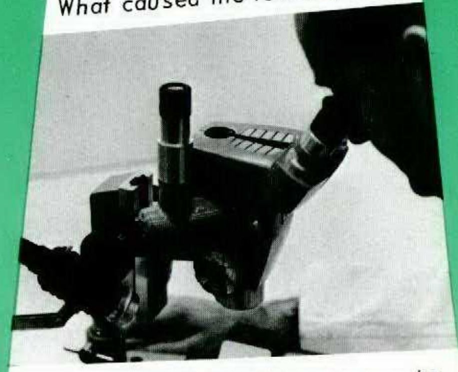
In this "clean room" dust levels are held to near-zero to prevent contamination by airborne particles. When the particles you're looking for are smaller than dust, the place has to be clean!

Is this aircraft weighing gauge accurate?



This strain gauge – in effect a miniature weighing scale – is squeezed with a force up to 50,000 lbs. Checked annually, they determine aircraft weight and centre of gravity. Master gauges at QA are, in turn, calibrated to Canada's national weight standards.

What caused the runaway trim?



Runaway trim – a pilot's nightmare – may be caused by the malfunctioning of minute parts. This analysis of a trim system component showed metallic breakdown in electric contacts leading to ultimate fusion from arcing. The foreign particles between the contact surfaces were identified as carborundum particles introduced when technician cleaned contacts with carborundum paper – contrary to EOs.

The 104 - *no stick-in-the-mud?*

Crank up a list of hazards likely to confront a pilot and you wouldn't likely see "buried alive in an aircraft" – at least, until now. This subterranean squeaker in a 104, was a typical snowball: a minor emergency that wound up writing off the aircraft – and very nearly the pilot.

Twenty minutes airborne on a routine ferry mission, the pilot noticed his nozzle drifting to the open position (7.5), and just as routinely fired his emergency nozzle closing system, restoring thrust. Just about then the engine oil low level light came on; in this case, the nozzle's drifting open was the precursor to the oil problem. Unknown to the pilot, the driveshaft of the number 1 scavenge oil pump had broken.

This meant getting the bird on the ground as quickly as good fortune would permit. The nearest landing ground turned out to be a 7600-ft strip nestled at the foot of a 4-5 degree slope covered with houses! Without radio contact with the tower he made one alerting pass, and set himself up for his approach over the rooftops.

Heavy with fuel, he elected to fly his approach at 225 knots down a 5-degree approach slope forced on him by the terrain. With commendable precision he landed 150 feet from the button and gently lowered his nosewheel fearing it would break under the heavy load. The dragchute didn't seem to be working so he tried the handle a second time and in the process gobbled up eight very valuable seconds. Ironically, the chute had deployed; it was his weight which had smothered most of the drag the chute delivered.

Braking slowed the aircraft, but not enough. Still indicating 50 to 60 knots the 104 continued into the overrun breaking off the nosewheel. The overrun – more aptly called a "shoreline" – soon gave way to water, below which was a bed of slimy mud.

All motion ceased, 40 degrees nosedown with only the tailplane and a small area of fuselage visible. *The pilot was buried beneath six feet of mud and an equal distance of water above that!*

104 slowly emerges from "overshoot area" in salvage operation.

In the inky darkness he quickly unstrapped from the seat and chute, and tried to collect his thoughts. Under the pressure the canopy would not move in manual release. Perhaps ejection would work; it did, but only enough to cause a momentary bump.

Things were really getting tight. Although still able to breathe through the oxygen system he was nevertheless neck-deep in slowly rising water.

One alternative remained – to eject through the canopy. He'd now been down there eight minutes. As rapidly as possible the pilot strapped into his seat again, pulled in his feet and inflated his Mae West. He recalls hearing pounding noises somewhere on the aircraft – so near, yet so far. Two men were frantically chopping about the afterburner area in the mistaken notion that it might provide access to the pilot compartment!

Fishermen nearby, were greeted to a sight to keep them away from the *vino* for some time. With a roar and a splash the pilot and seat emerged from the water a scant six feet from their boat, rose in the air to the height of a man, and plunged back into the water. Thanks to the "butt-snapper" pilot and seat separated but his oxygen mask hose and a lanyard attached to the survival kit in the seat, dragged the pilot under. He was now back down again – this time in a watery tomb.

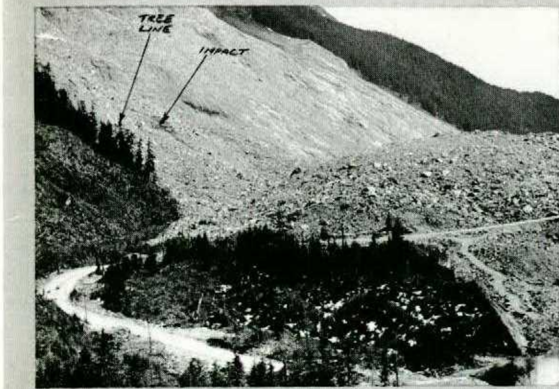
Circumstance, it seems, was determined to end this pilot's life and prospects for rescue looked slim. During the ejection the enormous weight of the mud and water played directly against his body; his back was broken in three places but by the same fortuitous coincidence which makes wealthy men out of sweepstake ticket-holders, the fishermen were expert divers. They soon completed the seat separation with their knives and brought to the surface a truly grateful pilot!

(The pilot, whose injuries now preclude his flying jets, should have been able to confine his landing roll to the runway. While the experts say about 4000 ft is required, that skimpy estimate still gives him an extra 3000 ft. Brakes should have been applied immediately he suspected dragchute failure; the second deployment having apparently failed the brakes were then applied but, of course, too late. The lanyard connection between pilot and seat is not the same as used in the RCAF.)

YOU BET YOUR LIFE!

A meteorologist looks at flight into deteriorating weather

Mr A Parry



A number of major accidents over the past years have a common pattern:

The pilot is required to maintain VFR flight and the flight is planned accordingly. The forecast weather conditions indicate this flight may be successfully carried out. Marginal or deteriorating weather is encountered and the pilot fails to recognize or to appreciate the degree of hazard in the situation in time to take effective action to avoid the accident.

It is evident that avoiding such accidents depends upon the pilot's timely recognition and appreciation of the degree of hazard involved under these conditions. Should you continue to fly into conditions of deteriorating weather to see how things will pan out? YOU BET YOUR LIFE if you do!

In the complicated atmosphere, and bearing in mind the many physical processes which contribute to weather, it is not feasible to wrap deteriorating weather situations into one neat parcel. Meteorological situations are many and varied. Moreover, inasmuch as this type of situation represents a departure from the expected (ie, the forecast which is a product of the application of considerable thought, professional knowledge and modern technology to the *apparent* meteorological state), there is always a very real danger of oversimplification by the pilot in making a reassessment. *One of the most common of these oversimplifications is that deterioration of the ceiling and visibility is only localized and that conditions will improve once the flight progresses through the bank of cloud ahead.*

Further, meteorologists and pilots must recognize that under conditions of deteriorating weather (particularly where this has not been forecast), it is the pilot to whom the ball is thrown. He must make a decision in which meteorology has become a critical factor and without the resources available to the meteorologist. If he is to avoid trouble, bearing in mind the speeds of modern aircraft, the problem must be recognized as it develops in order that the decision will not be taken out of his hands.

What guidance can a meteorologist offer then, that will assist in this decision, balancing the need to avoid dangerous situations with the requirement that missions should not be needlessly aborted? These questions may well occur to the pilot:

- Why is the weather not as forecast?
- How and to what degree is it different?
- What does this mean?
- When must a decision on this matter be made?

In answering the first question it is not expected that the pilot assume the function of meteorologist and, hence, make his own forecast. He must be as careful not to try to make meteorologist's decisions as the meteorologist must be in not trying to make pilots' decisions.

The pilot can, however, with the background provided him in meteorology be cognizant of the physical processes involved and, aware of forecast limitations, use the briefing and forecast as a frame of reference so that the importance of deviations from this will not be missed.

Deteriorating conditions of ceiling and visibility normally occur with an increase in relative humidity in the lower levels of the atmosphere. This may be brought about by radiational cooling or by vertical motion. The former process causes fog or radiation stratus and can result in a general deterioration throughout the area of flight. Lifting of the air may be the result of several influences: *orographic*, where the air is forced to ascend over hills, *convective* activity such as produces cumulus and air mass thunderstorms, or the *dynamics* of the atmosphere such as the vertical motion produced along weather fronts or in the vicinity of cold lows. Too, deteriorating ceiling and visibility may result from the addition of moisture, eg, the formation of low stratus in precipitation.

Where the weather deviates from that forecast, unexpected influences are operating or the processes involved are operating at a different degree than expected, and the pilot will be required to exercise his own judgement. His frame of reference will be the analysis and forecast presented at the meteorological briefing; using this, a continual assessment of the meteorological conditions experienced must be made throughout the flight. Then, the problem will not suddenly emerge as the ceiling drops below VFR limits; it will be evident earlier as it evolves and when alternate courses of action can be carefully weighed.

Meteorological training for aircrew places considerable emphasis on examples of typical cloud formations. These classical models of fronts, while useful, have limitations. As indicated in Weather Ways – "...you should remember that each front must be treated individually". The conditions ahead of, at, and to the rear of the front may vary considerably from the typical patterns depending upon the properties of the air masses involved and other interacting influences.

One of the major limitations on meteorology is worth emphasizing. Canada is, on the whole, a sparsely populated country, so the observational network is relatively widely spaced and many features (commonly called sub-synoptic) escape observation. Frequently the full life cycle of these features covers only a few hours. Radar and satellite reports are of increasing assistance in filling the gaps in the observational networks. In addition, the DOT has a 10-year program for expanding its weather observation network. Despite this, however, it is unlikely in the foreseeable future that a complete picture of the atmosphere will be available. Even in more densely populated areas of the world this observational gap persists. One of the most violent of meteorological phenomena – the tornado – frequently runs its full course without being reported to the observational network.

Minor (if viewed on the continental scale) waves form and move along frontal surfaces. Some of these are stable and do not increase in amplitude; some eventually develop into major cyclones. The lifetime of these features varies from very short periods of time to several days. The incidence of even a minor stable wave is normally accompanied by increasing low-level convergence, upward vertical motion and a consequent increase in the intensity of the frontal activity at that portion of the front. Such a wave, which may have been undetectable at briefing one or two hours previously, may well produce lower ceilings and visibilities along the front than anticipated. If such is the case remember that the pirep of a traverse of the front in that area several hours before may be quite misleading.

The foregoing, rather than being an apology for meteorology indicates some of the whys of the problems facing the pilot. To an extent, the answers to the other pressing questions are dependent on his understanding what a forecast is and what its limitations are. It is unlikely that a forecast will describe accurately all details of the situation which will actually be encountered in flight, but it is of prime importance that it provide the pilot with guidance. If it is simply discarded as a "bust" when the first minor variation in detail crops up, the pilot may be throwing away guidance which will be invaluable later on.

The next major questions are: how and to what degree are conditions deviating from those forecast? It is stressed that these must be continually asked and answered throughout the flight. The observational network of surface and upper observations, satellite photography and computer technology are increasing our knowledge of the synoptic scale features which provide a vital frame of reference to the pilot.

The analyses and prognoses used at briefing present these features and supply this frame of reference. At all stages of the flight the pilot must weigh the weather experienced against this background. As a pilot approaches a front he should carefully note the weather in advance and relate this to that indicated by the latest reports and to that forecast. If the cloud in the warm sector is more extensive and with a consistently lower base than previously indicated it is unlikely that conditions at the front will be as favourable as forecast.

Where terrain is a factor and where, in flight, it is apparent that the front has advanced more rapidly than forecast, bear in mind that conditions forecast at the front will be modified by the variations in terrain between where the front was expected to be encountered and where it will be actually met.

In this way, with a continual appraisal of weather conditions encountered in flight against the framework of the conditions forecast, the pilot will be alert to a situation of increasing concern. The evolution of a major problem will be anticipated before it breaks as a full-blown emergency in which there is little or no freedom of action. If briefing indicates a marginal situation many of the decisions on courses of action can be predetermined while there is time for clear thinking and without the added stresses of maintaining aircraft orientation, minimum safety heights, visual problems, etc. The FAA's book Aviation Weather For Pilots and Flight Operations Personnel states, "...pilots sometimes encounter weather different from that forecast because of forecast limitations. Therefore, in applying the weather reports and forecasts to his flight and in analyzing the weather as the flight progresses, the pilot always should have an alternate course of action in mind in case the weather goes sour. Also he should know alternate weather possibilities in addition to the specific weather forecast. Only then can important deviations from the expected weather be recognized in time for action." (cont'd on page 29)

Thirty-five minutes in a Nieuport 17

F/L WR LONG

Despite what the dictionary says, the vintage* aerodynes some of you may have noticed overhead last year were not scouting for, gathering, or mashing the joy-juice berries. And the ones sticking out of the turf in various poses were neither the end result of the grape nor the total output of the season...

A variety of antique aircraft were flown in Canada by the RCAF during 1967 for centennial celebrations. These aircraft included the Avro 504K flown by the Golden Centennaires, and the National Aeronautical Collection's (Rockcliffe) Sopwith Camel, Sopwith Snipe, Fleet Finch and the Aeronca C2. Two other aircraft, the Sopwith tri-plane and Nieuport 17 of the National Aeronautical Collection were flown briefly but did not fly in any air display. The Nieuport crashed after an engine mount failed; the tri-plane was found suffering from a cracked engine mount and was grounded.

Maybe they don't make pilots the likes of those "magnificent men" any more, but our safety-of-flight record for the Canadian Forces' vintage variety was outstanding – yes, it stood out, all right: an accident rate *270 times* the present-day military rate!

Flying these kites, was to say the least, *different*. My comments will apply mainly to the Nieuport 17 and reflect a wealth of experience on this aircraft: 35 minutes flying time and two landings – one on wheels and the last one not on wheels (see photo).

A brief general description may be in order. The first noticeable point is the rotary engine. The crankshaft is fixed to the aircraft; the whole engine – and with it the propeller – rotates. As you can imagine, this imparts interesting gyroscopic and torque effects to the aircraft.

Engine handling, controls, aids, and ancillaries are strictly elementary. Both throttle and mixture controls must be moved almost simultaneously or the noise level is either drastically reduced as the engine quits, or drastically increased as the engine backfires and vibrates. The Nieuport's control range was about 350 rpm. Fuel and oil flow are gravity fed; a sight gauge shows the amount of fuel remaining. Lubrication is provided by castor oil mixed with the fuel, pumped through the engine, and expelled through the exhaust valves. No oil instruments are needed; oil flow can be confirmed by the film on the lower wing leading edge and on the windscreen – not to mention the pilot's face and goggles.

***VINTAGE**
Gathering of grapes, or any output of a season

The instrument layout makes for an uncluttered cockpit. A tachometer is mounted on the right forward side of the cockpit (on the Nieuport) and a ball – no needle – is mounted on top of the cockpit cowling hard against the bottom of the windscreen. As a concession to my tender years and perhaps also to help me feel more at home, one modern, sophisticated modification was added: an airspeed indicator. It was placed atop the cockpit cowling ahead of the windscreen and could be read through the oil – I mean, the windscreen.

In the cockpit there's a primitive fuel valve below the tank, an ignition switch, and a "blip" switch on top of the control column. The fuel cock is a simple on/off tap controlling fuel flow from the tank. The two switches controlled the ignition. The actual ignition or mag switch was attached to the left side of the cockpit and resembled an old wall-mounted electric light switch, circular in shape, with a simple on/off paddle in the centre. The engine has only one set of plugs so a mag check isn't much use. Either full rpm was developed on run-up and you went flying, or full rpm wasn't developed, and the mechanics started skinning their knuckles.

The blip switch controlled the ignition but is used mainly for landing. It's a plunger-type switch, spring-loaded up, and controlled by the pilot's right thumb. The Nieuport control column is a hollow metal tube with the blip switch filling the hole at the top. As the engine idled fairly fast on approach, the rate of descent and speed could be adjusted by depressing the blip switch. This cut off the ignition until the engine was needed, at which time the blip switch was released and the engine roared into life. This was used in conjunction with side-slipping for nearly all approaches and landings. On the flare or round-out the switch was again depressed and the landing completed.

The blip switch also controlled taxi speed; however, taxiing was avoided with the Sopwiths and Nieuport because of the narrow-track undercarriage, no brakes, no tail-skid steering, and a shortage of replacement wing-tips, etc. We were warned about the possible consequence of holding the switch down for too long. During cut-out, the engine still gets fuel, which makes for fumes under the cowling. When the switch is released, the pilot is in for a surprise. That hazard and a pilot's understandable reluctance to fly *sans* engine-power meant that the switch was used for only a few seconds at a time.

With the exception of two mainplaines, a tail skid, and one or more machine guns mounted externally about the front end, the aircraft is readily recognizable as one of the ancestors of today's aircraft. The Snipe even had an elevator trim system similar to the Sabre's.

The handling characteristics were generally straightforward and predictable, considering that rotary engine. The only exception was the Camel whose reputation, according to its pilot, W/C Hartman, had not been exaggerated over the years. Very light and touchy on the controls, unlike the others it turned with the stick held neutral or slightly forward. Control response on the Nieuport was light on the elevators, heavy on the ailerons, and very light on the rudder. There is no trim. The aircraft becomes progressively more tail heavy as the speed is increased above 70 knots. The absence of a needle-and-ball is hardly noticeable; the airflow suddenly striking the pilot's face on one side or the other promptly informs him that all is not right.

Takeoff for the first time is startling. The aircraft gives the impression of being airborne even before takeoff power is reached. Within 300 feet of roll, liftoff speed is reached – 45 to 50 knots indicated – and increases quickly to a comfortable climb speed of 70. The aircraft would probably climb faster at 60 knots but the extra 10 provides a much better view over the nose. Rate of climb is only academic since the aircraft has no vertical speed indicator or altimeter. Turns can be done in a surprisingly small amount of space and can be entered quickly – even with the heavy ailerons. Rudder must be blended in smoothly as always; I noticed the ball was always in the centre while enroute to and from both extremities.

Landings are fairly simple once the pilot becomes accustomed to using the blip switch; without it, the aircraft feels like it will fly all day at idling rpm. On round-out or flare, depress the blip switch and the drag from the windmilling propeller puts the aircraft on the ground in short order. We were cautioned not to try fly-on landings but to concentrate on 3-pointing the aircraft. This is because the C-of-G sits almost over the main wings and a slight miscalculation by the pilot could send the aircraft tail over teakettle onto its back.

Surface wind direction was carefully noted; takeoffs and landings are always into wind. Otherwise, lack of wheelbrakes, and in most of the aircraft, no steerable tail skid would almost certainly result in the pilot having to do some explaining on a CF210. All flying was done off the grass; space is no problem since landing rolls were always less than 500 feet. As a matter of fact, my *last* landing used only about 15 or 20 feet !

Well, these aircraft provided an unforgettable experience – a once-in-a-lifetime chance to see what flying was really like soon after its inception.

Whether my remarks confirm or deny the impressions you may have gained on seeing The Magnificent Men in Their Flying Machines, I'll leave to the reader's judgement. And those rumours that I was in hospital for one month following my final landing are simply not true – it was only one day!

F/L Long was flying his second practice trip in a Nieuport 17 when, at approximately 300 feet around 75 knots he heard a loud bang from the lower left side of the engine. The noise was followed by very heavy engine vibration; pieces of cowling fell off the aeroplane. F/L Long's forced landing was complicated by a troop of RCMP horsemen directly ahead. He completed 150 degrees of an attempted 180 when his aircraft stalled, fell on the left wingtip and came to rest on its nose. Having no shoulder harness or hard-hat F/L Long struck his head on the gun and was injured.

The lower left engine mount had fractured at the weld where it is bolted to the firewall. This weld was of poor quality and not up to the heavy strains placed on it by the rotary engine.

F/L Long's quick response and cool-headed judgement in a tight spot was good old-fashioned flying at its best!

F/L Long received his wings in 1955 and instructed till 1958 on Harvards at Claresholm, Alberta. He then moved to 111KU and flew Dakotas and Cosmopolitans on search and rescue and transport duties. Since 1964 he has been the Base Flight Safety Officer at Uplands.

CLOSE CALL
OPERATIONAL HAZARD
SAFETY SUGGESTION

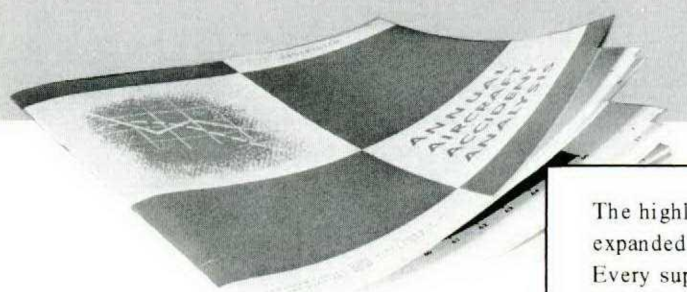
TIP FOR TRANSIENTS

A transient T33 pilot recently asked servicing to remove some items from the luggage carrier mounted beneath his aircraft. Probably through inexperience with this aircraft type, the nose portion of the luggage carrier was left open during refuelling. As the aircraft took on fuel it settled, damaging the luggage carrier.

As many bases no longer have technicians fully trained or even familiar with visiting aircraft, accidents of this type (or more serious accidents) can be expected. For this reason aircraft captains – especially those travelling without crewmen or flight engineers – must exercise very close supervision during servicing and handling.

THE '67 STORY

Birdstrikes caused six accidents – 2 aircraft were destroyed.



The highlights of our 1967 military aviation activities presented here, are expanded upon and analyzed in the Annual Aircraft Accident Analysis. Every supervisor from the NCO level up, should read this book. As well as being interesting reading it constitutes a real "Handbook of don'ts for 1968". See your FSO.

WE GAINED...

The previous record low (62 air accidents) established in 1966 was reduced last year to 54 – a noteworthy achievement. Looks like this will give us the lowest accident rate yet achieved – although statistics at time of writing are incomplete. The new record was attributable largely to the reduction (from 24 in 1966 to 8) on reciprocating aircraft. Helicopter accidents more than doubled to 14 over the previous year's six. The jets and turbos remained fairly constant at 29 and 3 respectively.

In the 54 air accidents last year, 92 cause factors were assigned. Pilot error was down considerably – 39 instances vs 63 in 1966. Similarly, supervision substantially reduced from 27 to 4 – encouraging evidence of a growing maturity in aircraft management at supervisory levels.

History was made in 1967 – our first 365 days free of deliberate breaches of discipline by such things as low flying, low-level aerobatics or other irresponsible acts. Let's hope this, too, is evidence of a new maturity in the Canadian Forces.

Another record low was achieved – in aircraft destroyed. 1967's toll of 21 was one less than in 1964 – the previous low – and two less than in 1966. The improvement stems entirely from reciprocating aircraft operations which showed a striking reduction from 7 in 1966 to only 2 in 1967. Light aircraft (L19, Chipmunk, Otter) losses fell to zero from the previous year's four – which were all attributable in part, to aircrew error.

Leading the write-off roster was the CF104 with 8 of the 21 aircraft written off in 1967. Birdstrikes cost us two of these. Leading the cause factors in aircraft-destroyed accidents were: pilot factors 15, weather 5, as well as 7 undetermined.

We gained, certainly, and for this achievement we heartily commend all those who contributed. We should never lose sight of the fact that accident record lows are merely the visible evidence of a mounting achievement of non-accidents. A glance through any issue of Flight Comment's Good Show column will indicate why we're having more non-accidents these days. Keep up the good work.

In 1954 we lost 119 aircraft; 1967's losses were 21.

There were 6 wheels-up landings during the past year – this, in stark contrast to the previous year when one helicopter made a partial touchdown with the wheels retracted.

None of the major accidents in 1967 were charged to faulty maintenance.

WE LOST...

We gained ground in 1967 but we lost, also. It was a year of disappointment as we saw for the first time in many years an increase in fatal accidents despite the reduction in overall accidents and write-offs. Fatal accidents increased from 9 to 13 and with them, fatalities from 16 to 22. Of the 11 attempted ejections 3 were unsuccessful – unfavourably comparable to 1966's one-in-eleven figure. The Hercules crash in which six men were killed was caused by materiel failure. In several other fatal accidents our equipment failed to provide the margin of safety necessary for survival, although in the majority of cases it was an error on the part of the pilot that started the fatal chain of events.

Ground accidents and incidents showed an incredible rise of 71% to a total of 147. Of the 18 ground accidents two were classified as majors because the aircraft was gutted by fire (one while at a contractor's plant). Of 1966's 16 ground accidents, none were majors. Personnel error was the main cause factor in the 94 ground occurrences during servicing or towing. Inadequate supervision and improper maintenance practices led the list of errors. Towing and cargo loading crews were responsible for 22% of the personnel errors. As well as extensive and costly damage to aircraft, 10 persons were injured in 1967, several of whom were exposed to fatal hazards.

Air incidents were up 20% to 1771; in these, 1940 cause factors were assigned: materiel 976, personnel 483, environmental 242, undetermined 216, and unidentified FOD 23. By far the most significant feature of the incident breakdown was the high incidence of materiel factors in three aircraft types: Tutor, Argus, and T33. The word "incident" is primarily a statistical convenience; several incidents were real hair-raisers. A pilot inadvertently flew into the ground on takeoff when he looked inside the cockpit and got away with only damaging the underpart of his aircraft. Engine repairs fall under the category of incident – and repairs are costly.

Accident costs were up; both total costs and cost per flying hour were higher than the previous year. Destruction of aircraft accounted for 93% of this total. 1967's bill included eight CF104s and a very expensive Hercules.

That's the '67 Story – which could be called the raison d'etre for this year's flight safety program.

On the Dials

In our travels we are often faced with "Hey you're a UICP, what about such-and-such?" Usually, these questions cannot be answered out of hand; if it were that easy the question wouldn't have been asked in the first place. In answering these questions any can of worms opened up in the process can be sorted out for everyone's edification. 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 Commander, Canadian Forces Base Winnipeg, Westwin, Manitoba, Attention: UICP School.

For whom the shoe fits

Through numerous and sometimes nebulous grapevines we occasionally hear of a few "way-out" practices that some pilots have adopted. Here's an example: When cleared for a *visual approach,* a pilot will do a full instrument approach, outbound, procedure turn, and all! This is by no means the name of the game. A visual approach is an approach by IFR flight whereby the pilot with visual reference to the earth, uses at the most only a portion of the instrument approach. He is to fly directly to an aerodrome and align himself with the active runway without delay. The aircraft will be clear of cloud and must have at least one mile flight visibility. However, when cleared for a visual approach, your IFR flight plan is not cancelled and the controller must still provide standard IFR separations. Therefore, any subsequent directives or vectors issued by the controllers must be complied with.

Another way-out tidbit is the misconception that when cleared for a *straight-in* approach, the term *straight-in* refers only to the final minima. The pilot mistakenly does the full instrument approach, outbound, procedure turn, and all! This is another hair-grabber for the controllers. The term *straight-in* when used in an IFR clearance, does not refer to the applicable approach minima. It is an instrument approach where the final approach is begun without first having executed a procedure turn. For example, a radar controller aligns an aircraft on the final approach course and expects that the aircraft will continue in on final without further manoeuvring. For the DOT viewpoint read their Notam 4/67 dated 1 Feb 67.

While you're at it, a perusal through all their class II Notams is well worth the time.

If I flight plan a standard instrument departure (SID) and on initial contact with departure control my routing is changed, do the SID altitude restrictions still apply?

The answer to this question is normally *yes.* Let us assume that you have flight planned from Ottawa to Syracuse via V145 with a request for a Smith Falls One SID. For a takeoff on runway 14 the SID reads "proceed direct (ADF) to *UP* NDB, thence via direct (ADF) to the Smith Falls NDB to intersect V145. Cross Smith Falls NDB at 3000". Your departure clearance reads "...to the Syracuse airport via flight planned route, maintain 8000 feet, a Smith Falls one departure...".

Immediately after takeoff, while proceeding direct to the *UP,* departure control on their initial contact, say "...in radar contact; for vectors to Smith Falls turn right to 235 degrees...". There is no mention of altitude. Now, is your SID broken and can you climb to 8000 feet, or does the 3000 feet altitude restriction at Smith Falls still apply?

To answer this let's look at the situation if you were not given an SID by name but issued the same routing. In clearance form it would read like this "...to the Syracuse airport via direct *UP,* direct Smith Falls, flight planned route, maintain 8000, cross Smith Falls at 3000 feet...". Now, if you were radar-vectored immediately after takeoff to Smith Falls with no mention of altitudes, would you climb to 8000 at this time? Obviously not, we all know that routing changes do not affect altitudes or altitude restrictions. The same applies to the SIDs.

Even if we had received our clearance by mail weeks in advance instead of at the end of the runway, it is still to be read, interpreted, and flown as a normal clearance. By the same token, if after takeoff the departure controller said "...in radar contact, now cleared to climb to 8000 feet" and the routing was not mentioned, you would be expected to fly the SID route.

Unfortunately, there are occasions when all this information may not be of any help. For instance, if the controller told you "...for radar vectors to V145..." then your actions could differ depending on whether you will intercept V145 before or after Smith Falls. Or, do you maintain 3000 feet until abeam Smith Falls? In an ambiguous situation such as this, all that we can suggest is that you query the altitude restriction with the controller *before* climbing above 3000 feet. If in doubt, shout out!

When SIDs were brought out, no explanatory material or applicable rules or regulations were issued with them. Therefore, neither pilots nor ATC controllers have any concrete instructions that can be applied. This leaves the whole issue to individual interpretation. Consequently, if you have any doubt as to the actions required of you when flying the SIDs, don't hesitate to ask the controller.

(The interpretations in this article are the result of considerable research and they reflect the views of both the DOT and military controlling agencies. In addition, the USAF and FAA also treat their SIDs the same – that is, a change in the routing does not change any altitude restrictions that may still apply, or vice versa.)

New Mules - BEWARE!

The new towing mules are much heavier, have a higher top speed, and are proportionately more dangerous...

– Flight Safety Committee minutes

"a roar and a yellow flash..."

Nearly midnight – and reinstallation of a fueltank was proceeding smoothly, "...it was just a matter of buttoning up the installation, tightening down some bolts on the bottom of the tank near the elbow, and tightening up a couple of lines". Then it happened. Without warning and with stunning rapidity, flame engulfed the centre section of the aircraft and the two men working in the fuselage under-section. Both men were badly burned.

Several airmen rushed out to the hangar to investigate the sudden loud noise. The fire alarm was pulled. One man grabbed the 20lb CO_2 fire extinguisher off the wall and arrived at the fire in time to see two NCOs emptying their extinguishers on the flames – with no success. Realizing the futility of adding his own small extinguisher to the effort he returned to assist in bringing the 40-gallon foam extinguisher into position. "We rolled to approximately 50 feet from the aircraft. I unrolled the hose and activated the nozzle valve, but nothing came out... A few seconds later there was another explosion." *(A fire-fighter later testified that "whoever attempted to use this extinguisher was not familiar with its operation"; this is understandable. The technician had no training on this type nor could he rely on printed instructions – there were none.)*

The gutted CF100 was towed, still smoking, away from nearby aircraft and out of the hangar. Throughout, the men in the hangar at great risk courageously fought the blaze.

The Board of Inquiry found that an electrical inspection light with a faulty connection had ignited fuel vapour causing the explosion, and understandably recommended that "...a more rigid inspection and repair system be devised for electrical equipment such as inspection lights, extension cords and electric drills..." Looks like a new lighting unit will be procured.

Suppose this near-tragedy had cost us a hangar filled with operational aircraft. It would be ironic to have paid such a high price for something as commonplace and preventable as a loose electric wire connection.

Screw came loose, causing spark

And the fire extinguishers? This – and several recent close calls – has prompted another hard look at our *first-aid* hangar extinguishers. Whether wall-mounted extinguishers can ever be adequate to combat an aircraft blaze is open to discussion, but the multiplicity of extinguisher types is not.

Fire is a panic-creating sight for us all. Even though we may conquer an instinctive urge to run away we are in no mental state to recall a briefing of six months ago – we may even forget which way a knob turns to open a tap. It's distressing to admit that industry has produced a fearsome array of levers, taps, pins and triggers. If available light and mental condition permits, there is a set of instructions on most extinguishers, but... this problem too, is under study. If ever circumstances dictated the need for standardization, it's in the device a man will have to use *without hesitation or confusion,* for life and millions are at stake.

From the AIB

Tutor - Costly Murphy

An alert, sharp-eyed field service representative from Canadair, Mr D Armour, recently discovered a Murphy which had been built-in at the factory years before. (It seems that a *Murphy Monger* from the Aerodyne Design Department – see Bird Watchers' Corner Jul-Aug 1967 – had made it possible for the cooling air deflector in the starboard engine access door louver to be installed backwards making the louver an exit rather than an inlet. Ah well, back to the drawing board . . .)

Earlier, a series of false overheat indications in Tutor 26141 cost us repeated futile checks of the fire warning system and jet-pipe areas, not to mention the airtests after each inspection. This Murphy has undoubtedly triggered many overheat snags in the past; in fact, four aircraft were found in this condition. So, Mr Armour's discovery will be good news to frustrated technicians who have spent many fruitless hours looking for a non-existent malfunction.

The AIB inspector is happy also. An assessment of "Undetermined" is particularly frustrating; not only does it represent a nil gain of knowledge or understanding but it's usually the culmination of a great deal of time-consuming sleuthing.

Thank you, Mr Armour!

Clunk, thunk, bang

The title is aircraftese for "ouch" and the pilot who ignores these tell-tale noises does so at his own hazard. In Gen from 210 there's the story of a helicopter pilot who disregarded a loud CLUNK on start-up and flew his aircraft with his power train (including rotors badly damaged.

Several recent similar occurrences bring to mind a message which could well go on bulletin boards:

*HELICOPTER TRANSMISSIONS ARE CRITICAL ITEMS – ANY ABNORMAL INDICATIONS FROM TRANSMISSION OR CLUTCH MUST BE **PROMPTLY** INVESTIGATED.*

Quote without comment . . .

A recent air incident involved an engine component failure forcing the pilot to abort the mission. This was the second similar failure in the aircraft in two months, a fact that was somehow overlooked by the unit.

Later, after a teletyped interchange with a higher formation who had picked up the unusual recurrence, the unit reported "the fact being considered at this time . . .".

CF104 - Kicker, shaker, and flap

The angles of attack of the shaker and kicker vanes at which the APC cuts-in are influenced, not by the actual position of the leading edge and trailing edge flaps, but the position of the flap handle. As you know, the stick shaker is activated by the left vane, and the stick kicker is activated by the right vane.

	Flap handle in TAKEOFF		*Flap handle in UP*	
APC mode	Aircraft ∠ of attack	Vanes ∠ of attack	Aircraft ∠ of attack	Vanes ∠ of attack
Stick shaker	13.0	20.5	10.7	17
Stick kicker	16.1	24	13.8	20

Good Thought

The BFSO stated that transient crews were unable to buy coffee, cigarettes, or sandwiches during the quiet hours. Facilities were either closed or non-existent. He was concerned that aircrews might be departing . . . with a hostile attitude detrimental to their safety.

– Flight Safety Committee minutes

(cont'd from page 21)

The effects of terrain on weather require further comment since it is over rough terrain that accidents most frequently occur. In the vicinity of hills, ceilings will almost certainly be reduced below that generally prevalent in the area even if the effects of orographically induced vertical motion were neglected. The relationship between ceilings over relatively flat terrain and those forecast in the area may indicate problems ahead when flight is directed towards a range of hills. *The safety altitude must always be borne in mind.*

All changes of weather conditions enroute should be noted and considered. The pilot flying at 2000 feet should remember (and attempt to relate within his weather frame of reference) that a change in ceiling from 5000 to 4000 feet is deteriorating weather. It is not, at that point in time, as serious as a change from 2500 to 1500 feet but it is one which should be noted and considered.

Having noted the changes that have occurred in large measure answers the questions as to what they mean. For in this sense the pilot wishes to know if he can complete his flight and, if not, what to do and when to do it. A continuous weighing of flight conditions encountered against the conditions indicated at briefing, bearing in mind the safety altitudes in the flight area, should indicate the possibilities of marginal conditions before they overtake the pilot. "What to Do" is in the pilot's domain and is a decision which can be carefully considered beforehand when the pilot is alert to the deteriorating situation.

When must a decision on this matter be made? A partial answer to this question is: throughout the flight. A continual appraisal of the situation will assist the pilot to make the full decision at the correct point of time. Alert to deteriorating weather, aware of the limits below which the safety of the aircraft is endangered, guided by the relationship between conditions encountered and those forecast and having predetermined alternate courses of action before a full-blown emergency has arisen, the appearance ahead of below-limits weather no longer leaves the pilot out on a limb. Valuable time at this critical point is not wasted in consideration of various courses of action and unsafe flying conditions will be avoided.

Finally, another quote from the FAA manual mentioned above:

There is no sounder advice.

FIX LIMITS OF WEATHER CONDITIONS BEYOND WHICH YOU WILL NOT FLY – AND STICK TO THEM.

Tool Control: *pilot project underway*

The Aircraft Maintenance Development Unit at Trenton has been given a tough nut to crack – " . . . to assess modern methods of tool control and design and evaluate methods which will reduce the incidence of FOD to Canadian Forces aircraft."

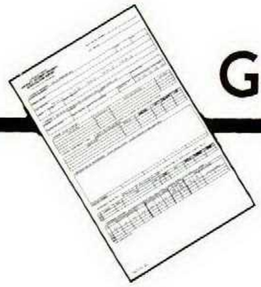
The directive handed to the AMDU notes that "The need for tight control has already been recognized and applied by the air forces of other nations". First, the unit will assess existing methods of tool control such as those of the RAF, the RN and the RAAF. The directive wisely cautions:

"Although the deterrent aspects of tool control cannot be ignored, the aim of the project is to devise an efficient method of control which will engage the participation of technicians, supervisors and managers. The emphasis should therefore be placed on *prevention* of FOD by tools rather than investigation of FOD by tools, even though the latter aspect is complementary to the former. Human values at all levels must not be ignored or depreciated."

This is the crux of the problem; we have spent much futile labour on a pre-occupation with finding the culprit and making him an example. What we need is some way of *preventing* carelessness in the first case. A good example here is the nuclear safety program which is sensibly based on the presumption that as long as there are people involved there will be carelessness; with this hypothesis as a starting point the program was virtually assured of success.

The directorate sponsoring this project is aware that this is only one part of the problem. There's the big one of contractor participation in the manufacture and maintenance of aircraft through depot-level inspection and repair, MRP, and control of C-class items such as bolts, rivets, etc. And, of course, there's all the debris lying on floors, ramps and runways.

(We'll go on record unofficially to suggest that if there are ideas floating around, send them to the AMDU.)



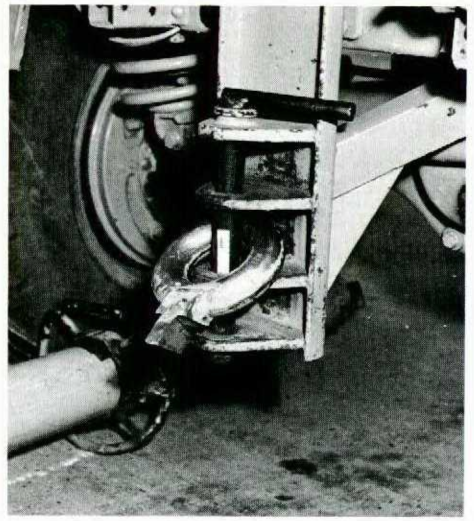
Gen from Two-Ten

SEA KING, FORCED LANDING Shutting down the live engine during single-engine practice is a classic as old as twin engine aircraft. Now that we have twin-engine helicopters we have had a similar occurrence.

As the instructor was shutting down number 1 engine to demonstrate an airstart there was a rapid decrease of rotor rpm. The instructor took control and commenced an autorotation, at which time he noticed that he had mistakenly shut off the fuel to the *number 2* engine. He quickly flicked on the fuel and the igniter for number 2 engine without either retarding the speed control lever from the 104% position (required for single-engine flight) or having recovered his rotor rpm. The resulting rapid acceleration on number 2 engine severely damaged the blade dampers allowing the rotors to flap violently. The gears and bearings of the main transmission were so badly damaged that failure was imminent. During this emergency the pilot was able, with considerable difficulty, to perform a successful emergency descent.

Earlier in the flight the instructor and student had been practising single-engine landings with *number 2* engine shut down. This likely conditioned the instructor to select the wrong fuel control – a mistake which nearly cost us a crew and helicopter. Instinctive or habitual (ie, unthinking) reaching for switches and levers is hazardous – as this breathtaker demonstrates.

Before you reach – THINK!



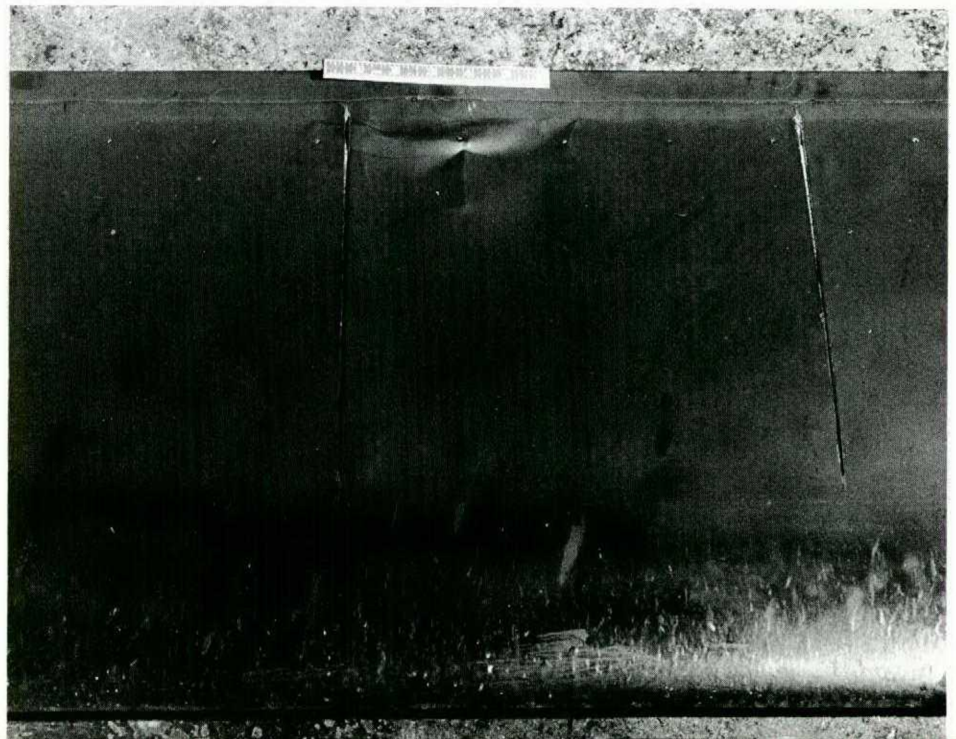
CF104, TOWBAR SHEAR PIN During towing the towbar shear pin broke; the aircraft continued rolling spearing the tow vehicle with the pitot boom. Runaway aircraft are a menace to themselves and others; fortunately the damage was limited to a shaft in the aft of the tractor.

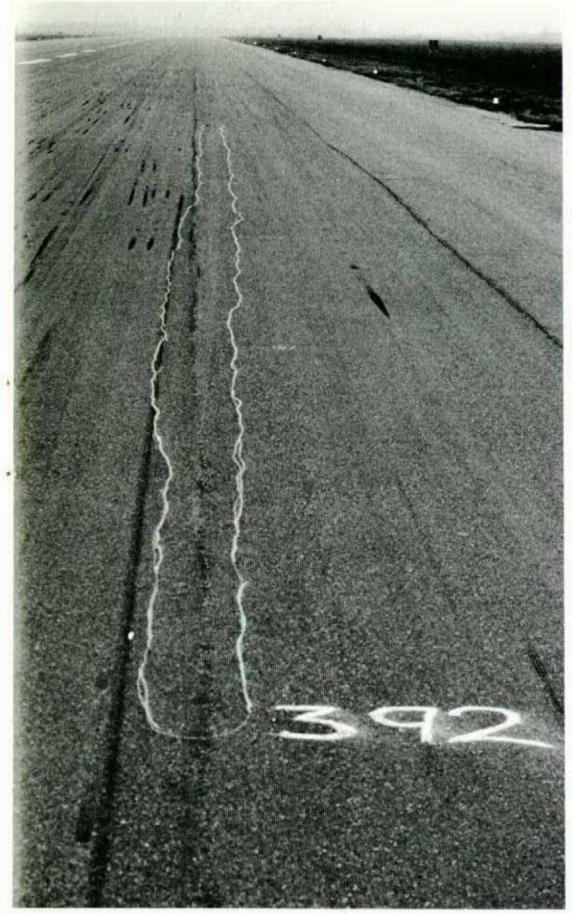
Shear pins – unlike aircraft – are inexpensive; for this reason Air Division has instituted a timed replacement program because the design of the towbar prevents a visual inspection of this all-important pin. In this case, as with so many others, the shear pin had already been partly sheared.

H21, BLADES OVERSTRESSED While bringing the rotors up to speed during start-up for his first solo the pilot heard a CLUNK somewhere in the area of the central transmission. The engine tach needle had flicked momentarily, but as the engine and rotor needles joined the pilot pressed on. This, he should not have done.

All six rotor blades were buckled at the trailing edge; both rotor heads, and all three transmissions and driveshafts had to be changed. In short, the pilot flew this aircraft in a very dangerous condition despite the tell-tale noise on start-up.

The photograph shows one of many points of buckling in the rotor blades.

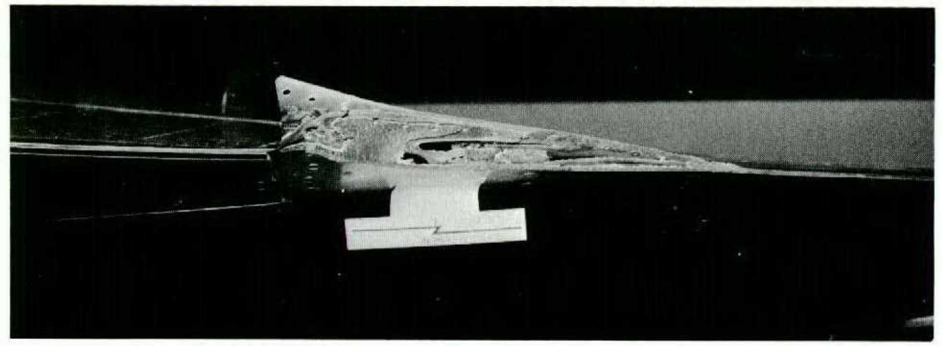




CF101, FLAP SCRAPED ON T/O This uncomfortably close call was set up by that old classic – number two over-running the lead on a formation takeoff. Despite minimum burner, number two steadily gained ground on his lead throughout the takeoff roll and at liftoff was in the awkward position of having to raise his undercarriage and maintain separation with eyeballs glued to his lead. This resulted in the pilot probably banking his aircraft slightly, just enough to scrape his extended flaps on the runway.

Under the circumstances, ie, deprived of visual reference to the ground, the pilot could readily have manoeuvred his aircraft in such a way to drag the flap. But for precisely this reason, both pilots should be quick to recognize and preclude such a situation occurring. Following burner selection the takeoff occurs in less than 10 seconds; this demands immediate and total cooperation between *both* pilots. If, as in this case, the formation is beyond control, each pilot must be prepared to take off independently rather than maintain formation integrity beyond sensible limits.

Certainly, in this critical manoeuvre there is no margin for misjudgement – the secret is, don't get caught in that position.



HERCULES, BRAKES vs MULE The crew were in position to begin towing. The man on the aircraft brakes leaned out the window and shouted "Are you ready for brakes-off?", but a noisy power unit nearby blotted out all but "...brakes off". The mule driver then applied power (although the tow crew NCO had not yet given the order); this was followed by a loud bang as the nosegear towing lugs broke.

The tow crew NCO stated that "...If the shear pins had sheared as designed, there would have been no damage." Fair enough, but hangars have always been noisy – and procedures should take this into account.

CF104, CHOCKS SLIPPED A tow crew – vehicle driver, cockpit rider, and a man for the chocks – positioned a CF104 on a wooden loading ramp for the night. As the towbar was disconnected the man in the cockpit left the aircraft – just in time to witness the aircraft rolling backwards off the ramp. Hasty attempts to wedge the chocks more securely and insert other chocks, failed. Soft ground and a small storage building brought the aircraft to a stop. The tail was damaged as was the shed.

This occurrence proves that wooden chocks on a wet wooden ramp don't work. Improved chocking, tighter supervision, a five-man towing crew, and the man in the cockpit remaining until all is secure, should prevent a recurrence.

A crewman was injured while trying to insert chocks behind the runaway 104; he was lucky – he could have slipped and....

Comments to the editor

In 1956 or '57 while employed in SOAE/ADCHQ I compiled several hundred fire-warning reports and pointed out statistically that the fire-warning systems were useless. I found that people believe in statistics only when they show you have too many men! It was argued that statistically the failure rate is not as bad as the component failure rate suggests, etc, etc, and let's not get rid of the system. Statistics show that false-warnings outnumber the real warnings about 1000 to 2 and it is therefore superfluous.

It is certainly refreshing to see that after some 10 years, several hundred more false fire-warnings, mods on mods, manhours upon manhours wasted, that someone else now shares my belief. It will be interesting now to see how long it will take to delete fire-warning systems or follow the USAF and deactivate a system or two and see if there are any quarrels.

WO2 JW Brown
CFB Gimli

While you were at SOAE/ADCHQ almost all of the false fire warning reports received at DFS were in the CF100 – probably history's greatest false-fire-warning machine. The story's different with the CF104; during the first five years we received only one false fire warning report. There were nine actual fires or overheats to which the system alerted the pilot.

False fire warnings tend to discredit fire warning systems; unhappily, false warnings have always exceeded actual warnings by a considerable margin. In-flight fires are rare but overheats are not. Gas escaping from combustion casings, or improperly secured tail-pipes produce overheat hazards, although the pilot may see this on a "FIRE" indicator in the cockpit. Unnoticed, would any of these overheat conditions have progressed to a disastrous degree? There's strong liklihood that some of the more severe cases would have.

On the other hand, we have lost aircraft and subjected crews to unnecessary stress through false fire warnings.

The evidence obliges us to concede, however, that a simple, reliable overheat detection device is still a requirement but until something better comes along, looks like we have another item for our list of "exigencies of the service".

The article "A Little Fuzzy on Observations" in the Sep-Oct Flight Comment definitely points out the problems in observing and flying in marginal weather with obscuring phenomena and precipitation.

An example given in the article: W4X1S- is not possible. If there is any precipitation which is obscuring the ceiling, the classification P (precipitation) is used. The number after this classification is the height in hundreds of feet which the observer can see into the precipitation. "W" is used for obscuring phenomena other than precipitation so the other example of WOXOF (zero-zero in fog) is quite correct. If there is precipitation the P classification supersedes the indefinite classification.

LAC Guy Blanchette
CFB Summerside, PEI

In modifying the article for Canadian publication this point was overlooked. The point you make is indeed valid using Canadian observing practices, but would not be so for the US.

The Canadian manual MANOBS gives the definitions of ceiling classifications:

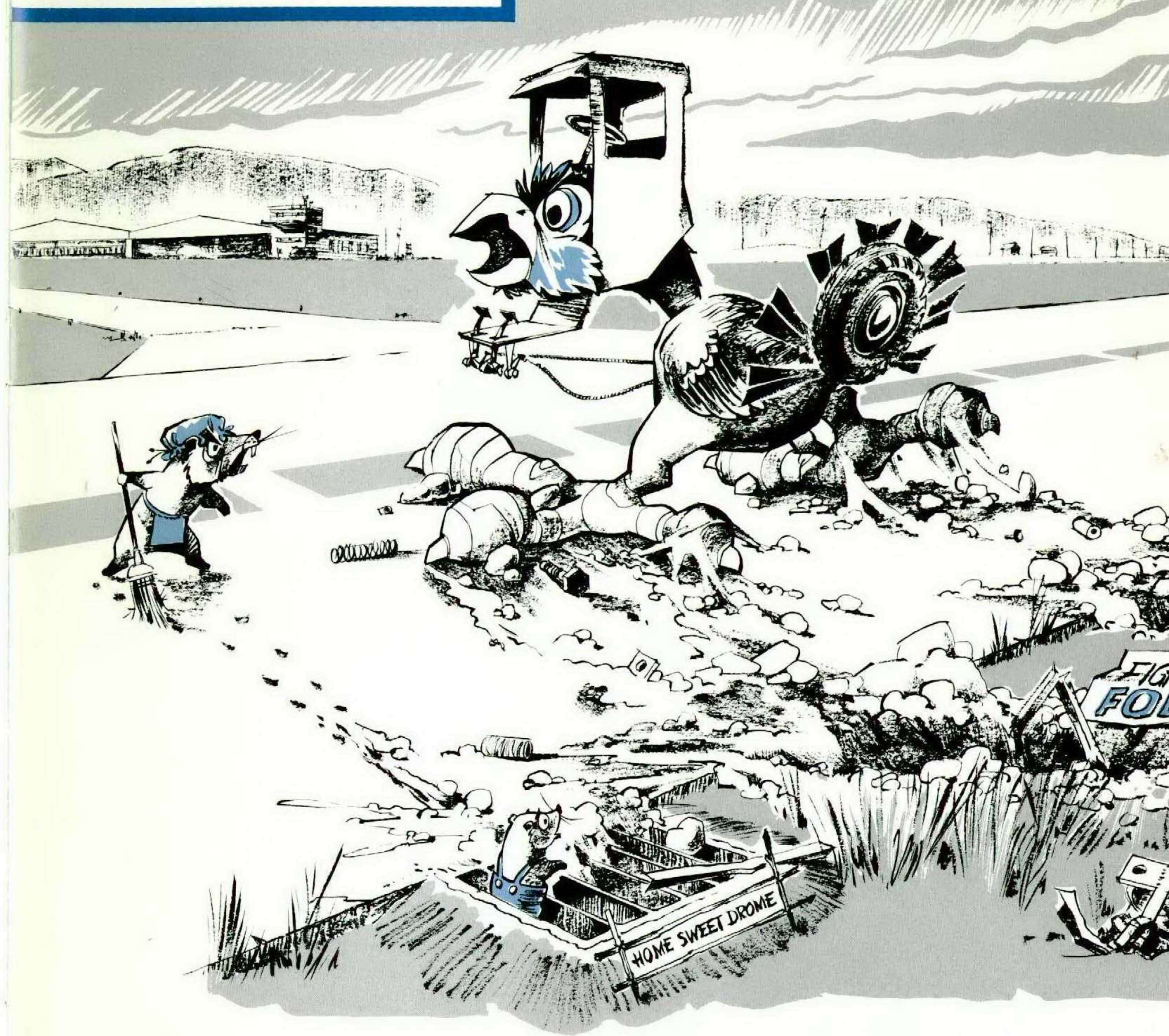
INDEFINITE is the height classification employed for the value of the vertical visibility into a surface-based layer which is not composed of precipitation and when the classification AIRCRAFT is not appropriate.

PRECIPITATION is the height classification employed for the value of the vertical visibility into a surface-based layer which is composed of precipitation and when the classification AIRCRAFT is not appropriate.

Attention, metal bashers

WE RECENTLY WRECKED A J79 ENGINE DUE TO INGESTION OF JO-BOLT P/N 164 DRILLED OUT DURING REPAIRS TO AIR INTAKE DUCT. ALTHOUGH DUCT HAD BEEN VACUUMED ON COMPLETION OF REPAIRS IT IS SUSPECTED THAT JO-BOLT REMAINED, STUCK TO SEALING COMPOUND USED IN REPAIR. ALL TECHNICIANS ARE CAUTIONED TO REMEMBER THAT J79 ENGINES PRODUCE FAR MORE SUCTION THAN ANY VACUUM CLEANER, AND TO ENSURE NO OBJECTS ARE LEFT STUCK TO SEALING COMPOUNDS AFTER AIRFRAME DUCT REPAIRS.

- Flight Safety Flash



FOD-FOOTED MUCKING-BIRD

"Show me a nesting area, and I'll show you a mucking bird" goes an old bird watchers' adage. And sure enough — across the muckiest region of the infield, FOD-foot comes vehiculating toward the runway. Once on firmer ground, there commences a stomping of feet — an instinctive ritual which is this bird's greatest delight. Divested of his deadly debris he glances momentarily backward to admire the mire; at this point — if you listen to the mucking bird — you'll hear his chortling call:

ICOULDGROUNDTHEWHOLEFLEET WITHMYFILTHYFEET

*One picture worth one-thousand words