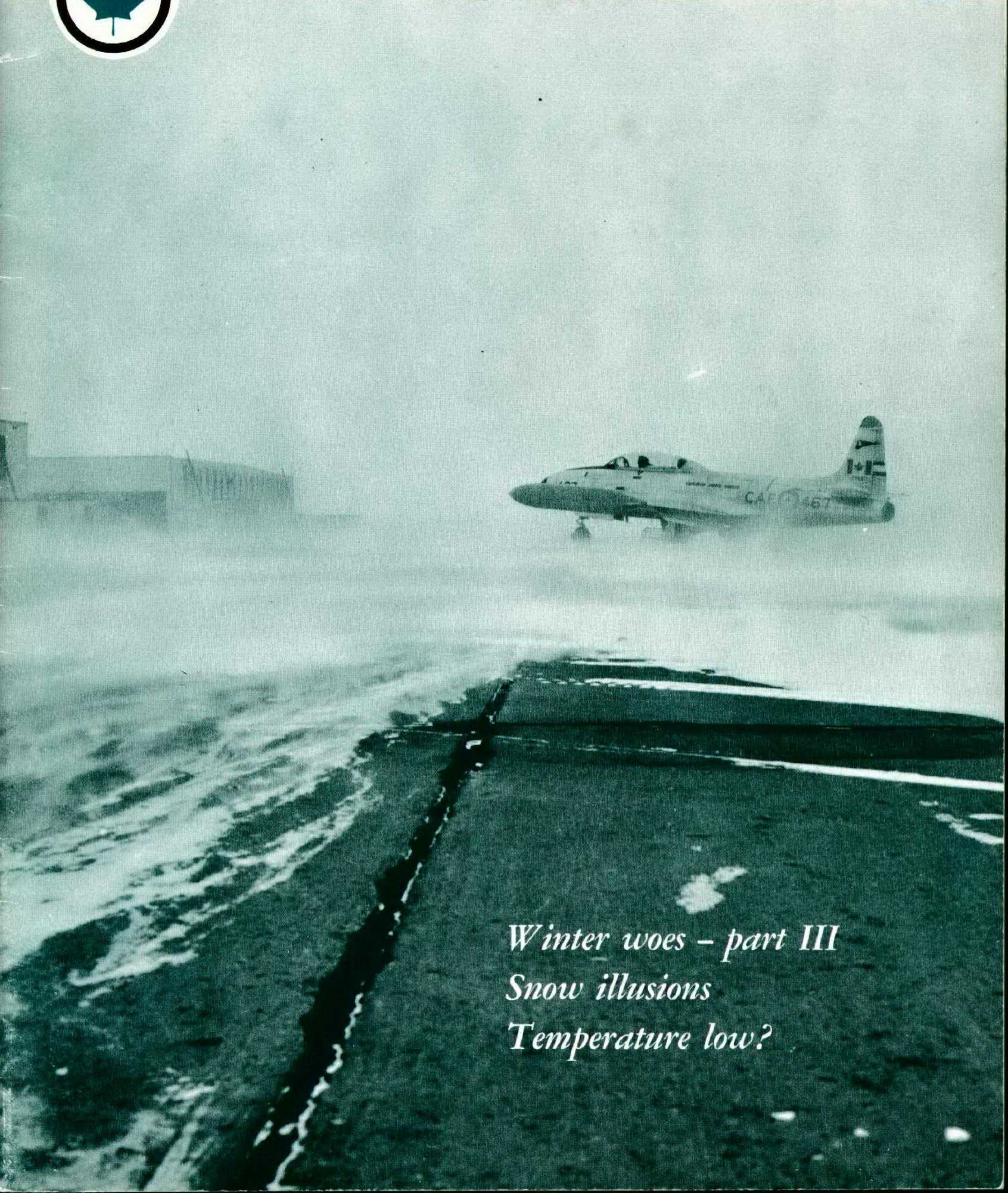
FLIGHT COMMENT

NOVEMBER • DECEMBER
1969



Comments

"In general the flight safety survey visit was a success with particular mention being given to the excellent support offered by all supervisors to the flight safety program", goes a recent report. Encouraging news, this.

An aeromedical variant of the old song might go "Smoke gets to your eyes". In addition to the obvious smoke irritation causing tearing and blinking the presence of carbon monoxide in the body is insidious and substantially more hazardous to vision. A man who smokes 20 to 30 cigarettes per day or three cigarettes in close succession will saturate 8-10% of his blood with carbon monoxide. This significantly decreases night vision: 20% from sea level to 4,000 ft, 25% at 6,000, and 40% at 10,000. At altitude, this is double the vision loss (through partial hypoxia) of the non-smoker.

We assumed (incorrectly) that the levity in the title of the Tracker picture sequence "going...going... GONE!" implied that the aircraft was "gone" from view *momentarily* - not forever!

"Little things mean a lot" is particularly applicable to aircraft operations. Take for example the indifference on the part of some technicians for the care of aircraft skin structures. The importance of aerodynamic smoothness is starkly evident in this fact: for the C141 jet transport a six by six-inch plate 90° to the airstream would absorb the energy equal to about 1000 lbs of payload. Of course, no plate would be so installed but each small irregularity becomes part of a total profile.

Carrier pilots are advised to get their hands on "Pilots Carrier Approach/Landing Aid Development Reviewed" from the US Naval Air Systems News, Vol I, No 2. Your FSO can help.

The Personnel cause factors stated in the article "...I knew I was going to drown" (Sep/Oct), were tentative at the time of publication and were not the final assessments of this accident. Therefore, they should be disregarded. We apologize for any embarrassment this may have caused.

CANADIAN FORCES HEADQUARTERS — DIRECTORATE OF FLIGHT SAFETY

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GOOD SHOW

The articles on "Winter Woes" and "Snow Illusions" prompted me to discuss hazards associated with winter operations and, in particular, the real dangers of trusting one's eyes too much under various atmospheric and terrain conditions. Instead, I will take the unusual step of using this editorial to pay special tribute to the one individual who, in my opinion, has done more than anyone else in recent years to get the message on this and other flight safety matters to Canadian Forces personnel.

I refer to Captain John Richards, Editor of Flight Comment, who regretfully will have retired before this edition reaches you, and will have started a new career associated with civil aviation. Captain Richards has been a member of DFS for almost six years; first as Assistant Editor of Flight Comment, then for over four years as the Editor.

At the time he became editor his staff was reduced from three to one but the work load and responsibilities increased because of other force changes. In all probability a less imaginative and dedicated officer would have flagged in the face of an almost impossible task resulting in either a poorer quality publication or in its cancellation. That neither of these undesirable situations came to pass is due almost entirely to Captain Richards perseverance and ability.

In itself this officer's contribution to the flight safety programme through Flight Comment would warrant the award of a Good Show. However his efforts were not limited to this aspect alone and he contributed to many other flight safety projects, including development of the assessment and reporting system and as a lecturer at various service courses. Therefore, on behalf of everyone in the Canadian Armed Forces associated with the operation of aircraft, I am awarding Capt John Richards a "Flight Comment Good Show" in acknowledgement of a job exceedingly well done. "Good Show and Good Luck".

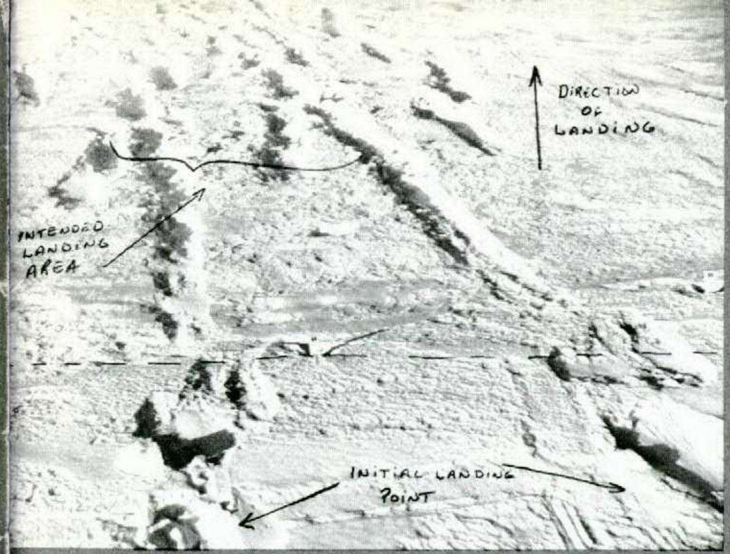
COL R. D. SCHULTZ
DIRECTOR OF FLIGHT SAFETY

Pilots with winter woes succumbed last year to pretty much the same hazards as publicized in the previous two years. As Canadians, the rigours of the northern winter should come as no surprise; nevertheless, the hazards illustrated do have that old familiar ring.

A word of warning to managers and supervisors. How many of these occurrences had inputs from the remoteness of your office desk? (Inadequate clothing, hazardous exposure to cold, and runway environs not quite cleared of snow.) Or could it be that someone on your unit might press-on into a snowshower, or has an unhealthy disregard for frost on wings, or wears improper winter and survival clothing?

Well, warmest wishes for a woeless winter!

Clothing can be a nuisance - particularly, if the user incorrectly fastens his parka...



Snow can hide bad ground. In this case, a CH113 hit a "bump" buried beneath the snow.

Frost on aircraft - still with us.

WINTER WOES

(an annual feature — no. 3 in the series)

	WINTER INCIDENTS		WINTER ACCIDENTS	
	67-68	68-69	67-68	68-69
SNOW ON INFIELD	2	0	1	2
RESTRICTED VISIBILITY - HEAVY SNOW AND WHITEOUT	0	1	5	2
SNOW/ICE/SLUSH - RUNWAYS, TAXIWAYS AND RAMPS	14	13	2	0
ICING - AIRFRAME, ENGINE UNDERCARRIAGE, FLIGHT CONTROLS, AND INSTRUMENTS	20	10	0	2

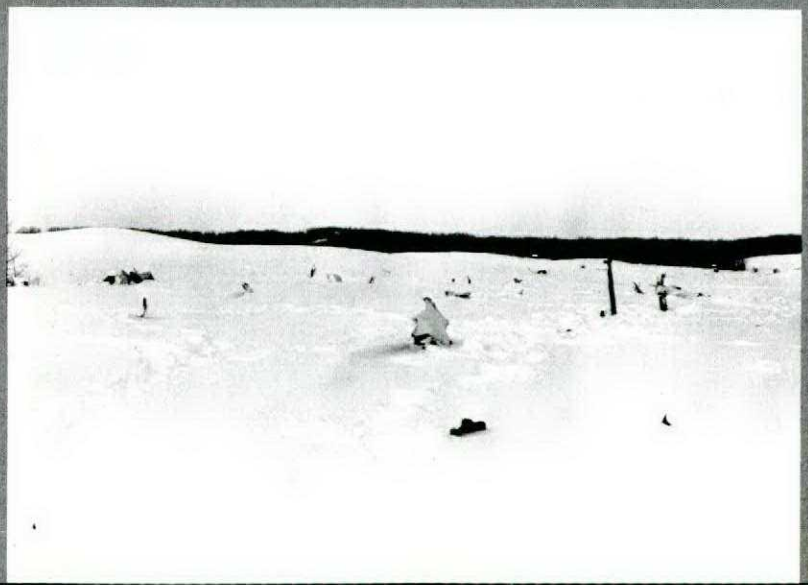
Snowbanks on narrow runway - a double hazard.

Last winter's record shows that...

- Persons exposed to severe cold become inattentive and prone to errors in judgement.
- The snow-covered infield continues as a hazard to aircraft.
- Cockpit visibility in a helicopter can drop instantly to zero when flown near snow-covered ground.
- Visibility in rain is bad but in snow it's nil.
- Otters stayed off thin ice last year - and that was a record!

With no visual references over frozen lake, pilot succumbed to ***snow illusion.***

Pilot was last seen flying low-level in a heavy snow-storm...



Sling-load was incorrectly attached - technician exposed to very severe wind-chill beneath helicopter.

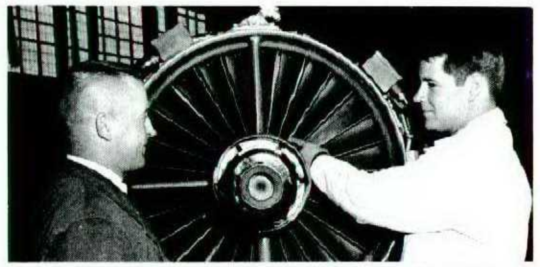
Good Show


Lt T. Hartvigsen


Capt D.H. Lay


Lt T.P. Nevison


WO L.T. Archer


Pte J.P. Holgate

LT T. HARTVIGSEN

In the circuit on his first night solo in a T33, Lt Hartvigsen experienced a rapid roll to the right when he selected flaps down. Quickly assessing the cause of the roll as a split flap he immediately selected flaps up, declared an emergency and discontinued his approach. Faced with an emergency which required him to fly a difficult flapless landing at night, Lt Hartvigsen flew a faultless radar assisted approach and performed a well-executed landing.

For someone of his experience level, although confronted by a rare and unexpected emergency, Lt Hartvigsen displayed a high degree of competence in cooly handling this potentially dangerous situation.

CAPT D.H. LAY

While on a high-level cross country over the United States, Capt Lay heard a loud noise followed by the complete disintegration of the port engine in his CF100. The reported weather conditions were considered suitable for an emergency approach; however, Capt Lay was later confronted with having to make his single-engine approach and landing through a ceiling of 300 feet and 1 mile visibility.

Throughout this extreme emergency Capt Lay handled the diversion and recovery at an unfamiliar airport in a most professional and competent manner. He displayed cool judgement and flying skill in bringing his disabled aircraft to a successful landing under very challenging conditions.

LT T.P. NEVISON

Just after takeoff at 150 feet over the end of the runway, Lt Nevison heard a loud bang in his Tutor. The tailpipe temperature went beyond the maximum allowable and the rpm rapidly dropped off to 30 percent. After pulling up to gain altitude he attempted an airstart but was unsuccessful. Out of position for an into-wind landing, Lt Nevison elected to land downwind on the parallel runway. Declaring an emergency, he lined up with the runway and successfully completed a landing after touching down with 3500 feet remaining. Employing all braking devices including the open canopy and flaming out of the engine, he came to rest just five feet into the paved undershoot area. During manufacture some stator blades had been improperly installed and an engine failure had been inevitable.

Lt Nevison's flying skill and cool judgement meant the safe recovery of a valuable aircraft - a commendable contribution to flight safety.

WO L.T. ARCHER

During informal discussions, WO Archer's suspicions were aroused when he learned that a fire extinguisher carried on Argus aircraft was charged with a water/glycol solution. During his research into the engineering orders his suspicions were confirmed; the extinguisher should have contained chlorobromomethane. Also, he uncovered a contradictory statement in another EO pertaining to the use of water/glycol.

Had these fire extinguishers been used against a fire in the hydraulic system, a very serious fire could have developed. WO Archer's commendable alertness and initiative averted a potentially dangerous condition.

PTE J.P. HOLGATE

Assigned to perform a pre-installation inspection on a J79 engine, Pte Holgate while using a mirror and light discovered very small cracks on the rear face of two inlet guide vanes. Cracks of this type can progress very rapidly into a complete blade failure; if ingested, blade fragments can cause immediate engine failure. The defects he found were almost invisible to the naked eye and in all likelihood would have been missed by the majority of technicians.

Although the inspection of the J79 guide vanes is a normal procedure, Pte Holgate demonstrated a commendable degree of integrity and perseverance. He not only saved an engine but averted exposing the pilot to the hazards of an in-flight engine failure as well as loss of the aircraft.


Sgt J.G. MacDonald


Cpl M.E. Ramsden


Cpl J.R. Short and Cpl O.E. Harvey


M/Cpl R.W. Green and Cpl C.T. Smith

CPL M.E. RAMSDEN

During a routine inspection of a Huey helicopter under field conditions and in poor light, Cpl Ramsden discovered a small crack in the skin near the tail boom attachment point. His discovery brought to light a condition which could have had serious consequences if it had gone undetected.

Cpl Ramsden's thoroughness in performing a routine job demonstrated the continuing contribution to flight safety of alert and conscientious technicians - often under demanding and adverse conditions.

SGT J.G. MACDONALD

During the takeoff run, an engine caught fire. Sgt MacDonald, who was senior flight engineer in the Argus, shut down all engines but the fire continued. After directing his flight engineer assistant who was on the panel, to perform the prescribed fire procedures, Sgt MacDonald ensured that the cowl flaps were open to aid in the fire fighting and climbed out onto the wing. He fought the fire with a hand-held extinguisher and after having expended one, continued to fight the fire with another extinguisher until the base fire-fighting equipment arrived.

Sgt MacDonald's knowledge and competence enabled him to respond effectively to this serious emergency. In addition, his display of initiative and courage prevented the fire from severely damaging a valuable aircraft.

CPL J.R. SHORT and CPL O.E. HARVEY

While marshalling-in an Argus late in the evening, Cpl Short heard a hissing sound from one of the engines. He reported this, but a check of the sparkplugs and other possible leak areas revealed nothing. The next day Cpl Short again heard this hissing sound and again reported his observations; this time, a more thorough check by Cpl Harvey uncovered a cracked cylinder head. The crack was difficult to see because it had returned to a very fine hairline when the engine cooled and it was in an area adjacent to a sparkplug insert.

The initiative and alertness of Cpl Short and Cpl Harvey resulted in the discovery of damage which could have caused an in-flight emergency as well as the loss of thousands of pounds of jettisoned fuel.

M/CPL R.W. GREEN and CPL C.T. SMITH

While performing a primary inspection on a Dakota, Cpl Smith detected an abnormal noise in the elevator control system. Reporting his finding to the crewchief, M/Cpl Green, the two technicians verified that this deficiency warranted further investigation. After removing the floorboards a careful check of the upper elevator control system revealed that a cable was binding on the autopilot servo drain tray. Someone had incorrectly routed the cable underneath and around the tray forcing it to bind.

Cpl Smith's alertness and competence was demonstrated by his detecting a noise which is extremely difficult to distinguish from the normal servo system noises common in the Dakota. Further, the professional follow-up of M/Cpl Green averted what could have caused a serious in-flight control problem.

cont'd on next page

Winter - fall hazard

SAMO reported that large icicles have been forming on the roof and overhanging the doors of the hangar, making a hazard to both equipment and personnel...

- Flight Safety Committee

Winter work...

A "cherry picker" has been arranged for, to keep hangars clear of icicles.

- Flight Safety Committee

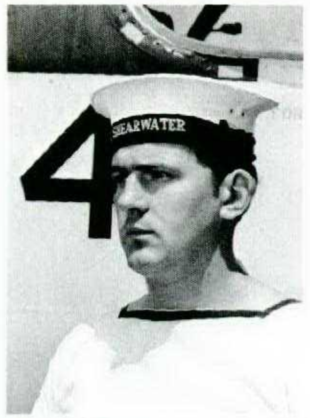
GOOD SHOW

Cpl T.A.D. Miles

WO J. Sopaz

Cpl J.D. Wadden

Pte D.R. Engberg and Pte R.M. Jackson



Pte L. Gmyz

WO J. SOPAZ

WO Sopaz, a flight engineer, was performing the pre-flight control check on his Yukon when he spotted a small but serious deficiency in the aircraft tail 20 to 25 feet above. The starboard elevator control tab eyebolt had become disconnected from the pushrod - a condition which could have had disastrous consequences. The locknut which held the eyebolt to the pushrod had backed off from vibration, allowing the pushrod to turn. The locking wire on this nut was found broken.

WO Sopaz conducted his control check with outstanding thoroughness and in doing so made a noteworthy contribution to flight safety.

PTE L. GMYZ

While his unit was detached at another base, Pte Gmyz was attempting to start a hydraulic test rig when a serious fire broke out. As the flames were dangerously close to a storage tent filled with vital materiel, the fire posed a serious threat to the whole operation. Pte Gmyz, showing commendable knowledge of fire fighting techniques, brought the fire under control.

Pte Gmyz's professional knowledge as well as his courage enabled him to respond to a serious and hazardous emergency. His quick reaction and disregard for personal safety during a moment of crisis averted a serious resource loss during operational training.

CPL T.A.D. MILES

On weekend duty in the CFB Rivers tower, Cpl Miles learned that a civil aircraft pilot had missed his approach at nearby Brandon in adverse weather and requested a diversion to "any base near enough for an immediate landing - encountering severe icing conditions". Cpl Miles established contact with the aircraft and provided courses to steer to Rivers while attempting to contact other traffic control and base personnel for the emergency. In this, he was severely hampered by a breakdown in the telephone system. The aircraft with five people on board landed safely although severely iced-up.

Cpl Miles, displaying a professional command of his equipment and procedures, probably saved the lives of five people.

PTE D.R. ENGBERG and PTE R.M. JACKSON

During a routine inspection of an Otter, Pte Engberg noticed a slight binding or scraping feeling as he carried out a functional check of the fuel selector. This condition is not uncommon in the Otter because the selector shaft rubs on the bushings. Joined by Pte Jackson, the inspection was extended to other areas. Pte Engberg discovered a badly frayed selector cable; this damage could be seen only when the fuel selector was between the "off" and "front" positions. Had the selector cable failed during flight it would have been impossible for the pilot to select another fuel tank; Pte Engberg's discovery therefore, prevented a serious or perhaps even fatal accident.

In extending their inspection far beyond that required of them in orders, Pte Engberg and Pte Jackson demonstrated a commendable professional attitude towards their work.

CPL J.D. WADDEN

While performing a routine inspection on a T33, Cpl Wadden detected what he thought might be a crack in the airframe skin in the intake. With the assistance of another technician of smaller stature a closer inspection revealed a 2½-inch crack about four feet inside the left engine intake.

Cpl Wadden's thoroughness during an inspection he had performed many times, led to the discovery of a potentially hazardous condition. A "routine" inspection revealed a notably non-routine deficiency.

Just a reminder...

The base Personal Safety Equipment Officer remarked that some aircrew were wearing only summer boots. Considering the environmental conditions, leather boots were not adequate; felt boots or mukluks should be worn.

- Flight Safety Committee

flight safety

Temperature low? - you're low!

(Here's a good reminder from an FSO. Winters don't change - neither do the cold facts stated below.)

Have you ever thought the hilltops were uncomfortably close while flying a low-level mission on a cold dark night, even though you had your position and altitude pegged exactly? If not, you either have never flown a low-level mission on a cold dark night, or you fly with the storm lights on and resolutely refuse to peer outside the cockpit! Did the hilltops only *appear* much closer than they should have, or was there a reason for you being lower than your altimeter told you?

The altitudes given on your map make allowance for position error provided you are flying at the speed given; just remember that an increase in speed increases the position or compressibility error. Let's disregard this error, and any other errors such as instrument error, and concentrate on the errors due to temperature. How accurate is your altimeter in very cold conditions? Your altimeter will give correct altitudes only when in an ICAN Standard atmosphere. A simple rule of thumb which can also be shown on your computer, says that for every degree variance from ICAN, four feet of error will be shown for every 1000 feet.

Let's apply this to the Cold Lake environment where you will admit a temperature of -30°C is not unusual. Rounding figures off slightly, this is 40° colder than ICAN. We start off with zero error at airport elevation but for every thousand feet of climb, as long as the same variance from ICAN Standard persists, the altimeter tells us we are 4 x 40 x 1 or 160 feet higher than we actually are. Apply that to a trip involving a 4000 foot climb to a route altitude of 5800 ft and we get 4 x 40 x 4 or 640 ft of error. You obviously had good reason to be concerned about the nearness of those hilltops. Common sense says you should pad the route altitudes on your map by an amount calculated from this simple rule of thumb.

CHILL ~~CAUSE~~ FACTOR

(When attention-to-detail is called for, winter simply leaves some of us cold. It's a well-known fact that the lower the temperature the lower the attentiveness. An extract from a message points to what we mean:)

"...Aircraft took off as No 2 in two-plane formation. In climb shortly after takeoff, captain noticed airframe vibration and difficulty in maintaining station in formation. Visual check by other aircraft reported left hand lower engine access door hanging open...

...Weather very cold; aircraft was to be hangared shortly. Technician failed to properly secure door or make entry in form CF349. Weekend shift change. Second technician failed to notice security of door while carrying out DI during night shift. Third technician failed to notice security of door on B check after aircraft placed on line the next morning. Pilot missed same on his preflight walkaround.

Cause factors assessed: personnel - maintenance/CF - non-compliance with orders. Environment - weather chill factor high..."

FIRE WARNINGS

a summary...

MEMORANDUM

Editor
Flight Comment
CFHQ/DFS

AIRCRAFT FIRE DETECTION SYSTEMS
FALSE FIRE WARNING STATISTICS

1. The attached statistics for the calendar years 1967 and 1968 were compiled to provide information as to whether our attempts to reduce false fire warnings were bearing fruit. To this end, it can be seen that the "False Warnings" column proves that in most cases the situation in 1968 was considerably better than 1967.

2. Several dozen copies were distributed to all Commands with a specific request to provide wide distribution to the maintenance personnel who maintain the systems and to those who are careful enough not to damage the elements when doing other jobs on the aircraft. It was pointed out that quality of maintenance was the largest single factor in reducing false warnings. EO 40-1-2B was issued to provide details of what to look for when inspecting fire-wire and to replace it on engine build-ups even if it only looks bad.

3. It was recently established that these statistics did not reach the personnel they were intended for. In fact, the Instrument/Electrical Section on one of our largest bases did not see them. Further to this, only one individual in that CHQ had seen them and thought they were passed to all bases. This indicates that the technical administrators did not distribute the information as requested...

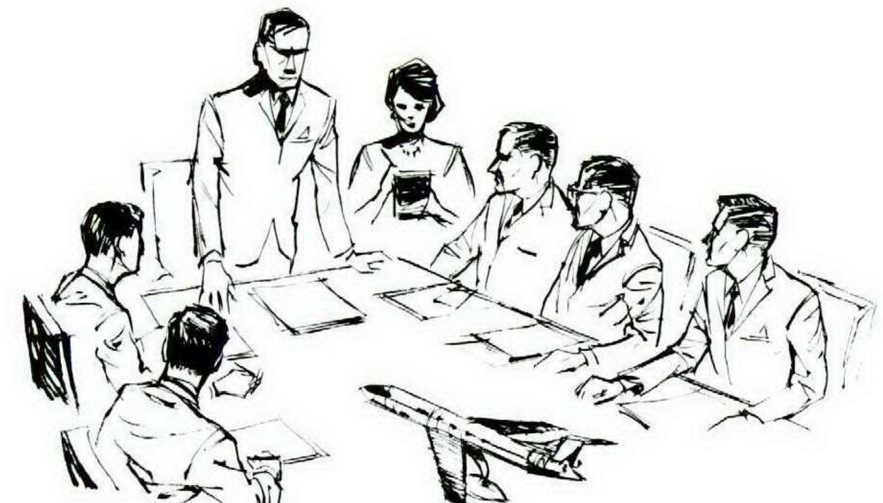
4. I appeal to you to publish these statistics in Flight Comment because I know our technical personnel read this magazine and also it may provide some comfort to the aircrew to know we are attempting to reduce false fire warnings.

(signed)

	FALSE WARNINGS		TRUE WARNINGS		SYSTEM TYPE	MANUFAC-TURER
	1967	1968	1967	1968		
Albatross	6	0	4	0	cont wire	Fenwall
Argus	15	9	5	5	cont wire	Edison
Caribou	5	0	0	0	cont wire	Fenwall
Dakota	0	0	0	0	thermocouple	Edison
Expeditor	1	0	2	0	thermocouple	Edison
Tracker	2	9	3	2	cont wire	Kidde
Buffalo	0	1	1	0	cont wire	Kidde
Cosmo	0	1	0	0	cont wire	Fenwall
Hercules	6	2	5	4	cont wire	Kidde
					thermal Sw	Fenwall
Yukon	5	3	1	1	cont wire	Edison
CF101	13	15	1	1	cont wire	Kidde
CF104	3	1	4	0	thermal Sw	Fenwall
T33	12	17	11	6	thermal Sw	Fenwall
Tutor	24	6	9	1	cont wire	Edison
CH113	5	2	1	0	cont wire	Fenwall
CH113A	0	2	1	2	IR Sensor	Pyrotector
CHSS-2	6	1	1	0	cont wire	Fenwall

(The US National Transportation Safety Board recently urged the aviation industry and the FAA to establish "some form of system safety approach" to replace the current "fragmented seller/buyer/regulator relationship". This, from a report on a fatal accident written "to demonstrate graphically how human stress, an inadequate procedure, management practices and a mechanical system deficiency combined to cause a fatal accident". The report continued that "it was published to alert the aviation industry to the need for a systems safety approach to accident prevention". With the certainty that Mil Spec 38130A will have increasing impact on our relationships with aircraft designers and producers we toss this whimsical little speech in to illustrate the point...)

Safety is what you built in...



Gentlemen, my company has given me the responsibility - and the honour - to present our case briefly (your time being valuable), for a new aircraft we feel is not only a fine product, but one you will find uniquely acceptable for the reasons I will explain to you today.

Let me say first a few words about the "uniqueness" of this aircraft. Before our designers put their pencils to work my company conducted an elaborate - and I might say eye-opening - survey of your flight safety experience. This I submit as evidence of our determination that past mistakes be distilled into present wisdom. The document that emerged became the design philosophy for this aircraft and carried with it the authority of the company president.

The published requirements (called "parameters" by some) were received with mixed feelings - suffice to say that despite the hard-sell in its introductory passages it was not an instant best seller! But top management stood firm; the book prevailed. Looking back - it was nearly four years ago - I recall that the early opposition faded when it became obvious that for us, it was a matter of enlightened self-interest; if we were to sell aeroplanes, we were first going to have to satisfy the customer.

We were soon up to here in problems - some easy, some monsters. Early in our liaison with your experts we quickly sensed an uncompromising rejection of the single-engine doctrine. That meant two engines for our bird. It wasn't all that easy; some tough problems remained to plague us almost to delivery day. Micro-switches for example. Even a casual look at your continuing problems revealed that micro-switches were not reliable. It took us three years to perfect the radically new "Sensipress" units which simply can't jam, even in ice, salt, and dust.

We had to break new ground in other areas too; as you know, the entire aviation industry have accepted our "Magtronic" tool and foreign object detector, which I will demonstrate at the end of my presentation.

The toughest nuts to crack turned out to be component and sub-assembly problems over which our company had little or no control - altimeters for example. We took your prototype to the industry, but their interest in producing this device was tempered by inventories, the high cost of a limited production run, and the skepticism that greets novelty. We countered their "easy-to-read" claims about existing models with your statistics.

Undercarriage assemblies concerned us greatly; your experience, we quickly learned, was somewhat disenchanting - to put it mildly. What with excessive complexity and early aging of stressed items we had no right to assume that our product would escape a similar fate. Company experts began their designing by engineering out all known earlier faults.

We had not realized - until our study commenced, that is - the devastating ineptness of hinging doors on other than the forward edge. We were also to find that this alone was insufficient protection - that spring-loading to the open position when unfastened was also a much-needed innovation. As design engineers, we were most disturbed to hear of the needless loss of life and aircraft wrought by these misplaced hinges.

I spoke of micro-switches. We had a similar problem with fire warning systems. We learned that existing systems didn't tell the pilot what he needed to know and were prone to perennial malfunction. Ours, gentlemen, is not an appendage to the structure; it is quite literally built into the aircraft and the component itself. The system is integrated and recessed and gives promise of a

cont'd on page 20

Break in procedures = break in engine

On the run-up prior to takeoff after a few seconds at 95% the CF104 pilot heard a very loud bang; the rpm then wound down. The rumbling continued until the engine stopped rotating. In both intakes there were damaged blades and the nozzle area was covered with fine metal particles. Compressor blades were found on the runway as far as 150 feet in front of the aircraft.

A badly-damaged cartridge holder was found halfway down the engine left intake; a second cartridge holder was lodged in the boundary layer control (BLC) intake. The cartridge holder access door was open and the cartridges missing. It was evident that they had been sucked up the BLC duct in the reverse flow from the outlet and one had entered the engine. This explained what happened - but not why.

Earlier, a technician (new to the unit) had removed the cartridge holders from the rack and placed them in the BLC outlet duct because it formed a convenient shelf to keep them clean, unaware it was an unauthorized stowage position. The crewchief had been juggling men and crews that morning to meet a heavy workload. The crewchief - a corporal - was stand-in for the sergeant i/c of the trade and had to leave occasionally, which meant that much of the time supervision was spread too thin. Both the cartridges and the open access door were overlooked by the crewchief on his final check. In addition, the crew member detailed to complete the paperwork did not do so because he did not have a serial number; on being assigned to another job, he forgot. The stage was set for a costly crunch.

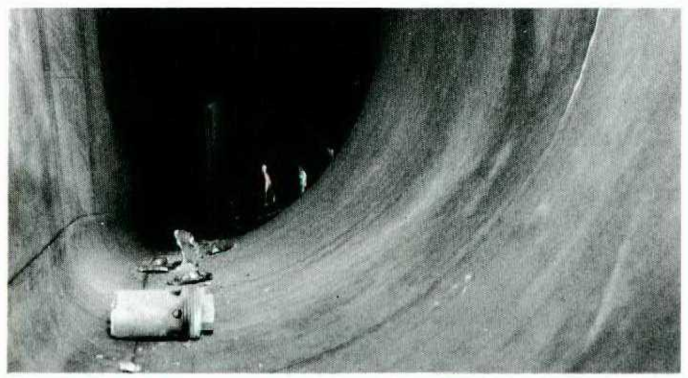
Now signed out as serviceable, the aircraft was not inspected and the CF104 was assigned to flying. A line crew of two men prepared the aircraft for flight; the man doing the external check including panels noticed nothing unusual. When the pilot arrived, the other line crewman accompanied him on his external check and again nothing unusual was noted. After start-up, the first technician again checked for loose panels as part of the line crew pre-taxi check. *Despite all these men doing the external check, the open cartridge holder access door and the missing cartridges were overlooked.* (The pilot later stated that had he noticed the open access door, he still would not have thought of checking the BLC outlet duct for foreign objects.)

After the occurrence, the door was still not noticed until the aircraft had been returned to the hangar. The unit recommended painting bright orange the part of the rack covered when the cartridge access door is closed. Also, another proposal was to include a complete re-certification check as part of each Supp I check, which would mean that the Supp I check must be done by uninterrupted checklist. EOs will be amended.

The severe damage to this very expensive engine brought to light a situation in which management and supervision had been lax, technicians had been haphazard and inattentive to a degree amounting to non-compliance with orders.

It all looked like another case of false economies - up to the time the pilot aborted. After that, things could have *really* been costly...

The two cartridges were stowed in the duct because it formed a convenient shelf...



The aftermath - a severely damaged J79.

Aircrew fitness

The Sqn CO emphasized the importance of aircrew fitness and asked that the flight surgeon monitor this. The WFSO pointed out that it would be highly beneficial to have a flightline office established for the flight surgeon. In this way, aircrew fitness could be more closely monitored. The flight surgeon expressed a willingness to spend a few hours a day on the flightline.

Flight Safety Committee

On the Dials

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

MET - Special observations

Approaching destination aerodrome, you call Terminal Control. The controller responds with a bunch of good information including a weather sequence which he prefaces with the phrase "Special observation taken at 1025 local".

Nothing really unusual there. But, did you ever stop to think of what caused that special observation to be taken? If you've never run across the ground rules before, sir, (since you are the aircraft captain) - read on! The following is based on the Department of Transport Meteorological Branch MANOBS (Observer Manual):

Criteria For Taking Special Observations

A special observation shall be taken whenever one or more of the elements listed below have changed in the amount specified. The amount of change is with reference to the preceding regular or special observation. Criteria marked with an "asterisk" (*) are effective only at stations having scheduled aircraft operations, unless otherwise authorized by the Director of the Meteorological Branch.

Ceiling Ceiling decreases to less than:
(a) 1500 feet
(b) 1000 feet
(c) 500 feet
(d) * highest minimum for scheduled aircraft.

Ceiling increases to equal or exceed any of the values above or, (*) a ceiling of less than 500 feet changes by 100 feet or more.

Sky Conditions A layer aloft is observed below:
(a) 1000 feet, and no layer aloft was previously observed below this height;
(b)* Highest minimum for scheduled aircraft, and no layer aloft was previously observed below this height.

Visibility Prevailing visibility decreases to less than:

(a) 3 miles	(e) * 1/2 mile
(b) * 1-1/2 miles	(f) * 1/4 mile
(c) 1 mile	(g) * highest minimum for scheduled aircraft
(d) * 3/4 mile	

Prevailing visibility increases to equal or exceeds any of the values of the preceding paragraph.

Tornado, Waterspout or Funnel Cloud
(a) Is observed
(b) Disappears from sight
(c) Is reported by the public (from reliable sources) to have occurred within the preceding six hours and not previously reported by another station.

Thunderstorm
(a) Begins
(b) Intensity increases to become a "heavy" thunderstorm
(c) Ends (special observation shall be made 15 minutes after last thunder is heard).

Precipitation The following criteria do not apply to "very light" precipitation. Thus a change from "very light" to "light" precipitation is considered as the beginning of precipitation in meeting the requirements for taking a special observation. Similarly, the change from "light" to "very light" is considered as the ending of precipitation.
(a) Begins. Report the beginning of each individual type of precipitation, regardless of the simultaneous occurrence of other types. Changes in character, eg, R- to RW, R- to R- INTMT, do not require a special.
(b) Ends. File a special report following the ending of each individual type of precipitation, regardless of the simultaneous occurrence of other types. A leeway of up to 15 minutes is allowed after the ending of precipitation before a special is mandatory. Changes in character of precipitation do not require a special if the break in precipitation does not exceed 15 minutes.
(c) Freezing precipitation changes in intensity.

Wind
(a) Speed (one minute mean) increases suddenly to double the previous reported value and exceeds 30 mph.
(b) Direction charges sufficiently to fulfil criteria required for a "wind shift", viz, when a change in wind direction of 45° or more takes place in less than 15 minutes, and the speed of the wind after the wind shift is 10 mph or more.

The criteria specified in the preceding paragraphs shall be regarded as the minimum requirements for taking special observations. In addition, any weather condition that in the opinion of the observer is important for the safety and efficiency of aircraft operations shall be reported by a special observation. (Further, local criteria may be established temporarily by the local official-in-charge and made permanent with the approval of the Director, DOT Meteorological Branch.)

Winter clothing - NOW!

With the approach of winter all aircrew should ensure they have adequate winter flying clothing. Some items are stocked only in small quantities but can be ordered...

- Flight Safety Committee

snow illusions...
(or, A Lovely Day in Winter)

(Our thanks to Maj SO Fritsch of DFS staff for this item.)

WHAT IT ISN'T — Whiteout, in the accepted sense - ie, no horizon, with sky and ground merging.

WHAT IT IS — A lovely day over a flat expanse of snow, sun shining, good visibility with a neat faraway horizon.

WHAT TO CALL IT — Snow Illusion. (If you haven't heard the term before don't worry; we just coined it.)

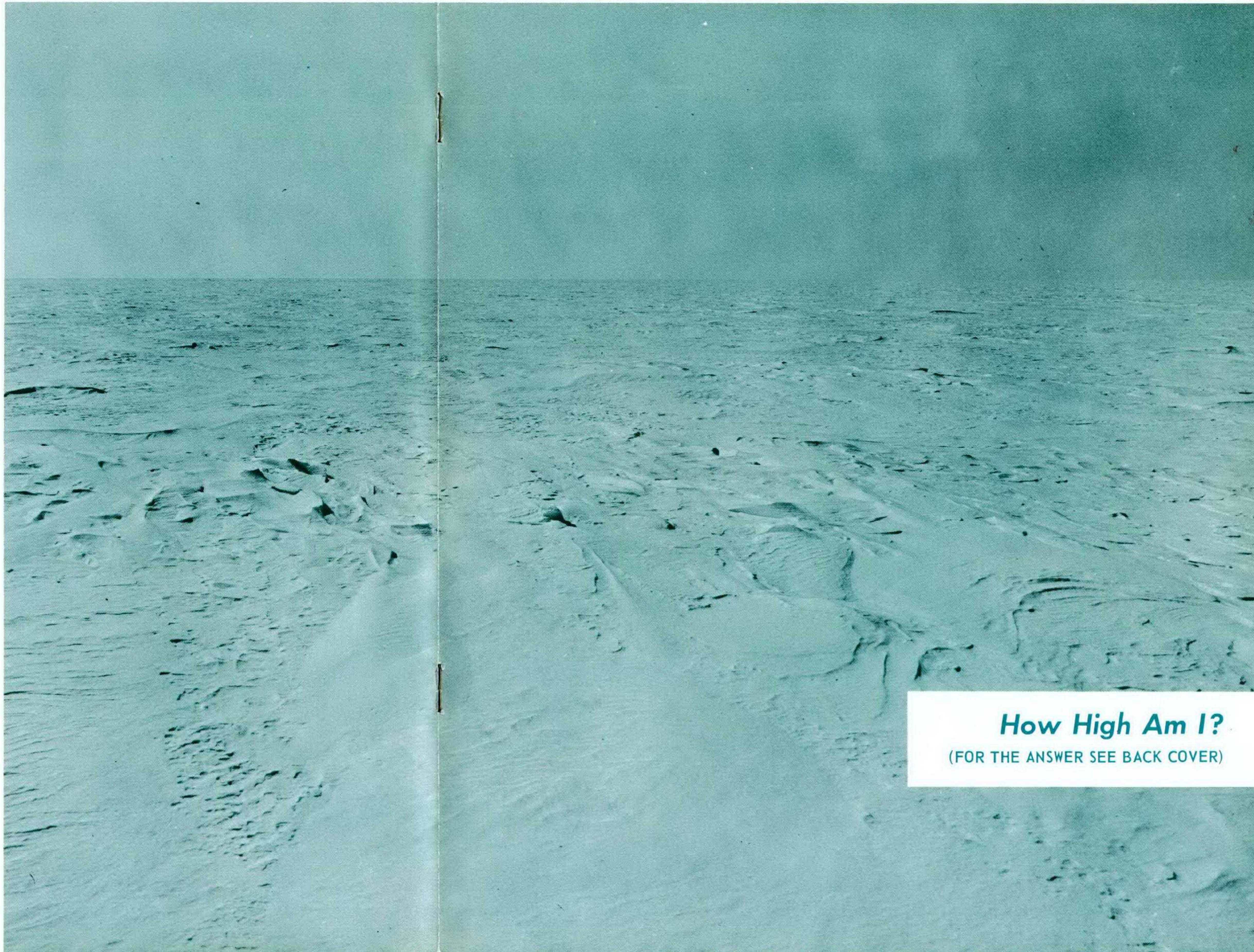
WHAT DOES IT MEAN? — If you see this scene through the front porch window, your next sensory input may be - CRUNCH! You probably won't care much about anything after that.

WHAT'S THE RECORD? — There have been no fewer than 18 prangs in "whiteout" since 1963. Trouble is, no one has differentiated between the pure whiteout and snow illusion - until now. Anyway, it looks like at least four drivers saw something like this before they hit.

WHAT'S THE MORAL? — There's no way for you to determine how high you are in conditions like these. The surface details may be any height; you will never know - until you hit.

WHAT CAN WE DO ABOUT IT? — If you have to fly with visual reference over surfaces like these, frequently check your altimeter.

(DFS is proposing that a film be made about "Visual Phenomena in Flight". In it, we would like to include such nice things as St Elmo's fire, snow illusions, whiteout, windscreen precipitation refraction, and so on.)



How High Am I?

(FOR THE ANSWER SEE BACK COVER)

rules of thumb...

Minimizing encounters with CAT

(At a recent ICAO Air Navigation Conference a paper was presented detailing some rules of thumb to assist pilots in avoiding or minimizing encounters with CAT. These might form the basis for a discussion at the next weather lecture.)

■ Jet streams stronger than 110 kts (at the core) are apt to have areas of significant turbulence near them in the sloping tropopause above the core, in the jet stream front below the core, and on the low-pressure side of the core. In these areas there are frequently strong wind shears.

■ Wind shear and accompanying CAT in jet streams is most intense above and to the lee of mountain ranges. For this reason CAT should be expected whenever the flightpath traverses a strong jet stream in the vicinity of mountainous terrain.

■ On charts for standard isobaric surfaces, such as 300 millibars, if 20-kt isotachs are spaced closer than 60nm there is sufficient horizontal shear for CAT. This area is normally on the low-pressure side of the jet stream axis.

■ Turbulence is also related to vertical shear. From the winds-aloft charts or reports, compute the vertical shear in knots-per-thousand feet. If it is greater than five knots-per-thousand feet, turbulence is likely. Since vertical shear is related to horizontal temperature gradient, the spacing of isotherms on an upper air chart is significant. If the 5°C isotherms are closer together than 120nm there is usually sufficient vertical shear for turbulence.

■ Curving jet streams are more apt to have turbulent edges than straight ones, especially jet streams which curve around a deep pressure trough. Wind-shift areas associated with pressure troughs are frequently turbulent. The sharpness of the wind-shift is the important factor. Also, pressure ridge lines sometimes have rough air.

■ In an area where significant CAT has been reported or is forecast, it is suggested that the pilot adjust the speed to fly at the recommended rough air speed on encountering the first ripple, since the intensity of such turbulence may build up rapidly. In areas where moderate or severe CAT is expected, adjust the airspeed prior to the turbulence encounter.

■ If jet stream turbulence is encountered with direct tailwinds or headwinds, a change of flight level or course should be initiated since these turbulent areas are elongated with the wind, and are shallow and narrow. In the northern hemisphere, a turn to the right places the aircraft in more favourable winds. If a turn is not feasible due to airway restrictions, a climb or descent to the next flight level will usually find smoother air.

■ If jet stream turbulence is encountered in a crosswind, it is not so important to change course or flight level since the rough areas are narrow across the wind. However, to traverse the CAT area more quickly, either climb or descend after watching the temperature gauge for a minute or two. If temperature is rising - climb; if temperature is falling - descend. This will prevent following the sloping tropopause or frontal surface and staying in the turbulent area. If the temperature remains constant, the flight is probably close to the level of the core, in which case either climb or descend as convenient.

■ If turbulence is encountered in an abrupt windshift associated with a sharp pressure troughline, establish a course across the trough rather than parallel to it. A change in flight level is not so likely to alleviate the bumpiness as in jet stream turbulence.

■ If turbulence is expected when penetrating a sloping tropopause, watch the temperature gauge. The point of coldest temperature along the flightpath will be the tropopause penetration. Turbulence will be most pronounced in the temperature-change zone on the stratospheric side of the sloping tropopause.

■ Both vertical and horizontal wind shear are, of course, greatly intensified in mountainous regions. Therefore, when the flightpath traverses a mountain-type flow it is desirable to fly at turbulence-penetration speed and avoid flight over areas where the terrain drops abruptly, even though there may be no lenticular clouds to identify the condition. ■

the pre-flight...

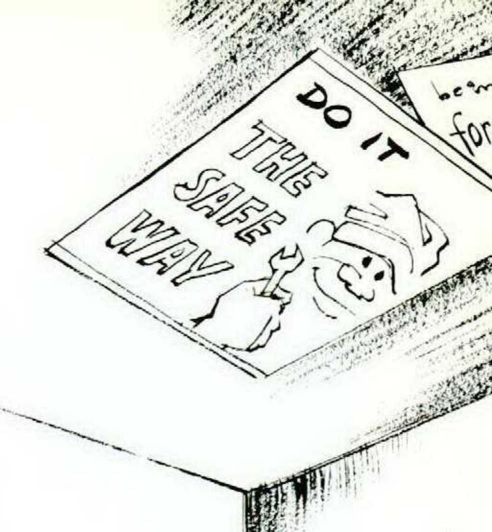
A look before you leap...

This pilot stumbled onto a possible cause of a recent crash - till now undetermined...

Checking the hydraulic bay access area on his external, the CF104 pilot looked forward under the engine and noticed what appeared to be a coating of oil on the port generator. A closer look showed this to be a barely discernable wisp of "smoke" coming from the generator. The smoke in fact was vapour created by fuel under pressure spraying through a fine pinhole in the fuel manifold. This escaping fuel was spraying the generator and the bottom of the engine.

Recently an aircraft was lost when a fire developed shortly after takeoff. This could explain what might have occurred. In any case, here's another pilot who's convinced that a good look before the leap into the blue makes sense.

the last say



Having the last say in Flight Comment has finally come. Around here, an editor's got to retire before he can get a page of his own - and that's the way it should be. But on the premise that even a dog has his day, may I express a few thoughts - strictly my own, mind you - on aviation safety? Being at the helm of Flight Comment for some years, plus dabbling in our "Bible" have left me with a few views - pertinent and impertinent - some of which I throw out for your consideration...

■ Flight safety has finally come of age. By this, I mean we have acquired the competence to justify our present confidence. This has been achieved in recent years by the influence of top-notch men both in DFS and in the field. This strongly suggests flight safety as career sub-speciality.

■ It's clear to anyone who has the gumption to face it, that we've just about squeezed all we're going to get from existing flight safety techniques. What we're doing is good - but not good enough. This has brought us into the era of resource conservation management and safety systems engineering.

■ "Personnel" are 60-70% of our problem. What are we doing about it? Not as much as we're putting into fixing aircraft, that's for sure - and aircraft are considerably less to blame than people.

■ That last one brings up the thorny (and gut) issue for our top-level aviation managers: What premium do we *really* place on resource conservation? The US Forces non-combat losses in Viet Nam should answer that one for us.

■ "Safety vs Manhood" is a noted US safety psychologist's way of seeing it. Can safety (dammit, we should be calling it "resource conservation"!), ever achieve total acceptance when North American culture promotes mindless risk-taking as something inherently manly? Fact is, that the country losing most of its aircraft in non-combat accidents is grossly jeopardizing its chances for victory.

■ The label "flight safety" sticks like glue to our image, and does us disservice. "Flight" excludes the groundcrew and "safety" obscures the issue. Unfortunately "safety" carries with it the connotation of "for its own sake" making it an alien word in the military. We would have changed over long ago but we can't find a replacement!

■ Without question, most of us have acknowledged the benefits of reporting occurrences. Incident reports are continuing to alert us to accident causes. The mentality of keeping things "under your hat" is subsiding - and a good thing, too.

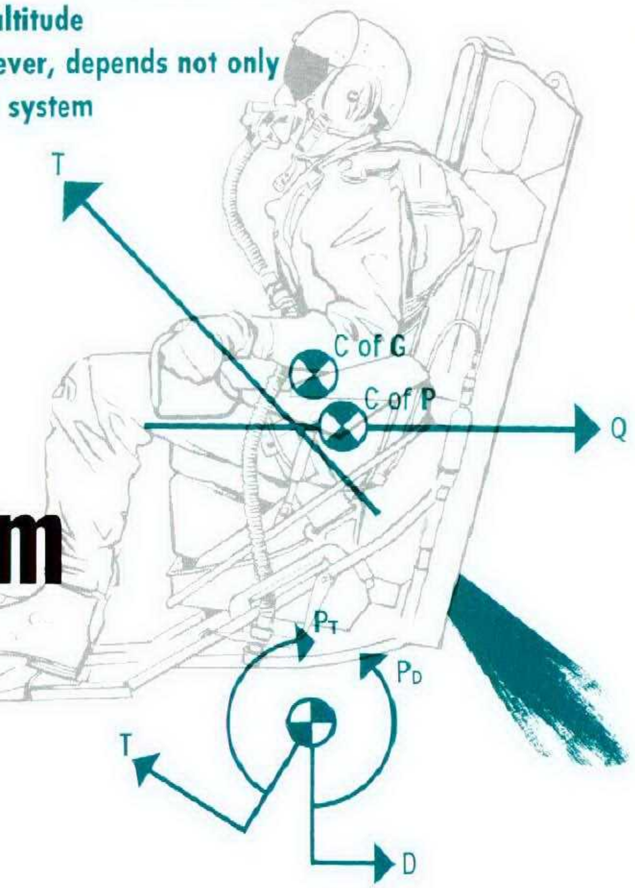
These are just a few of the problems for you of the seventies and beyond - bon chance!

Mr John Dubord was my partner throughout. That John is the other half of the staff has been obscured by the masthead title "CFHQ Graphic Arts". His skill as an artist and his familiarity with military aviation make him indispensable and irreplaceable. The close-knit teamwork we were able to achieve carried us over some of the darkest "dwindling resources" crises. The new editor - Capt Pat Barrett - has the very best artist for the job ahead.

Over to you, Mr Editor - may you continue to enjoy the support given to me over the years not only by the DFS staff but by the many who contributed and made Flight Comment your magazine. Cheers!

J Richards

Modernization of the T33 ejection system will greatly enhance chances for successful escape at low speed and low altitude
Successful ejection however, depends not only on the capability of the system



A new escape system for the T33

Maj D S Poole
AETE

For years modernization of the T33 ejection system has been a recognized requirement. Test and evaluation of a prototype improved ejection system for the T33 was begun four years ago, and from these tests - plus the availability of new escape systems hardware - came even more extensive changes than had been originally foreseen. Finally, after our tests had evaluated the new system's capabilities throughout the aircraft speed range, we knew we had a much improved escape system with a greater life saving potential than we had earlier aimed for.

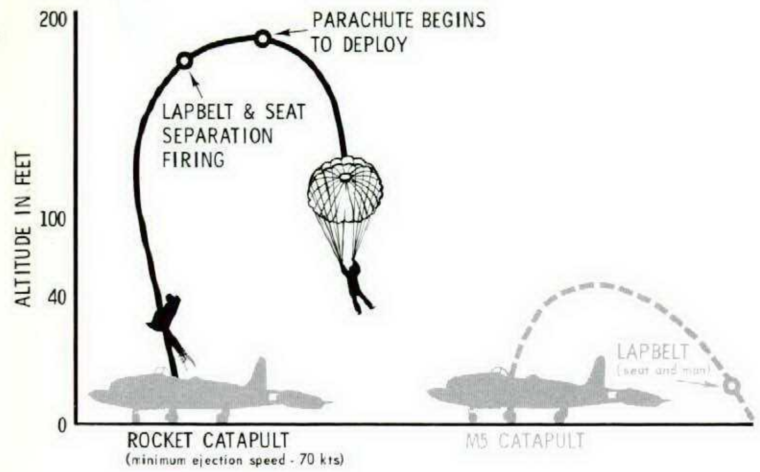
USAF statistics indicate that 90% of all ejections take place below 1000 feet. With the M5 catapult system, the records show 100% fatality below 100 feet (unless you land in a swamp, as happened at Lakehead last year - Flight Comment, Nov/Dec 1968). Below 500 feet things aren't much more encouraging - nearly 60% chance of not making it. It's therefore obvious that our greatest need for escape system improvement lies in the regions of low altitude and low speed, and in a descent. In retrospect, the escape systems test team at AETE Uplands were able to satisfy the hoped-for improvements in the T33 ejection system in these regions.

A number of components have been changed and others added. The new system consists of:

- a rocket catapult capable of propelling a seated pilot to a height adequate for ground-level ejection
- a seat/man separator in the form of a ballistically operated rotary actuator
- a new lap belt which ensures a greater reliability for automatic opening
- a new global hard seatpack survival kit
- a ballistic inertia reel (BIR) to ensure both forward and aft seat occupants are pre-positioned in a good posture for ejection
- a single-motion ejection control
- a sequencing system to ensure that both occupants are safely ejected from the aircraft in minimum time.

Let's look at each feature in detail.

Rocket catapult. The new rocket catapult is a two-stage device with the rocket motor encased by the catapult. The catapult is fired by a cartridge which is activated by pressure from an initiator. As the rocket motor separates from the catapult cylinder (almost at seat tip-off from the rails), the rocket is ignited. The catapult portion of the operation takes place in 0.15 seconds and accelerates the seat to approximately 45 feet a second. The rocket motor burns for 0.25 seconds with a maximum thrust of 6000 pounds giving an 18G acceleration. The rocket thrust direction was selected to provide maximum stability for the full range of pilot "configurations" throughout the aircraft speed range. However, some tumbling can be expected in most ejections especially after rocket burnout. The forward component of rocket thrust provides a more comfortable deceleration during a high-speed bailout. The greatest advantage of the rocket seat is the added time it provides in trajectory; *time* is the critical factor in a low-altitude ejection.



The IEM hard seatpack survival kit. This new survival seatpack offers greater comfort and stability during normal flight as well as ensuring better ejection posture with less slump and "submarining" under the lap belt. Less maintainance will be required. The global survival kit contains a more versatile life support package.

Single-motion ejection control. For the pilot, the only difference from the present system is that the trigger has been eliminated. Raising the right armrest now initiates the entire firing sequence. Aircrew under stress of the moment or because of disorientation, have had difficulty in performing the second motion required to actuate their ejection seats. To support this statement, during one year 35 *surviving* USAF pilots reported difficulty in locating the ejection trigger due to disorientation or panic. How many *non-surviving* pilots suffered the same problems? Obviously, they were not as successful as the survivors. Other pilots squeezed the handgrips before realizing they had missed the trigger, or, they raised the survival kit release instead of the leg braces.

Ballistic inertia reel. Adding a ballistic inertia reel to the T33 ejection seat ensures correct positioning of both occupants prior to ejection regardless of who initiates the ejection. Controlled haul-back of the shoulder harness through the BIR (essentially a gas powered wind-up reel similar to the seat/man separator) cinches up the upper body thus imparting good ejection posture and providing adequate restraint.

RPI automatic lap belt. The addition of the RPI gas operated lap belt offers some new safety features to the T33 ejection system. The new belt has greater reliability for automatic opening, positive arming of the parachute during opening, and a "no lock" restriction unless the parachute arming cable tab has been correctly inserted. The belt is operated by a one-second delay initiator which is activated when the seat starts up the rails. Disadvantages such as weight and difficulty of strap-in are known complaints but when the decision to purchase was made, there was no alternative on the market. The RPI belts are now standard on all our high performance aircraft.

The seat/man separator. One second after the seat begins to move up the rails a gas initiator ballistically operates the seat/man separator or rotary actuator. This device coils up the "Y" strap webbing (normally stowed beneath the survival pack and attached to the seat bucket lip) forcibly separating the man and seat. Seat/man separation is essential to prevent seat interference with the man or parachute. The rotary actuator device does provide adequate seat separation; however, the experts feel there's a valid requirement to investigate other means of separating man and seat.

The Parachute. The standard 24-foot diameter flat circular canopy parachute with the Mk 10 timer and emergency oxygen bottle attached, is a good parachute system. The time delay setting in the timer has been changed from 3 seconds to 1 second. The parachute tab that attaches to the arming cable from the timer and which fits into the RPI lap belt, is another slight modification to the parachute system.

Sequencing system

Sequencing the ejections became necessary when rocket seats were introduced into single canopy tandem aircraft. The rear occupant must be ejected first so that he will not be exposed to the forward seat's rocket blast. Regardless of who initiates the ejection, the rear seat is always ejected first. The instructor will now ask: What about the student being able to eject me without my consent? Read on, and keep in mind the reasons for the T33 sequencing system. First, it is mandatory (as already stated); hence, the only alternative is to leave the existing catapult system in service. Second, the student on the T-bird is of necessity not totally inexperienced; he should react to a situation with some competence and predictability. Of course, all aircrew will be thoroughly briefed on how the system works, and its advantages. For example, the addition of the haul-back inertia reel will ensure that even if the ejection sequence is initiated without warning from the forward cockpit, the rear occupant will be pre-positioned for ejection. With the new ejection system, either or both occupants can go for the ejection handle if the situation seems to warrant ejection.

What about the command selector system? Both the USN and USAF have tried or are using a command selector system to ensure that the instructor is not inadvertently ejected by the student. Both systems ensure that the rear occupant always leaves the aircraft first.

USN. The USN command system has a selector handle in each cockpit. They are interconnected and operate as one unit. Either pilot can assume command by moving the control to the "both eject" position in his cockpit:

- If the selector is so positioned in the front cockpit, the rear selector position is "rear only". In this configuration, the front cockpit can eject both seats, or the rear cockpit occupant can eject himself independently.
- If the selector is so positioned in the rear cockpit, the front selector position is "no eject". In this configuration the rear cockpit can eject both seats, but the front cockpit occupant cannot eject without first moving the selector back to the "both eject" position in his cockpit.

Should the front occupant try to eject when his selector is in "no eject" position, the initiators can be fired and the ballistic inertia reel retracted, but the seat will not eject. He then must first reposition the control to "both eject" then employ the opposite ejection method - either the face curtain or "D" ring. This system would not stop a student determined to eject his instructor. The system could add time to the ejection sequence depending on control position and flight circumstances.

USAF. In one USAF command system, if the control is positioned for rear cockpit command, the front armrest ejection control cannot be raised. When the rear seat occupant ejects, the front cockpit handle is automatically unlocked allowing the front occupant to eject. When the control is positioned for the front cockpit control, the front/rear linkage is disengaged allowing both occupants to be ejected from the aircraft in the proper sequence. This system also complicated the ejection procedure and could cause delays or even trap the front seat occupant were the other occupant to become incapacitated. The USAF no longer employs this system.

Canadian Forces. A delay cannot be tolerated; the new T33 ejection system ensures that either or both pilots can eject in the minimum time with a maximum possibility of survival. To achieve this, there is no command system; it is possible for the front seat occupant to eject the rear seat occupant without his knowledge although the probability of this happening is remote. Again, this points to a thorough education program preceding use of the system.

Ejection Procedure

To eject, the front seat pilot raises the seat armrest. Both armrests should be raised simultaneously even though only the right handle initiates the ballistic system. The ejection handles offer some restraint and protection during ejection. The sequences are then automatic:

- the cockpit canopy ejects, and both ballistic inertia reels fire simultaneously.
- the rear seat ejects one second after initiation. *(The one-second delay ensures adequate canopy clearance at low speed.)*
- the front seat ejects one half-second after the rear seat - a total of 1-1/2 seconds after initiation.

This sequence is the same whether the rear cockpit is occupied or not; in fact, the rear seat will eject even with the safety pins installed as for solo flights.

The rear seat occupant can also initiate his own ejection at any time independent of the front seat occupant's action. The armrests function in the same manner

and do the same things except that the front occupant would not be ejected; he must initiate his own sequence. The ejection sequence is the same for both seats; after the rockets fire the sequences are:

- As the seat travels up the rails it mechanically fires a one-second delay initiator which opens the lap belt and operates the seat/man separator rotary actuator.
- The parachute is armed either by the momentum of the automatically opening lap belt segments or by the seat/man separation motion. Parachute deployment is unchanged except the arming delay is now one instead of three seconds.

The parachute will be fully deployed in 2 to 3 seconds depending on ejection velocity. This means the rear occupant should be under a full canopy approximately 6 seconds after raising the armrests. The front seat occupant's sequence is 1-1/2 seconds later.

During the design phase of this project the suggestion that another set of initiators be installed as a backup to the canopy release system was explored. It was not adopted because:

- we have no reported canopy initiator failures
- the additional movements would consume valuable time
- a major redesign of the system would be required.

USAF experience since 1952 points to 29 through-the-canopy ejections with three fatalities. Although not conclusive, the evidence suggests that in two of the three fatalities the seats were not equipped with a canopy breaker.

Further Improvement

There is still room for improvement in this new rocket seat ejection system; consequently, the project will be under continuing review and development. Under extreme stress the pilot tends to revert to the system he is most familiar with. There is therefore a real need to standardize equipment and procedures so that a pilot flies in a seat common to all aircraft. The USAF are presently engaged in a two-year program to design a seat for use in future aircraft and possible retrofit in others. In the meantime, our aim is to standardize as much as possible our equipment and procedures. AETE publication, 67/31-1, Strap-in Procedures for CF Jet Aircraft, suggests a common strap-in procedure.

Parachute manufacturers are endeavouring to reduce canopy opening times (for low-speed ejections) while maintaining a reasonable opening shock for the high-speed ejection. Drogue guns, quarter bags, spreading guns, and deployment sleeves are being studied. A variable porosity parachute may solve the problem if a program presently underway proves successful. AETE is continuing to test these and other canopies for their value to the Canadian Forces.

To further stabilize the seat after rocket burnout, a seat drogue chute has been suggested and will be studied.

The new T33 rocket seat system has achieved a substantial reduction in the time from first initiation to full canopy deployment. Further reductions will involve fractions of seconds. For example, it may be possible to reduce the canopy clearance time to three-quarters of a second when a proven initiator becomes available. It may be possible to reduce the belt opening time from 1 second to 3/4, or even 1/2 second. The parachute arming may also be reduced to 1/2 second. It may therefore be possible to reduce the overall system time by 3/4 or even a full second. Parachute deployment time reductions of 1 to 1-1/2 seconds may be achieved.

The other ingredient - the Pilot

The new T33 emergency escape system obviously provides a much improved low-level escape capability. Having said that, pilots should avoid pushing this system into the region of its new capabilities. The success story behind the CF104 ejection record is attributable to a highly reliable seat and the pilots learning not to wait too long.

We believe the T33 system is a major improvement; the rest is up to the pilot. Remember, ejection is well within the state of the art - resurrection is not!

Major Poole was until recently, AETE escape systems project officer. He was prime project officer for development, test and evaluation of the T33 aircraft rocket ejection system. He conducted airborne test T33 ejections at Cold Lake, conducted the sled trials at the high-speed test track at Holloman AFB, New Mexico, and assisted during sled trials for the CF5 and Tutor systems. A native of New Westminster, BC, MAJ Poole attended Royal Roads and the Royal Military College, graduating in 1963. After a tour at 6 Repair Depot he joined CEPE (now AETE).

Cockpit FOD

Pens, kneepad battery caps, and other aircrew personal gear have been dropped or lost recently in aircraft. The time required to locate these articles took up to 1½ hours; aircrew were asked to be more cautious . . .

- Flight Safety Committee

Get in the swim!

On several occasions during sea survival training, aircrew being towed have panicked and have been in danger of drowning because of their inability to swim. Even strong swimmers have had difficulty after ejection; ejection over water for non-swimmers would therefore be especially hazardous.

- Flight Safety Committee

cont'd from page 9

real breakthrough in this area. Further, the system discriminates beyond the primitive "overheat" and tells the pilot the nature of the phenomenon so that he can make a more meaningful reaction to the emergency.

Your records showed us that hardly an aircraft had been purchased since World War II in which the emergency warning systems for the pilot had been satisfactory from the start and which hadn't undergone extensive and expensive modification. Too, we readily agreed with your pilots' assessments of random "pin-ball" warning light layouts. We therefore devised the "Alert-a-Lite" system which we humbly submit answers all your requirements and already has the enthusiastic endorsement of those who have tried it.

Your pilots, we found, had misgivings over the increasing proliferation of electronic command devices which are superimposed on power-boosted actuating systems for flight controls. We were particularly distressed to learn of the many hazardous malfunctions in control stick limiters, pushers, and shakers - truly, a safety device creating a hazard! In our aircraft, any impulse which activates these devices is fed into a discriminator before it can activate the mechanism. We employed the key-in-the-lock principle; if the impulse isn't keyed to the discriminator, it cannot pass.

We now share a mutual acquaintance with that mythical troublemaker, Mr. Murphy. If a part can be incorrectly installed we should hardly be surprised if that is what is done on occasion. I assure you that we have not used this phrase once in the maintenance manuals: "Care must be exercised to ensure that this part is not installed backwards".

Well, gentlemen, I'll limit myself to these typical examples; to dwell further on this theme would only involve repetition.

Before I close, I would like to thank sincerely the many members of your flight safety staffs who were involved in design philosophy planning. Your experience and our technical know-how are reflected in almost every component. We were thus able to design and build an aircraft which truly exemplifies our company motto "Safety is what you build in".

Thank you - and now for a demonstration of these devices...

LCOL I.H. Anderson

Ejection - and thigh length

in the T33

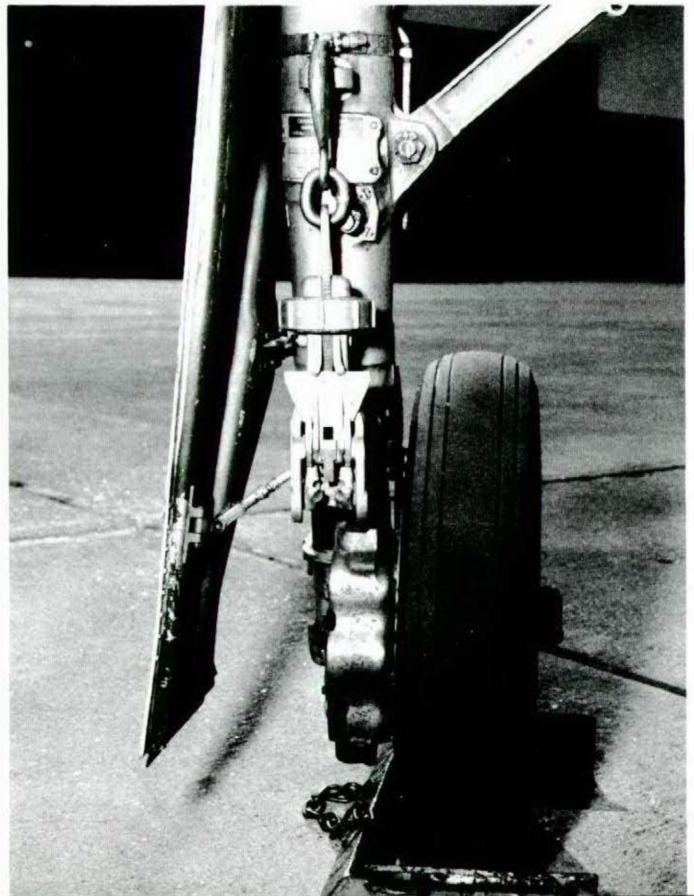
A flight surgeon discusses the problem with a T33 pilot . . .

Pilot: *I have a long thigh length - just on the 25" limit, in fact. Do I need a special thin backpack parachute or seat parachute to fly in the front seat of the T-bird?*
Flight surgeon: (Typically medical answer) *I can't answer that unless you can give me more information. Have you been hauled out of a front seat by crane and have you grown since you were last measured?*
Pilot: *I am the same height but when I was hauled out of a T33 front seat my knees just brushed the canopy top - and that's while wearing a summer flying suit. I don't think I could clear it in a winter suit.*
Flight surgeon: *I think you would clear it, but you may have knee problems if you slump at all on ejection.*
Pilot: *It would appear then, that I would lose my kneecaps if I slumped at all.*
Flight surgeon: *That's not true. You would probably sustain only minor injuries but they could be serious in terms of survival. To minimize this risk, make sure that you wriggle back into the seat when you strap in. Also, after climb-out and during flight, snug your lapbelt up again.*
Pilot: *"Minor injuries" is a difficult term to believe when one considers the forces involved in ejection. Are you sure this isn't just rationalizing because we may be stuck with the T33 for a bit? Let's have the straight goods; after all, it's my* **knees** *that I'm worried about - not a politician's answer!*
Flight surgeon: *I'm not trying to baffle you with facts and figures, but let's look at our ejection experience. Since 1952, of the 60 successful T33 bailouts six pilots suffered "minor" knee injuries from striking the front windshield frame. Here's a photo of a typical T33 ejection knee*

injury. The puncture wounds you see were caused by the upper windscreen bolts and the defroster tube bolt; you will note that they are more than one inch above the kneecap. The pilot had slumped considerably in the seat on ejection; his thigh length was only 23 inches. In the proper ejection position - with lapbelt tight - pilots with thigh lengths up to 27" would have cleared the frame. Three other pilots had similar injuries - all due to slump, as their thigh lengths were less than 24 inches. We have little data on the remaining two ejection knee injuries; one was a pilot 6'1" who suffered a "cut on the knee"; the other was 5'8" and received "bruised kneecaps".
Pilot: *Now you've confused me. Are you suggesting that all these injuries occurred to short-thighed people and were the result of slump?*
Flight surgeon: *Yes I am - with the possible exception of one pilot. If these people had been well back in the seat and their lapbelts tight, they would have been okay. Let's look at it another way: of the 60 ejections, 18 pilots with a height of 5'9" or more have punched out of the front seat unharmed. Nine of these were over six feet or more, the tallest being 6' 2½". This man was the only one of the nine wearing a seatpack parachute. Only a few of this group were measured but as the average thigh length for a 6-foot man is 25", some pilots must have exceeded the present limits.*
Pilot: *Have the US Forces had similar problems with the T33?*
Flight surgeon: *That's another difficult one to answer. We have been in touch with them and it appears that they have not. In 314 ejections only five (1.69%) suffered major injuries on the lower extremities from impact with aircraft structures. They state that there's no evidence to indicate that exceeding established limits has been a factor in these injuries; however, their thigh-length limit is 24" while wearing flying clothing. The flight manual states that all pilots exceeding this limit must use a seatpack parachute. If this rule is enforced it means that approximately half their T33 pilots are flying with seatpack parachutes.*
Pilot: *You have not exactly inspired me with confidence, although I can see that I could eject without injury. Should I get a thin backpack parachute or a seatpack chute?*
Flight surgeon: *First thing - get yourself remeasured accurately. The flight surgeon will measure you while seated with your backside pressed hard against a backboard with thighs parallel to the ground. The measurement is made from the back of the seat to a point level with the front of the kneecap. If you are 25" or under, make sure that you are well strapped in at all times in the front seat. If you are over 25" arrange for a crane haul-out while wearing a parachute without the back pad. If your knees strike the windscreen frame you may need a special thin parachute.*
Pilot: *You didn't mention using a seatpack parachute. I understand that they are used by a few pilots.*
Flight surgeon: *I deliberately omitted any mention of this item; once the rocket modification is installed the seatpack parachute will not be used because it would create an unacceptable C of G shift for ejection.*

EYE IT

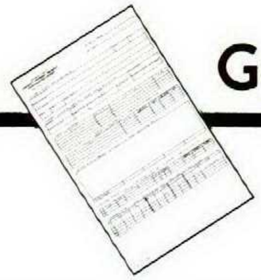
- then, fly it



After selecting the Tutor gear up, the pilot got an in-transit on one wheel and unsafe on the other. He reselected down and landed safely. The pilot later realized that a reasonably conspicuous tiedown hook had been left engaged on the port gear leg. The metallic finish on the tiedown components closely matched the surrounding machinery but in all probability he had not expected to see it and therefore didn't.

The human behaviour experts are continuously reminding us that it's not so much what you see as **what you want to see** which conditions the thinking process.

The last thing the pilot **wants** to see in his aircraft is a deficiency; therefore, the preflight's an occasion for a healthy professional pessisism.



Gen from Two-Ten

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

TRACKER, WING SPREAD FAILURE When the aircraft reached position, the plane director gave the wings spread signal. But the starboard wing remained folded. A second attempt was also unsuccessful. After again folding the one wing, still a third attempt to spread was made. Again only the port wing moved, and the plane director allowed completion of the spreading sequence, resulting in the port wing spread and the starboard wing remaining folded. An inexperienced technician then attempted to rectify the problem. Climbing on the folded wing he used a wrench on the lock assembly; a loud click was heard and the wing began to spread; but the locking pins had extended with the wing folded. Further use of the wrench to house the lock assembly was unsuccessful, and the selector lever in the cockpit could not be moved when the co-pilot attempted to re-select "fold". The engines, providing hydraulic power to the fold/spread actuator, were shut down but the wing was already beyond the 90° position. The wing continued downward and settled against the locking pins.

Attempts to support the wing with a maintenance stand were unsuccessful due to the weight and high winds. The starboard wing and winglock assembly received major damage.

It was now discovered that the wing lock "T" handle was not in the locked position. When returned to this position, the fold/spread selector lever operated normally.

Materiel failure of a component prevented normal operation of the wing spread actuator. Then during manual operation of this component, the technician inadvertently depressed a sequencing button thus operating the winglock pins prematurely. This also permitted the wingfold "T" handle to move out of the lock position due to wear of the latch and prevented further operation of the wingfold/spread selector lever. This final problem prevented stopping of the wing spread when the incorrect sequencing of the wing lock pins was noticed.

How many times should a system be operated when the initial selection indicates a failure? It is highly unlikely that having failed twice, a system will be normal on any subsequent attempts. On the contrary, unnecessary damage may result.

The attempt by an inexperienced technician to troubleshoot a problem on his own when it was evident that a major unserviceability existed, caused this accident. However, supervision of this "initiative" was obviously not present on the line nor had technical orders been issued detailing procedures for line personnel to follow when any malfunction of the wing fold/spread system occurred.

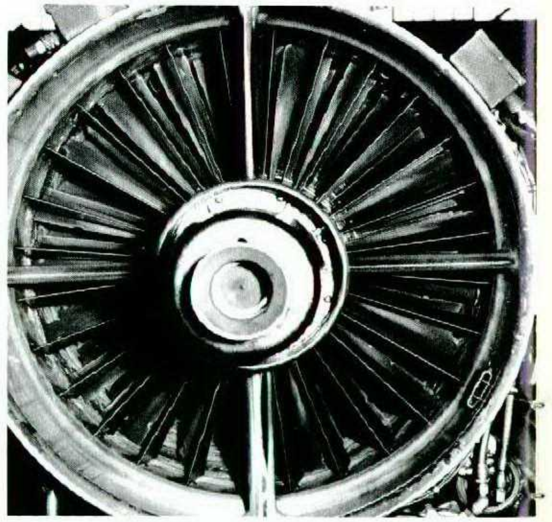
Technical orders have now been issued and both technicians and pilots have been briefed.

CF104, FOD ON RUN-UP The J79 was being ground run when (at 80%) the exhaust gas temperature increased to 750°. The technician immediately shut down the engine. Observers reported seeing flame and sparks coming from the tailpipe immediately after start-up; the engine had been shut down by the time they reached the aircraft.

The rear section was aluminized; also, small metal pieces were found in the tailpipe. The compressor casing and compressor rotor/stator blades were severely damaged. Scratches and dents - probably from a wrench or screwdriver - traced a line in the port duct from the intake to the compressor inlet.

The intake ducts had been checked after each of the two flights earlier that day; the object(s) were probably introduced during the period the snag crews worked on the aircraft. Someone made a costly error by using the intake duct as a shelf.

A more thorough duct inspection could have saved this engine. FOD occurrences on 104s are ahead of last year; so far, three engines have been lost during ground run-ups and one aircraft was destroyed when the engine failed on takeoff.



OTTER, HEAVY LANDING The instructor simulated an engine failure at 300 feet, after a 45° crosswind water takeoff. The student turned to land into wind but allowed the airspeed to fall off dangerously. Realizing the danger, the instructor took control and rapped the power on - but too late!

The Otter hit hard and was extensively damaged: failure of the right float attachment points, torn and buckled fuselage skin, and bent bulkheads. This damage required an off-unit repair job.

The instructor - a recent arrival - had been taught to always land straight ahead; the procedure at his new unit was the AOI method for normal crosswind landings: "...eliminate the effect of the crosswind by landing as closely into wind as confines of landing area will allow". The AOI gave no specific actions for an engine failure after a crosswind takeoff. These inconsistencies are being resolved. Command Air Staff Instructions now require the captain to brief on emergency actions after takeoff.

Of the last 12 *actual* forced landings only one occurred soon after takeoff (at 300 feet). However, during this period, we had five accidents during *practice* sequences; four of these followed simulated engine failures at 200 feet or less. Get the message?

T33, FATAL SNOW ILLUSION After breaking off from a routine training formation trip the aircraft was seen low over the ice in erratic flight. Moments later the T33 struck the frozen lake surface. Both pilots were killed.

The centre-page layout shows the snow illusion conditions faced by the pilots at the time of the accident. Looks like these pilots should have consulted the dials when faced with that featureless terrain.

This isn't the first accident of this type - let's hope it will be the last.

CH113, SLING LOAD PUNCTURES SKIN During air dispatch training a jeep and trailer were rigged for a sling load. The helicopter took up the slack, then descended momentarily, permitting a line to become entangled with the trailer - a fact that the helicopter crewchief failed to notice. When the lift was made, a sling leg caught on one corner of the trailer, jack-knifing the trailer upwards into the underside of the helicopter.

The sling legs had not been adequately safetied to prevent snagging on the load. The investigation uncovered differences of opinion among operators; standardization is obviously the prerequisite if these complex maneuvers are to be made safe. It's under study.

ALBATROSS, TWO HURT Two technicians on top of the Albatross were checking fluids during the PI unaware in the darkness that ice had formed on the wings after the fresh-water washdown. Suddenly one of the techs slid off the trailing edge of the wing to the concrete ten feet below. The other tech in attempting to save his buddy himself slid off the wing. Both men were injured; one received two broken arms and head lacerations, the second a sprained wrist and ankle.

The unit responded by directing that aircraft will be put in the hangar to dry when temperatures are close to freezing. When this is not possible, the upper surfaces will be first de-iced.

This sort of thing demonstrates why prevention derives from an ability to "see" the hazard before exposing men to serious injury. Was this occurrence - like so many others - preventable?

TUTOR, INTAKE PLUG INGESTED The captain was doing a BFI inspection away from home base which included an engine runup to allow for an oil level check. On his external check he noted that the right intake plug was missing.

The engine was started and a normal ground run completed. During the start cycle the EGT rose to 750°C (maximum allowable 900°C) and stabilized at 700°C (maximum allowable 735°C for two minutes). The captain felt that the EGT should have been lower and requested a FOD check. After removing engine access panels the right intake plug was found in the intake close to the engine with approximately 1½" of streamer torn off and the front set of turbine blades tinted red (see photo). Had the aircraft flown there would have been more serious consequences.

Aircrew and technicians must be aware that a lost or missing item is potential FOD. Every effort must be made to locate such an item before aircraft engines are started - whether flight is intended or not.

That "isolated case" may be the beginning of a trend...

Comments to the editor

One of the great problems in accident prevention is the failure to communicate some fact, idea, order, etc. It is a difficult job to do at any time using the best and most concise language, as the reading comprehension of individuals varies so widely and is further affected by conditions of fatigue, work pressure and environmental conditions generally. The apocryphal pilot entry "something loose in tail" and the technical rectification entry "something loose in tail - tightened" is hardly definitive of the trouble or its cure although the language as such is quite correct.

Such attempts at communication could best be termed as inadequate or incomplete and to a degree have been a problem through the years. Various steps have been taken at flying units to improve the exchange of information however, and will require constant supervision to ensure that adequate standards are met.

A much more easily rectified fault lies in the proper use of words and at this time my complaint is over the wide use of the word 'secured' which appears to be a favourite to describe some action such as shutting down an engine, stopping an aircraft, closing a door, or fastening a filler cap properly. Some of these meanings might lie within the Oxford dictionary definition but even if they all did is this not a sloppy word? The Monthly Accident Incident Digest of June 1969 is a case in point:

CIRCUMSTANCES

"Oil venting from No 2 engine oil filter cap, oil pressure fluctuating, engine secured."

COMMENT

"Loose fitting oil filter cap - cap improperly secured."

It would appear that No 2 engine was shut down or stopped when the loss in oil and oil pressure was noticed. What was the problem? A loose fitting cap, we are told. Was it worn, distorted or improperly installed? I would guess it was the latter but as an aircraft maintainer, I would prefer to know precisely what was discovered.

The Jul/Aug issue of Flight Comment has a timely display on the protection of evidence. I agree completely with this theme. Is protected evidence of any real value, however, if its significance is not properly communicated to the field? Can it be properly communicated if vague and improper words are used?

Heaven knows I am no language purist. In fact, I am often accused justly of too great a reliance on basic Anglo-Saxon. The elimination of the word 'secured' in its various sneaky guises would help my social image as well as my professional task.

LCOL D.R. McCracken
CFB Uplands

Here's one thin-skinned editor who heartily agrees!

CFP 125 Dictionary of CF Military Terms, is of no assistance. The word "secure" as employed in the military is undoubtedly inherited from the navy. From whom else would you get something like "the aircraft was secured and abandoned - the aircraft sank..." (This item is in that same MAID!)

As it is, ex-navy and even current CH113 engineering orders contain the word "secured" in the "made safe" context of an engine shutdown. The silly implication behind this is, of course, that on some shutdowns the pilot may elect to leave the engine unsafe.

In the file containing the occurrence you referred to, we found that the maintenance-originated messages were even more vaguely worded than the MAID account. Thus, imprecision of expression proliferates! Unless someone (?) declares this fuzzy word officially tabu we could end up as the Directorate of Flight Security. A memo with your observations is on its way to the gentlemen i/c CFP 125.

Capt Arnott's article "Birds vs Aircraft" in the Jul/Aug issue, Flight Comment pointed out the benefits to be gained from airfield bird control, and forcast future enroute control measures through use of microwaves and radar plotting. Lest anyone feel that enroute bird avoidance is a complicated thing of the distant future, I would like to add two points to his excellent presentation.

Firstly, Air Div's decreasing enroute birdstrike rate has largely resulted from applying fairly unsophisticated precautions over the last three years. Basically, the seasons of peak bird activity have been determined, the hourly bird activity rates noted, and bird sanctuaries and locations of peak activity and bird migration routes and heights plotted. Diligent co-operation from operations staffs and pilots has resulted in avoiding these dangerous environments - a technique well within the capability of any organization prepared to grapple with the problem.

Secondly, I have yet to see any attempts (or experiments) to promote bird avoidance through using lights on aircraft. Surely no self-respecting bird has the urge to deliberately get itself creamed by an aircraft. It therefore follows that the earlier the bird sees the aircraft, the more chance it has of getting out of the way in time. Although the use of lights would be unlikely to reduce the rate of strikes on birds' tails, it would surely be worthwhile investigating, even if it reduced by only 50% the rate of "head on" collisions. Is anybody working on this approach?

Capt DW Rumbold
CFHQ/DFS

Who can argue with success? Obviously Air Div is doing a first-class job.

Regarding the second point, the Canadian Wildlife Service is carrying out a series of experiments to determine the effect of flashing lights on birds. It would appear that steady lights have next to no effect, but that by varying the frequency and intensity of a flashing light, a reaction can be produced. We will publicize any significant findings that come out of all this.

Incidentally, since that article appeared, we've lost another Cold Lake CF104 to a birdstrike.

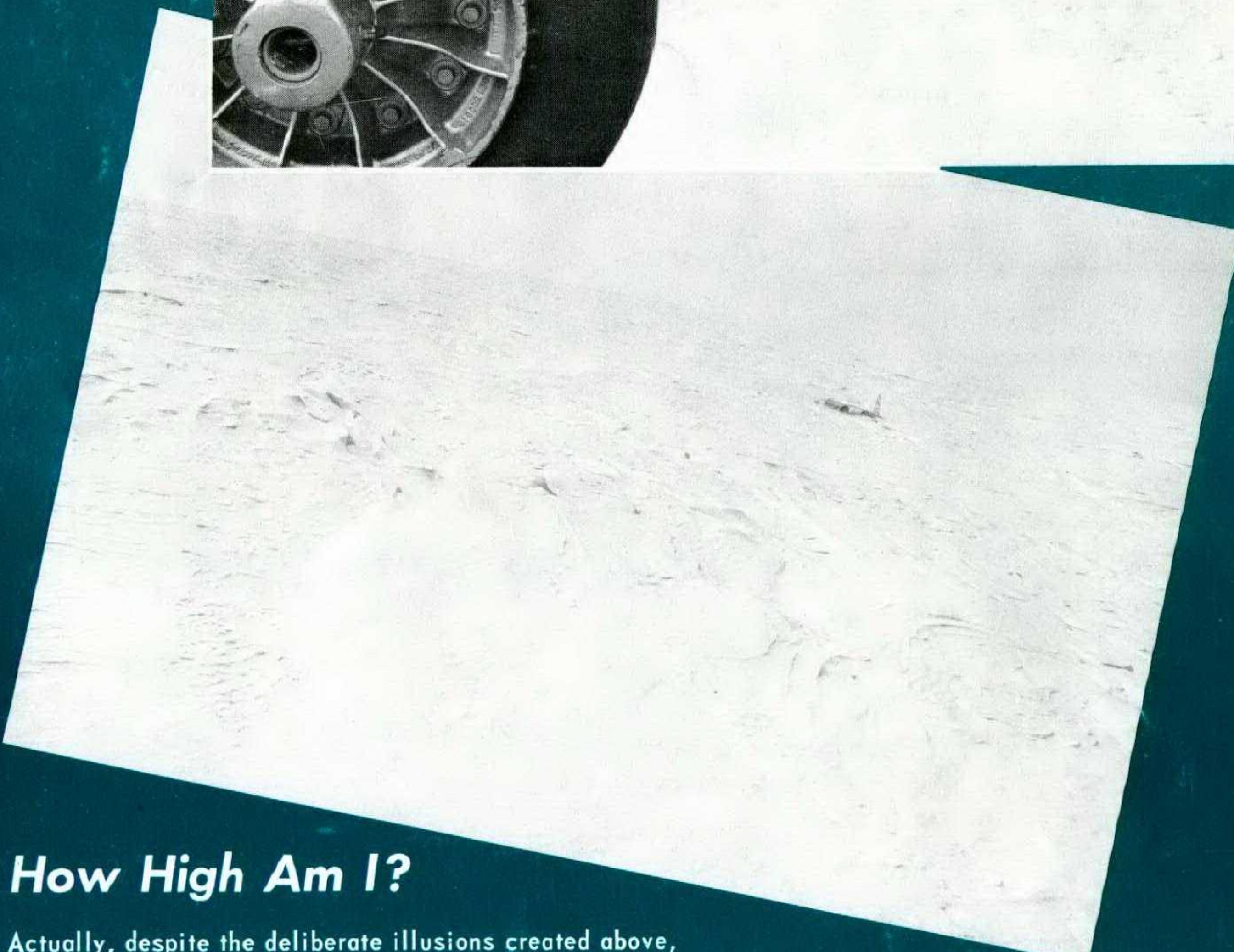
BIRD WATCHERS' CORNER

SNOW BUNTER

Across a wasteland expanse of what once was open water flits the Bunter at high speed and low level. Alone at last, he's doing his thing in a wide white world. Peering intently into the featureless void, the Bunter experiences a creeping apprehension as his 3-D vision reduces to 1-D. Alarmed, he commences a frantic flapping but the gyrations merely hasten the impending ending. After the frozen fluff settles, the Bunter lies sprawled on the snow and laments his lack of vision in this song:

WHEN-IT'S-WHITE-OUT-FOR-MILES

GET-YOUR-EYES-ON-THOSE-DIALS



How High Am I?

Actually, despite the deliberate illusions created above, the snow scene on this page and in the centre-page was taken at a height of 8 feet above the surface. The scene is Lake Winnipeg just south of Hecla Island.