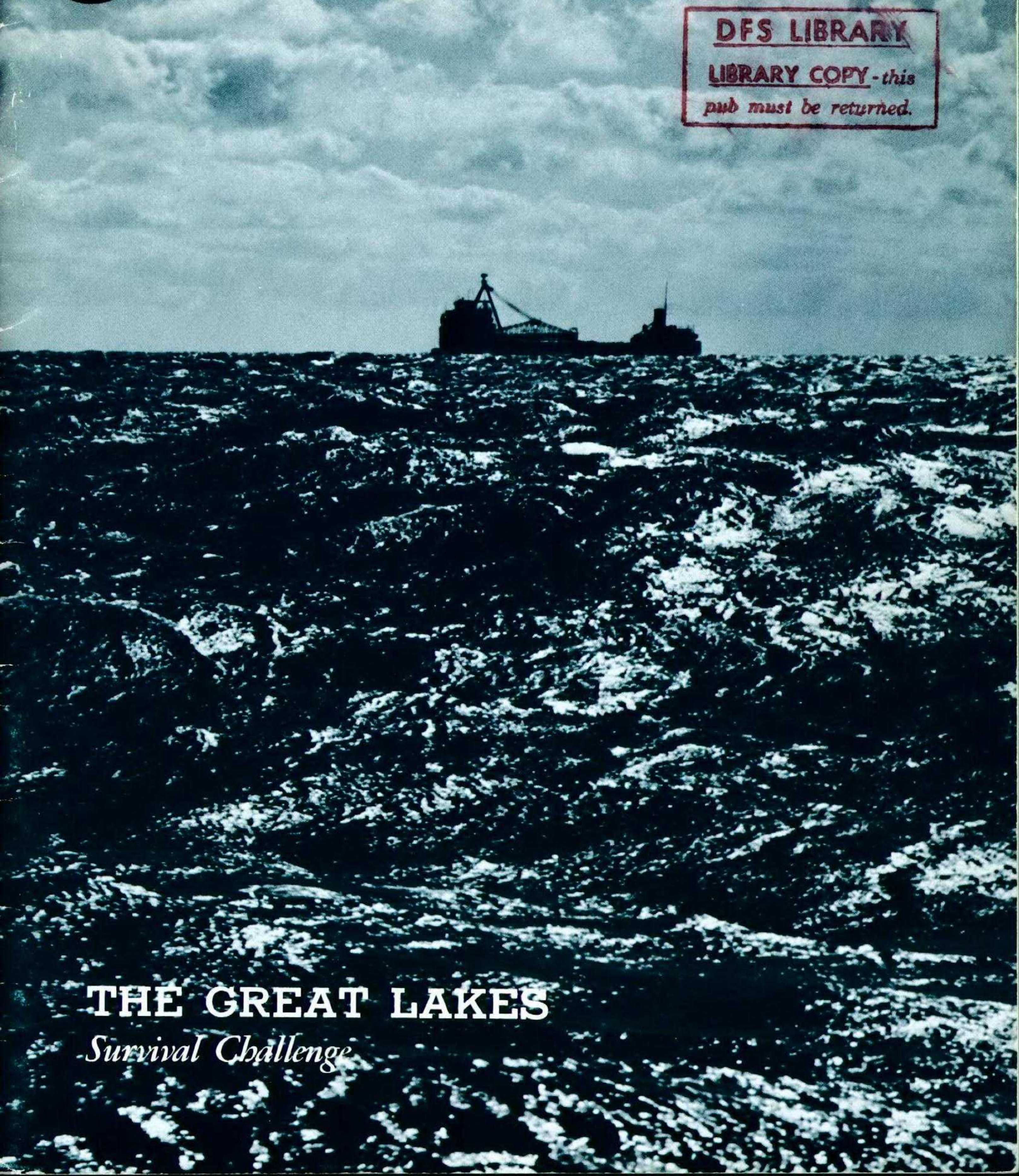
FLIGHT COMMENT

NOVEMBER • DECEMBER • 1966
(SEPT-OCT ISSUE NOT PUBLISHED)



THE GREAT LAKES
Survival Challenge

Comments

In the past year several unavoidable interruptions and delays pushed us slowly behind schedule. We were prepared to "have a go" if other agencies could have handled a "crash" program of catching up; this was impossible, Flight Comment being only a cog in a big wheel. We therefore, reluctantly abandon the pretence of the past year and label this issue with its proper release date. Consequently, there was no Sep-Oct issue.

■

The aircrew on a recent ejection from a jet aircraft were wearing the old two-piece helmets. The only type of helmet acceptable for use in jet aircraft is the one-piece DH41-2 (master ref 8475-21-801-9838). Jet aircrew still using the H4-1 helmet are to demand the replacement type DH41-2. Pending receipt of the DH41-2 the H4-1 will remain in service.

All other aircrew, or groundcrew will continue using the two-piece H4-1, the type 411 for helicopters and the type H5-3 in Caribou until depot stocks are depleted and existing helmets become unserviceable. When this occurs the replacement helmet will be the type 411, now the accepted flying helmet for all helicopter crews.

Ultimately, there will be only two types of helmets in use – the DH41-2 for all jet aircrew and the 411 for all users other than jet aircrew. (See EO 55-5B-5A/3 12 Jul 66.)

■

A glance to the right of this column will show a further reduction in staff; Mrs Kines, our assistant editor has moved to another government department. The move was associated with the much-publicized staff reduction and job-shuffling at CFHQ. Bonnie, who handled much of the behind-the-scenes work, was exposed for four years to the complexities of military aviation safety – challenging work for a woman. We wish her the best in her new editing job with the Secretary of State department.

DIRECTORATE OF FLIGHT SAFETY CANADIAN FORCES HEADQUARTERS

G/C AB SEARLE
DIRECTOR OF FLIGHT SAFETY

S/L MD BROADFOOT
FLIGHT SAFETY

W/C R D SCHULTZ
ACCIDENT INVESTIGATION

Editor—F/L JT Richards

Art and Layout—CFHQ Graphic Arts

Flight Comment is produced by the CFHQ, Directorate of Flight Safety. The contents do not necessarily reflect official policy and unless otherwise stated should not be construed as regulations, orders or directives.
Contributions, comments and criticisms are welcome; the promotion of flight safety is best served by disseminating on-the-job experience and opinion. Send submissions to: Editor, Flight Comment, CFHQ/DFS, Ottawa 4, Ontario. Annual subscription rate is $1.50 for Canada and USA. Subscriptions available at Queen's Printer, Hull, P.Q.

1966 AND ALL THAT*

Aircraft operators and maintainers may turn the page – this one's not for you. But please tell your friends in administrative jobs, especially the cooks and the food handlers. Even better – show them this editorial.

Should you be confused by the title we remind you that this year is the 900th anniversary of the battle of Hastings. To relate this event to flight safety, let's briefly review the facts. Historians generally agree that King Harold was guilty of an error in judgement. Was it that visor? No, his visor was down when the arrow hit him. (We won't raise the analogy of modern knights in 104s and Tutors who fly around in the bird-infested air with visors up.) Harold's visor was down all right but the peep-hole glass wasn't arrow-proof. But this wasn't the error, either. Harold was fatigued. Some days before the Big Day he was up north soundly defeating King Harald of Norway, then had forced-marched to Hastings in the south where he proceeded to attack William without benefit of rest or even a good night's sleep. And what about adequate rations? Hypoglycemia may have been a factor . . . and all that.

What we are leading to in a round-about way is not just the old saw about history repeating itself. What we really want to talk about – to certain people – is the provision of support to our present-day aviators. The Army calls this the administrative tail but we are all well aware that rations and quarters are elements essential to our well-being.

1966 has been a good year for demonstrating this fact – or, from a safety point of view, a bad year. For example, food handlers were responsible for four close-calls from tainted food provided our modern knights. In one near real-life enactment of "Flight Into Danger" ** the co-pilot fortunately wasn't hungry . . .

Too, many accidents and incidents had fatigue as a cause factor. We know that fatigue for some pilots results from staying up too late the night before the big flight; for others fatigue follows from a pilot's decision to overfly some bases – or avoid them when they would otherwise be the logical place to land. Why? Simply because of the service – or lack of it – which they could expect if they RON'd there.

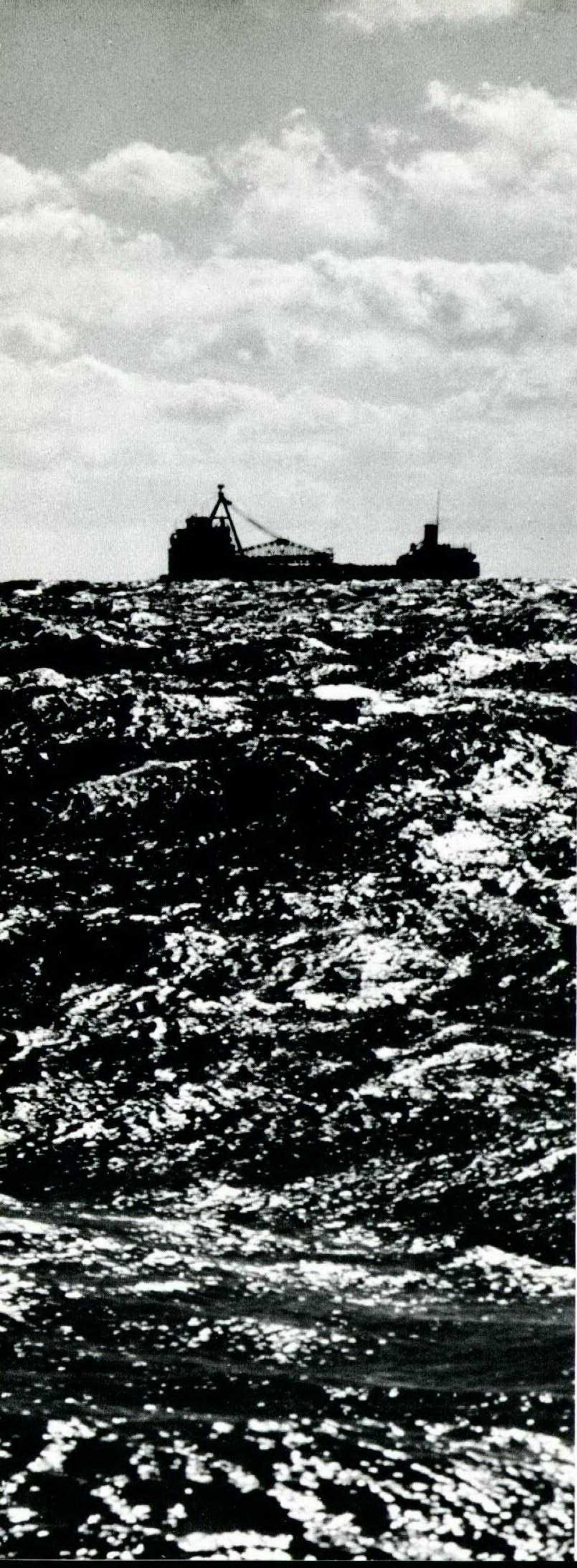
Our recent Flight Safety Officer course recommended the USAF "Rex Riley" approach as highly desireable. This would entail sending out vigilantes to probe for items such as: wheels, quiet rooms for bone-weary aircrews, beds and furnishings in readiness. The list would include availability of good meals in mess halls for the traveller who lands after the 1815 meal-hour closing, so that he is not forced to satisfy his hunger at an off-base inn. We didn't go along with the recommendation. We would rather appeal unofficially – and if need be, officially – to those responsible for taking care of visiting aircrew of whatever rank. Visiting aircrew must be given the best of attention and care if accidents are to be avoided. In this big land and overseas, the time clock is always taking its toll of their energies and resources.

The hazards of fatigue, and inadequate or unsatisfactory meals with the very real danger of food poisoning are causing us grave concern. We ask you all to look upon the travelling aircrew as potential next-door neighbours. Please treat them well.

Group Captain AB Searle
Directorate of Flight Safety

* History is lightly and delightfully treated by authors WC Sellar and RJ Yatesman in their famous "1066 And All That".

** A gripping yarn by Canadian writer Arthur Hailey, about poisoned pilots on a commercial airliner.



Survival Challenge

THE GREAT LAKES

If you've ever overflown the Great Lakes, you no doubt wondered as you glanced downward - "What would be my chances of survival? Have I adequate gear on board?"

Lt JH McBride, RCN

The Great Lakes cover an area as large as the four Maritime provinces (excluding Labrador) – about 95,000 square miles. Their sheer size as inland waters is awesome enough, but unfortunately for aviators, these huge lakes are at the junction of several storm paths (fig 1).

Storms from Western Canada are most frequent in the Lakes area in all seasons; fortunately most of them are relatively weak, rarely producing gales or causing extensive damage. The more destructive storms come from a *southwesterly* direction, and usually occur in October through May. As these storms approach, winds frequently reach gale force (34 mph), with a marked windshift when the cold front passes. Accompanying precipitation is often moderate to heavy. In winter, wet snow and freezing rain are not uncommon. Storms of tropical origin and those from the Eastern US usually move northeastward off the coast; although, on the rare occasions when they are steered inland, heavy and widespread precipitation results.

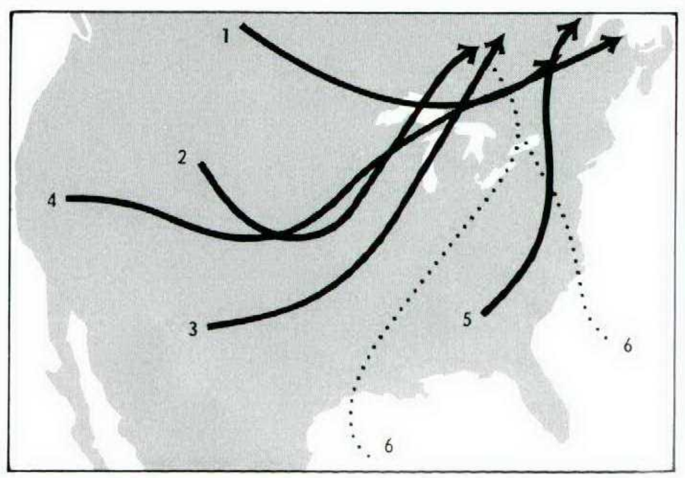


FIGURE 1. Great Lakes storm tracks. Storms originate: 1 – Western Canada, 2 – Central Rocky Mountains, 3 – Texas-New Mexico, 4 – Southwestern United States, 5 – Eastern United States, 6 – Tropics.

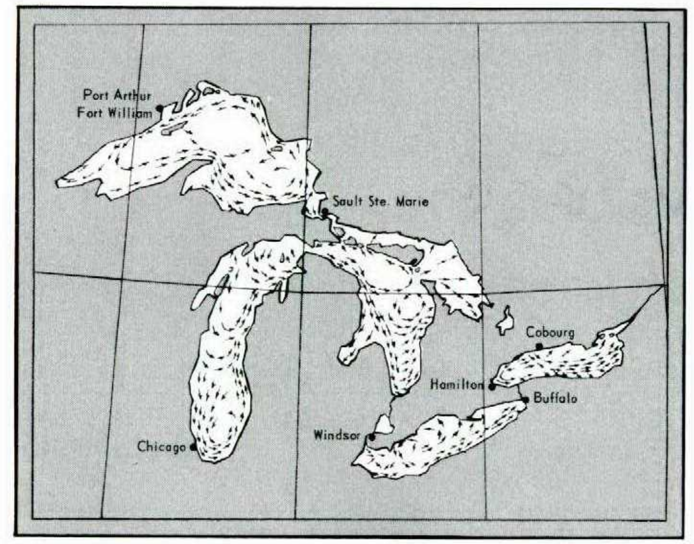


FIGURE 2. Mean Great Lakes Currents during the navigation season. (Source: Millar)

In the 22 years from 1937 to 1958 there have been 46 storms with gale-force winds, or about two storms per year in the Great Lakes basin. The windspeed over the Lakes was 40 to 60 mph. On 9-10 Oct 49, winds of 60-70 mph were general over Lakes Superior and Michigan; at Superior, Wisconsin, 12-foot waves and wind gusts to 102 mph were reported. On 17-18 Nov 58, a lake ship sank with 33 aboard; winds over Lakes Michigan and Superior were 60 mph with gusts to 75 mph. On 27 Apr 66, winds of 50 mph with gusts to 85 mph drove flood waters and ice on shore causing extensive property damage around Lake Erie and the western end of Lake Ontario. Waves of 10 to 12 feet were reported. These are, of course, extremes but serve to demonstrate that our Lakes can create a survival environment nearly as rigourous as the oceans.

HOW DATA ARE COLLECTED

Observations of weather and ice are made by the merchant fleet, coast guard, specially equipped research vessels, and aircraft. Instrumented towers and buoys also monitor lake conditions. In 1959 the Canadian Coast Guard ship PORTE DAUPHINE, (a 400-ton, 125-foot research and weather ship on loan from the RCN), began taking standard meteorological observations on all the Lakes bordering Canada. She records water temperature at all depths. In addition, a meteorological boom measures temperature, humidity and wind from the lake surface to 44 feet; and a wire-sonde measures temperature, humidity and pressure up to 1500 feet. She operates during the navigation season (Apr to Dec) on all lakes except Michigan, and Lake Ontario during the winter.

In 1960 the Meteorological Branch of the Department of Transport began aerial ice reconnaissance of the Lakes. The first reconnaissance is usually made around Christmas; flights continue until early May if necessary. In 1966 regular surveys of surface water temperature commenced, using the newly-developed airborne radiation thermometer (ART) technique. Our need to know more about these Lakes spurs increasing research each year.

LAKE CURRENTS AND TEMPERATURES

Currents in the Lakes are caused principally by wind; add to this, rotation of the earth, density differences, shape of the basin, and water depths. Currents are cyclonic (*anti-clockwise*) on all Lakes (see fig 2). Speeds are usually less than half a knot, although some well-marked currents have speeds up to one knot. Circulation is less marked on Lake Erie, probably because in this shallow lake, bottom friction acts as a brake.

Lake temperatures are related to the time of year and to water currents; the latter cause a large rise or fall in temperature. The water in the southeastern portions of the Lakes for example, is relatively warm in summer because warm surface water is blown to these areas by prevailing westerly winds. As a result of this local increase in volume (called a "set-up"), *convergence and sinking* occur in these areas, and a compensating *upwelling* is evident in the western and northern portions of several of the Lakes (see fig 3). In areas of upwelling, the surface water is relatively cold during the warm season. For example, along the northern shore of Lake Ontario from Cobourg to Hamilton from mid-June to August there is usually an area of cold water resulting from upwelling. Similar patterns occur at the north end of Lakes Michigan and Huron. In Lake Superior the south-southwest set of the current along the northwest shore is reinforced by upwelling.

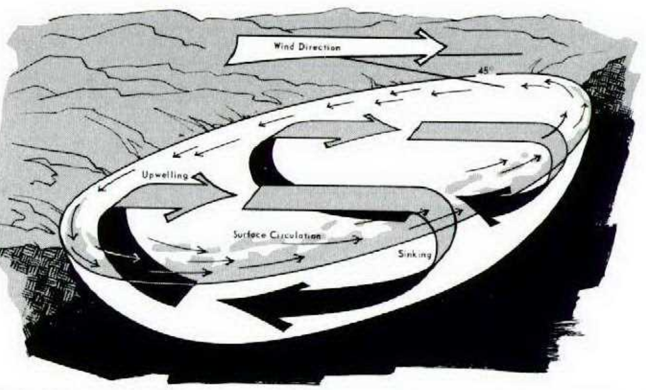


FIGURE 3. Surface circulation, sinking, and upwelling in lakes.

Latitude, depth and size of the lake, and drift of surface water affect the lake temperature. In the summer the relation of water depths to surface temperatures is so strong that the depth contours resemble a blurred image of the water isotherms. Lake Erie is the most southerly, shallowest (maximum depth is only 210 feet), and second smallest lake; consequently, it is the warmest lake except during the brief period when it freezes over. Conversely, Lake Superior is generally the coldest lake because it is the most northerly, largest, and deepest (maximum depth is 1302 feet).

From October to June, lake temperatures are 50°F and less. From July to September, they are above 50°F – except in the center of Lake Superior. Here the surface lake temperature is about 35°F in April (fig 4), and about 50°F in August (fig 5). In the southwest end of the lake, the water warms to 60°F. Although Lakes Huron, Michigan and Ontario are about as cold as Lake Superior in April, in the summer they are 15-20° warmer in the center. Lake Erie is actually colder than Lake Superior in winter but warms quickly in spring remaining 2-5° warmer than the other lakes the rest of the year.

For most of the year then, it is obvious that you cannot remain in the water for long (see fig 6). Your survival equipment should have this capability – or its worth will be short-lived!

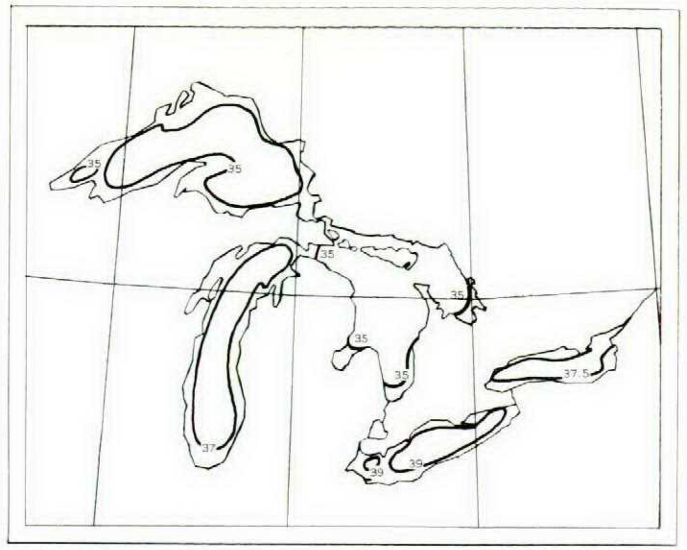


FIGURE 4. Mean Great Lakes Water Temperatures (°F) in April. (Source: Millar)

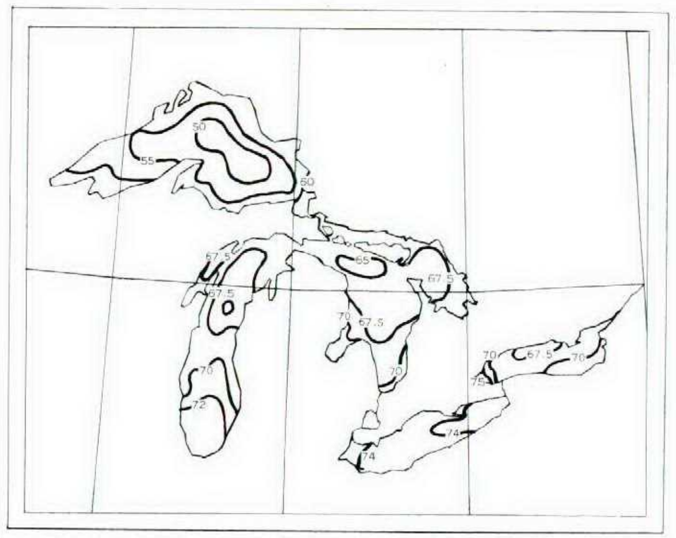


FIGURE 5. Mean Great Lakes Water Temperatures (°F) in August. (Source: Millar)

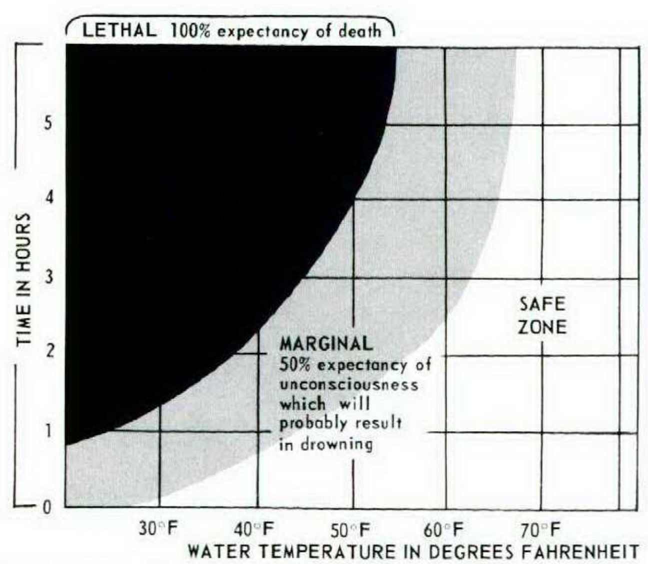


FIGURE 6. Survival chart showing predicted exposure time versus water temperature.

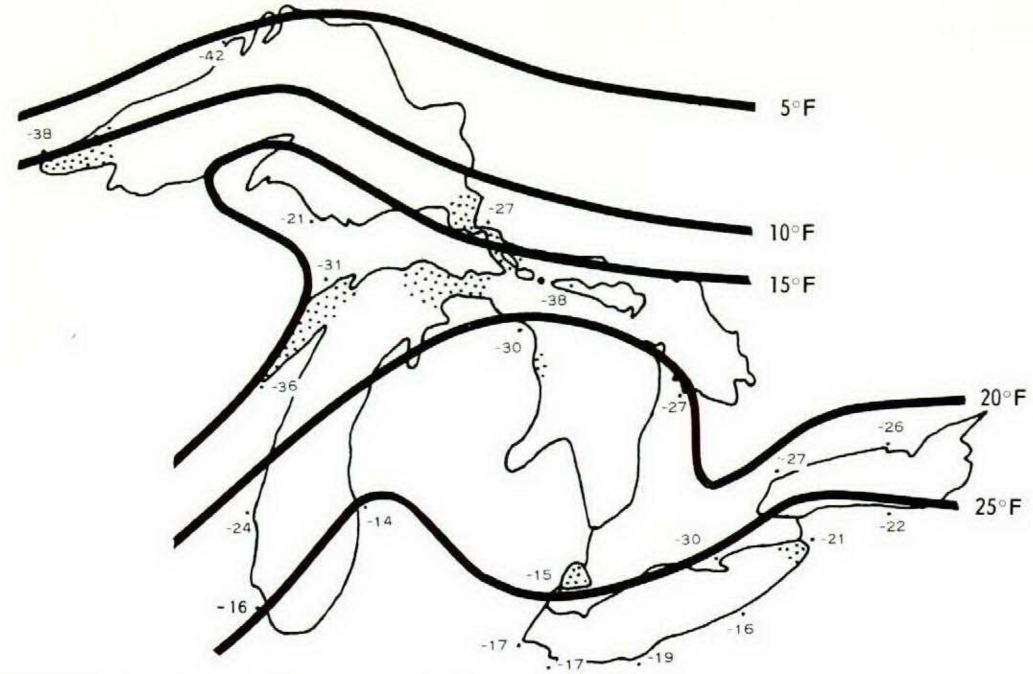


FIGURE 7. Mean Air Temperature (°F) for January are shown by isotherms. Record low temperatures are plotted. Stipple denotes critical early and late season ice areas.

AIR TEMPERATURE

The air temperature near the lake surface is generally cooler in summer and warmer in the winter than the air temperature inland. Unless the air is already saturated, the relative humidity of the air mass will increase as it traverses the Lakes. The modifying effect of the Lakes is particularly noticeable when very cold air moves south; temperatures along the southern shore of Lake Ontario can be 20° warmer than those on the north shore. The air temperature can drop 50 to 60 degrees within 24 hours with outbreaks of cold Arctic air in spite of Lake effect.

The mean daily air temperature for the month of January is shown in fig 7. The range in temperature between maximum and minimum is about 15°F. February is generally just as cold as January. Record low temperatures are also plotted in fig 7.

WIND

Winds from the westerly quadrant generally prevail, but winds from all directions may be encountered because so many storms cross the Lakes. Windspeed is highest at mid-day and least at midnight, but the diurnal (day-night) variation in speed is not as great over the Lakes as it is ashore. Winds over the Lakes are usually stronger than those ashore; average windspeed over the Lakes is 1¼ (in spring) to 2 (in autumn) times the windspeed inland. In very strong wind situations, a good general rule is to estimate the over-lake windspeed to be *one-third stronger* than the over-land wind.

In winter, strong winds blow from the northwest; in summer, strong winds occur when thunderstorms or squall lines cross the Lakes. In spring and autumn, strong winds blow when intense weather systems move across the Lakes. The highest one-minute wind velocity was recorded aboard ship on Lake Superior in a squall line on 25 Jun 50 – northwest at 93 mph! Higher velocities have no doubt occurred. The computed maximum gust speed is over 80 mph most of the year, and over 100 mph on Lake Superior in October. The mean winter windspeed ashore is 10 mph, so it is probably close to 20 mph over the Lakes.

Dry exposed flesh freezes if the air temperature is less than 12°F with a 20 mph wind!

WAVES

The effects of high winds are most serious when winds blow parallel to the long axis of a lake for any length of time. Such winds have a long fetch and can build up a rough sea. Strong west and southwest winds on Lake Ontario, for example, may become galeforce winds by the time they are funnelled into the Thousand Islands area at the east end of the lake. This funnelling effect occurs also at the east end of Lake Erie. Since over half this lake is less than 100 feet deep, a rough sea is easily generated. On Lake Michigan, dangerous seas are usually experienced with strong northerly or southerly winds. Strong westerlies can interfere with shipping on east shore harbours. Lake Huron and Superior are so large that winds from any direction have sufficient fetch to build up a sea.

We have only begun to collect wave data on the Lakes. Average wave conditions are unknown. Theoretically, a 25-knot wind blowing steadily for 15 hours over a fetch of 165 nautical miles will generate a fully-developed sea. This means that the average height of waves will be 9 feet; the average height of the one-third highest waves (called the significant height) will be 14 feet; and the average height of the one-tenth highest waves will be 18 feet. Waves of this magnitude can develop on any of the Lakes. The highest reported height is 22 feet on Lake Superior.

ICE

Ice on the Lakes halts shipping between mid-December and mid-April. The areas where ice forms early and remains late are shown in fig 7. Lake Erie freezes over every winter; the other lakes *normally do not freeze over* except in unusually cold winters. Ice, which may range in thickness from a few inches to three feet or more, forms in shallow and protected bays and harbours, and builds out from the shoreline. Winds and waves regularly break up this ice sheet and pile up ridges of broken ice 10 to 20 feet high.

After a cloudy summer when solar heat input is low, ice formation is more rapid and more extensive. On the other hand, a heavy snowfall shortly after freeze-up insulates the ice from the cold air; the ice will then be thinner than when it is exposed. Major storms, strong winds, waves, and overturning of lake water can cause large areas of open water to appear even when the temperature is below freezing. This is particularly true of Lakes Superior and Huron whose surfaces often become 50% open water despite below freezing temperatures.

Lake Erie freezes over in early January. On Lake Superior, freeze-over requires very severe winter conditions and little previous heating. It seldom occurs; the last freeze-over was in 1964-65, and lasted for only a few days. Lake Michigan freezes over in the northern end only. Lake Huron is similar to Lake Superior except for Georgian Bay which is quite shallow, and freezes over completely during an average winter, and apparently becomes 80% ice-covered even during the mildest of winters. Lake Ontario has the least ice cover of all. It is believed that it froze over once in 1933-34 (with ice about six inches thick), and possibly also in 1892-93.

Because ice cover is generally less than 60%, the open water creates poor weather conditions on the lake and downwind over the shores.

SNOW

Over all ice-free areas on the Lakes, the air is modified by evaporation of water from the warm lake surface. When the air becomes saturated with moisture, snow "cells" may form on the lee side, and yield heavy snowfalls. Fig 8 shows the snow "belts" produced inland by the prevailing windflow across the Lakes. December 1962 was a month of unusually abundant lake effect snowfall. Amounts of 18 to 45 inches fell in four days in the lee of all Lakes. The record one-day snowfall is 45 inches at Watertown, New York. The major cities around the Lakes have experienced one-day snowfall amounts of from 14 to 25 inches.

CLOUDS AND ICING

Little is known of cloud amounts over the lakes. Preliminary studies indicate that there is a little less cloud over the Lakes than inland in summer, and vice versa in winter. The number of overcast days gradually decreases from a winter high (of about 20 days per month) to a summer low (of about 12 days per month). The north-western part of Lake Superior has fairly uniform cloudiness all year.

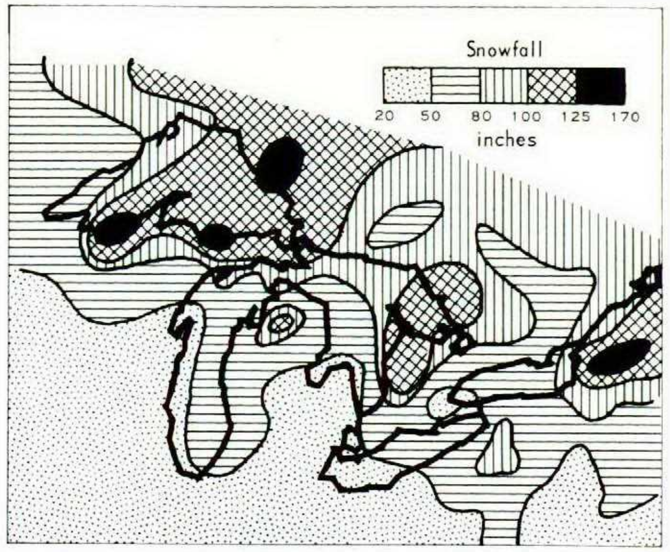


FIGURE 8. Mean Annual Total Snowfall, Great Lakes. Period of record: 1931-60.

In summer convective clouds are common, thunderstorms and squall lines being most frequent in spring and early summer. Stratus is prevalent in the spring and fall. Winter cloud types are cumulus and stratocumulus. Heavy snowfalls are associated with snow "cells".

Besides these seasonal clouds, each passing storm has the characteristic layer and "build-up" cloud types which herald the warm and cold fronts. These storms give moderate to heavy precipitation in all seasons – rain, freezing precipitation, or wet snow. The annual precipitation amounts to 25 to 35 inches.

The lower levels of the atmosphere are moist because water is constantly being evaporated from the Lakes. Thus, icing in low cloud is moderate to heavy when the freezing level is on or near the lake surface. For this reason, flight levels should be chosen to avoid snow "cells" and low-level cloud in approaching warm fronts in winter.

FOG

In the spring the Lakes are generally cooler than the air, and fog usually forms when warm moist air is advected over the Lakes. Fog is common in areas of upwelling. In late fall and early winter, steam fog occurs when cold air breaks out of the north and crosses the relatively warm lakes. Steam fog is common in areas of sinking. On the whole, the large western lakes are foggier than the two eastern lakes.

SUMMING UP

Your survival equipment should be selected to counter these Great Lakes conditions – does it stack up to the task?

- The lakes lie in the path of frequent storms, supplying the moisture for cloud, fog, and precipitation.
- Lows are intensified over open water. November is the stormiest month.
- While westerlies prevail, wind direction varies markedly with the passage of storms.
- Over-lake winds are usually stronger than over-land winds.
- Funnelling can produce substantially higher wind-speeds.
- High waves result when winds blow parallel to the long axis of a lake.
- Lake temperatures are below 50°F most of the year.
- In winter, lake temperatures are just above freezing (except Erie).
- Except for Erie, there is much open water, ice is thin, complete freeze-over is rare.
- Thunderstorms and squall lines are common in the summer.
- Fog may blanket areas of open water for several days, especially in spring.
- Icing is moderate to heavy in snow "cells" and warm fronts in winter.

A dismal picture? Indeed it is.

Is the equipment you wear or carry capable of giving you the best chance of survival after bailout or ditching?

Lt John H. McBride, CFHQ Meteorology & Oceanography Section

Lt JH McBride received his education at McGill, earning a Bachelor of Science in 1959 and a Master's degree in meteorology in 1964. He spent several summers at Stn Winnipeg, first as an AC2 radar performance checker and later in the URTP as a commissioned navigation instructor. As a Department of Transport forecaster he served at Trenton, Bagotville, Shearwater and Resolute, NWT.

On leave from the DOT, he is currently on temporary duty at Maritime Command as a forecaster.

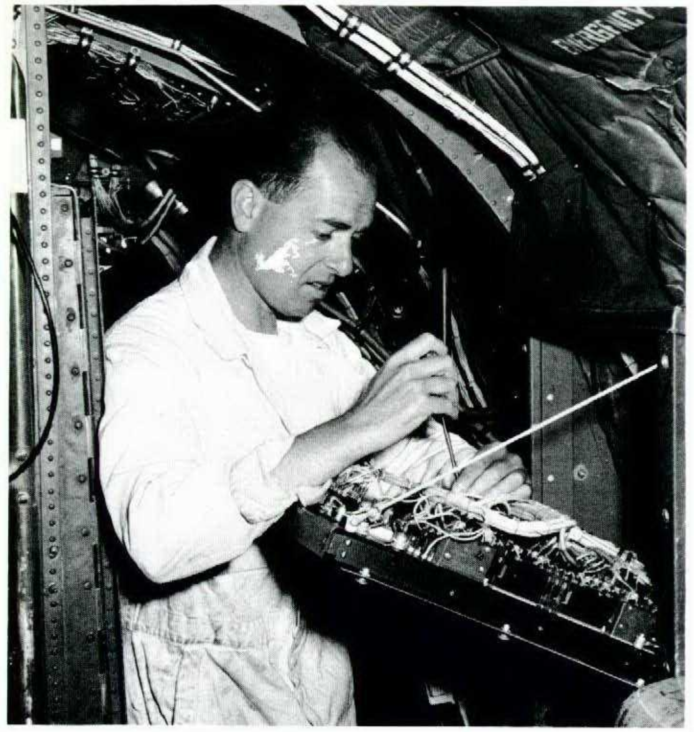
TRAINING COMMAND'S
Flight Safety Maintenance Award

The pennant, awarded to Training Command bases, attests to three consecutive months without an aircraft accident attributable to maintenance causes. The pennant may be kept flying as long as the accident-free record is maintained. The symbol on the pennant is a modernistic Lamp of Learning, indicative of Training Command's role in the Canadian Forces.

At CFB Winnipeg this is a commendable achievement. Extreme shortage of ramp space with numerous aircraft ground movements, results in aircraft almost constantly being towed to new locations on the hangar line. Obviously, this intense exposure to possible ground accidents requires the "extra" professional touch so vital in today's aircraft maintenance programmes. Congratulations to all personnel at CFB Winnipeg and other TC bases who are keeping the "flag flying".

Group Captain BE Christmas, Base Commander CFB Winnipeg, presents the Training Command Flight Safety Maintenance Award to Squadron Leader FM Routledge, Base Aircraft Maintenance Engineering Officer.

GOOD SHOW



CPL AC RAVENDA

Corporal Ravenda, while performing a routine electrical system check on a Neptune, discovered an unserviceable relay. Had this unserviceability not been detected it would have meant the loss of the pilot's and co-pilot's windscreen de-icing system; the de-icing system for the wing, cabin and empenage heater; and the APS20 radar. In heavy icing conditions – a possibility on maritime operations – the loss of these systems could have been serious.

Cpl Ravenda's detection of a component malfunction *not* included in the routine check demonstrates his knowledge and attention to detail. By Cpl Ravenda's integrity and perseverance a hazard was detected and eliminated – that's flight safety in action.

F/L W MUIRHEAD

Following a CF101 landing accident at CFB Chatham, the aircraft broke up and began to burn after coming to rest in the snow-covered infield. The fire trucks were unable to reach the scene through the deep snow, however the fire fighting equipment was quickly moved to the scene, fire damage was kept to a minimum and prevented destruction of parts necessary for

investigation. Also, had the aircrew not been able to escape from the aircraft on their own, the fire fighting equipment would have saved their lives.

F/L Muirhead, the fire chief, provided a fine example of good judgement; his foresight led him to require an extra length of hose to be carried in his fire trucks. As a result the equipment was able to respond – and fire trucks now carry more hose.

O/C K THOMSEN

As captain of a Tutor, Officer Cadet Thomsen of the Royal Danish Air Force was overshooting from a touch-and-go landing when at approximately 25 feet above ground, the low fuel pressure and master caution lights illuminated. He quickly assessed the situation and judged the remaining runway sufficient for a landing.

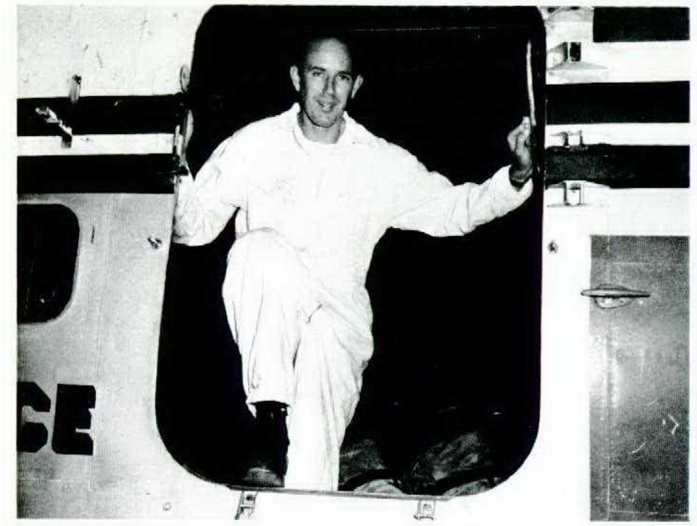
By returning his valuable aircraft safely to the ground in a tight spot, O/C Thomsen displayed the good judgement and quick thinking of a pilot well beyond his brief flying experience.

CPL GE ROBINSON

While based at Kamloops on an SAR mission, Cpl GE Robinson was performing an inspection on an Albatross when he discovered that the aileron control wheel, although free to move from neutral to port, could not be moved from the neutral position to starboard.

Investigation of the aileron control system revealed that an explosive rivet 1½ inches long, lying loose in the vicinity of the aileron chain and sprocket assembly located in the cabin roof, had fallen onto the grease-covered sprocket, and stuck there. When the control was moved to starboard the rivet jammed solidly between the sprocket and chain. This inspection had been done immediately after the aircraft had landed, indicating that the rivet may have lodged on the sprocket during the last landing.

Later, five more rivets were found in the area above the sprocket and chains.



That this fault turned up after a mountain search mission and prior to another, is indeed a most fortunate occurrence. Cpl Robinson performed this rountine inspection as expected of a skilled and conscientious technician; he can justly have the satisfaction of knowning that he prevented a highly possible serious accident.

CPL AE PFEIFER

Corporal Pfeifer, a GCA controller at Chatham talked-down his 10,000th aircraft – all at one unit. Cpl Pfeifer's 10,000th run recently, was with a CF101 aircraft flown by W/C JC Henry, Officer Commanding 416 AW(F) Sqn.

Corporal Pfeifer's contribution to air traffic control is lauded by Chatham's aircrew. His contribution to the safety of flight over the years is worthy of congratulations – here's one man who quite literally talked himself into a Good Show!

Sound Protection

The committee were informed that several flight line personnel have been walking from hangar to flight line with their ear protectors... unable to hear the approach of vehicles.

– Flight Safety Committee minutes

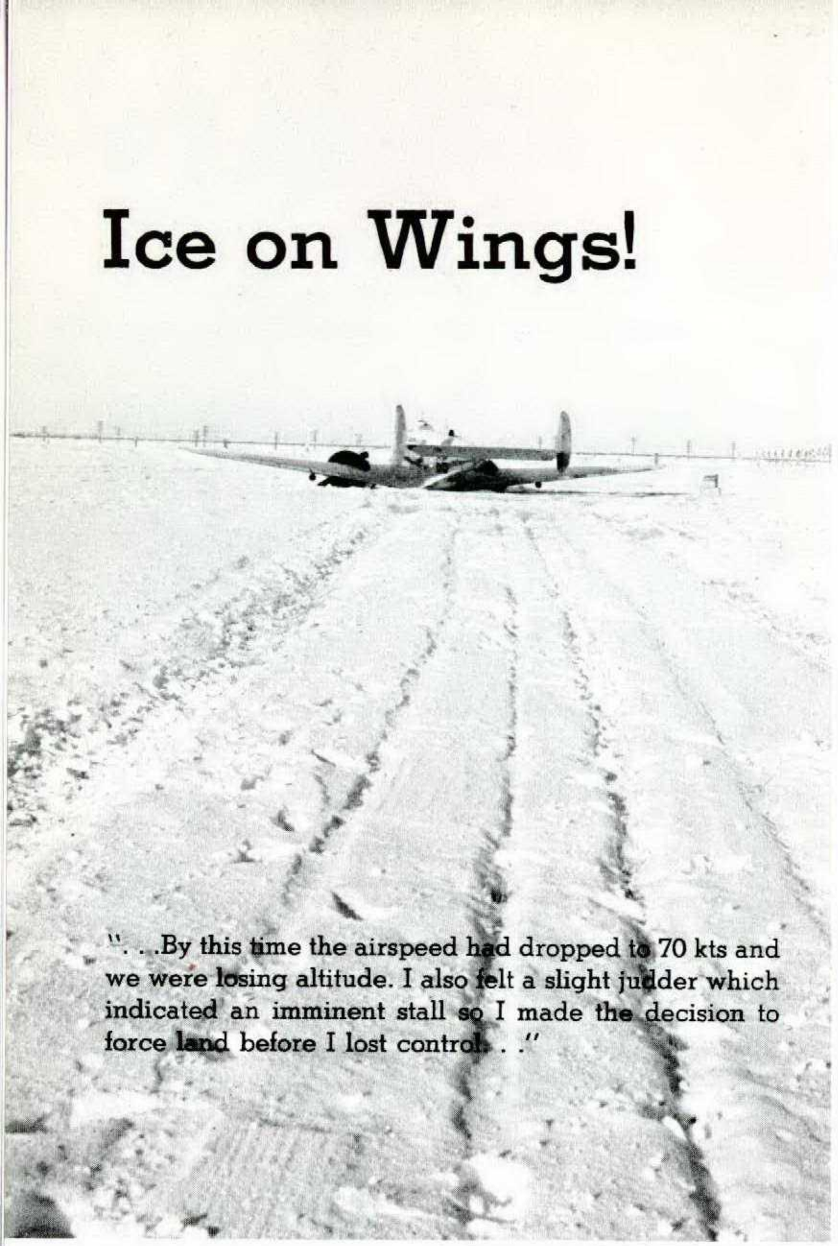
Radio Failure— and more

The pilot had radio failure and was trying to land. The following confusion resulted from this aircraft unserviceability:

- tower had trouble firing an ill-fitting flare
- tower was short-staffed – the assistant was away getting fresh bedding
- the tower was kept unnecessarily distracted by a constant flow of needless advice from operations the pilot did not employ all available radio equipment to monitor guard frequency
- the pilot did not see the green flare in the bright daylight and at the speed he was flying
- the ambulance, after being cleared to return to the hospital, came uncomfortably close to hitting a parked aircraft and a staff officer's car.

Don't get buried by snowballs!

Ice on Wings!

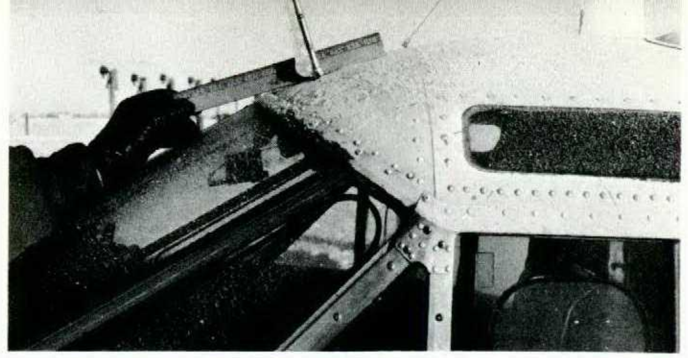


". . .By this time the airspeed had dropped to 70 kts and we were losing altitude. I also felt a slight judder which indicated an imminent stall so I made the decision to force land before I lost control. . ."

After being airborne for a brief flight to another airport the pilot took on a passenger without shutting down, and proceeded for takeoff. A vigilant lookout for signs of icing in cloud satisfied both pilots that they had encountered no icing. Both had used a flashlight, watching for tell-tale signs of icing on windscreen and windshield wipers. There seemed little reason to shut down and do a walk-around inspection.

Using 35 inches of manifold pressure the takeoff was normal in a 20 kt crosswind about 20° off the runway heading. This crosswind and a smidge too much braking by the co-pilot, extended the takeoff run somewhat. At about 70 kts, as the aircraft was skipping the captain took control. At 80 kts they became airborne; the undercarriage was raised as the aircraft climbed away. At about 100 feet the airspeed had increased to 88 kts but would increase no further.

The pilot states "...at this point I became concerned that we had only about 500 feet of runway left... I initiated a gentle turn left, applied full throttle, and selected the flap lever up. By this time the airspeed had dropped to 70 kts and we were losing altitude. I also



felt a slight judder which indicated an imminent stall so I made the decision to force land before I lost control..."

Fortunately, the aircraft damage was surprisingly light and no one was injured.

The investigation covered every conceivable possibility such as lack of power, false indication of speed, fuel load, and C of G (this was a TACAN-equipped Expeditor). Later on, returning to the aircraft the pilots observed the leading edge of the mainplanes iced to ¼ inch and the tailplane approximately ⅜ inch. The top surface of the wings were clear.

This one could have been fatal; the pilot was struggling with an aircraft that refused to fly, it was night, and the environs of the airport could well have been hazardous for a forced landing.

Several points emerged from this close call:

1. It appears that the windshield/wiper check is inadequate as a guide for airframe icing.
2. While the TACAN equipment has shifted the centre of gravity, it is insignificant.
3. The captain denied himself (by using an intersection rather than the runway end), approximately 2500 feet of usable takeoff room. If a ravine, for example, is to be the only landing place available, these 2500 feet could come in handy.
4. The icing occurred when there was no clear or rime ice reported at destination or departure airports. The photo shows the considerable ice accumulation on the airframe.

The ol' Exploder has strikingly poor response to airframe icing as these two pilots – and countless others – have found. (See Flight Comment article Nov/Dec)

A Good Show all 'round

The 101 pilot was in an uncomfortable position; conditions could have been worse – but not much. It was night, with 500 feet and 3 in rain and fog, plus a wet runway. Uppermost in the pilot's mind, however, wasn't the weather – it was that disturbingly loud bang which had come from the nosewheel compartment area. When the undercarriage had been selected down, the mains had indicated safe and locked but not the nosegear. Further, the gear handle warning light and the light on the left side of the instrument panel remained illuminated, plus the background noise of a persistent undercarriage warning buzzer tone.

The station was quick to respond.

Throughout the emergency, Comox GCA vectored the aircraft through several approaches and flypasts in an attempt to get visual confirmation from the ground that the gear was in a safe position. Since the arrestor system at Comox was not lighted a truck was positioned on each end of the barrier off the runway with headlights illuminating the cable. Foam was decided against as the runway was already wet. Crash equipment was moved quickly to approximately 1000 feet beyond the barrier; in addition, in case the engagement was not successful a crash truck was placed further down the runway on a taxi cutoff. These preparations followed the pilot's decision to attempt an approach-end barrier engagement.

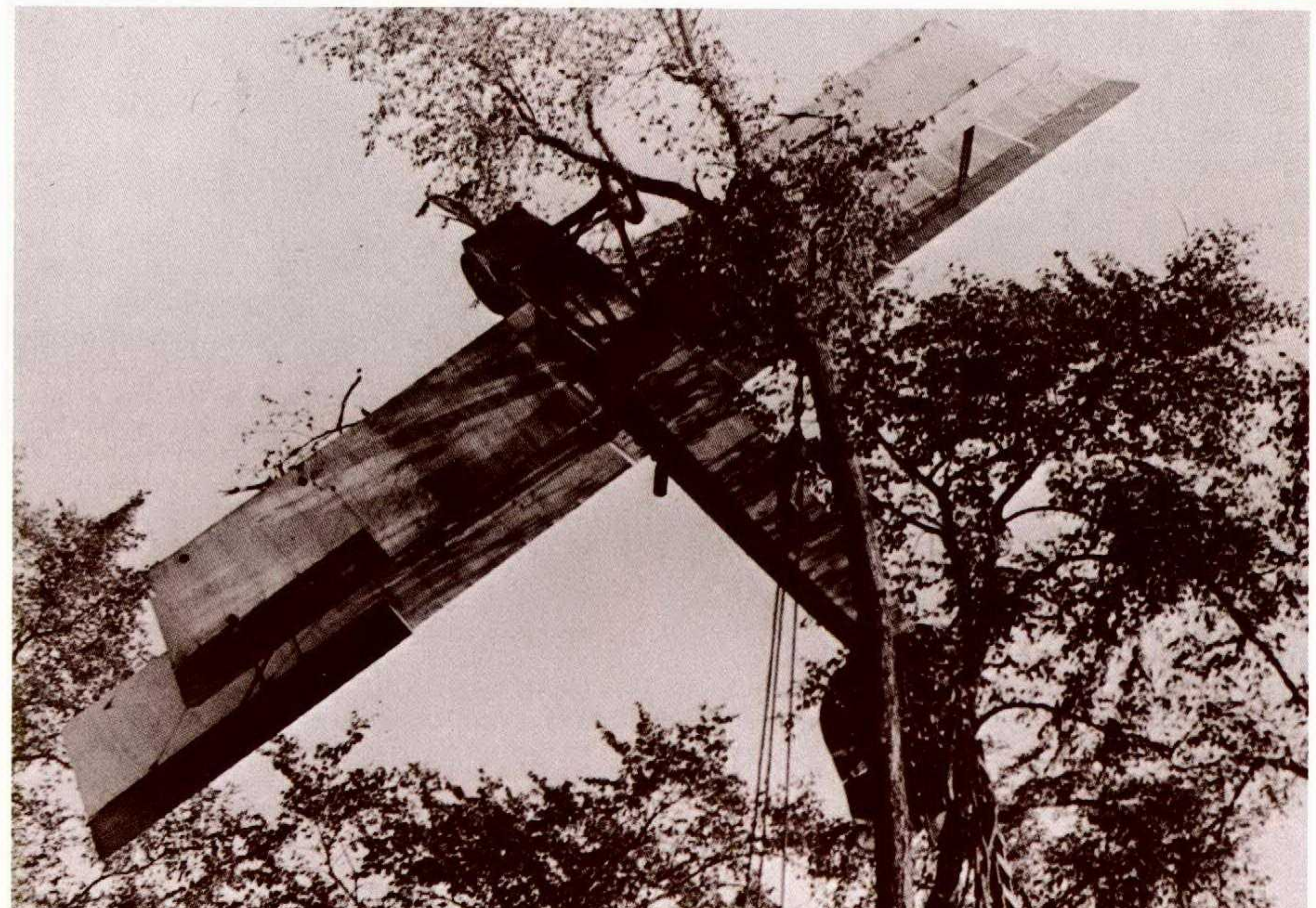
Following the engagement despite the nosegear striking the runway heavily it did not collapse – a well-executed landing under difficult conditions, (see Good Show May/Jun). As a precaution the engines were left running until the nose jack could be installed and wheel chocks positioned. A towing mule was placed under the nose of the aircraft to prevent anyone being injured if the nosegear collapsed. (Had the aircraft been moved backwards the gear would probably have collapsed.)

To quickly disengage the aircraft from the cable two fire trucks pulled the cable forward enough to disengage the hook.

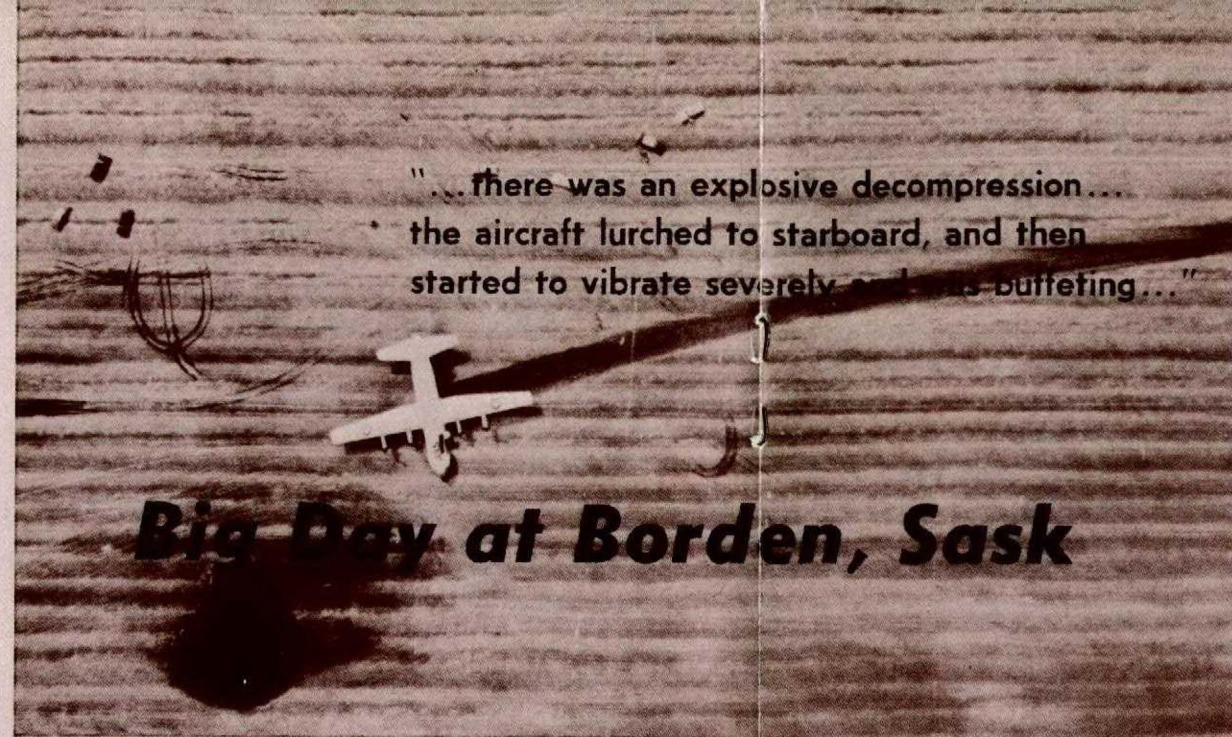
Thus, in this first approach-end barrier engagement, the fine flying skill of F/L Anderson combined with the excellent co-ordinated support received from the station – a good show all 'round.

Flash-Back

Landing in trees will be discontinued until a better aircraft-recovery method is devised.



GOOD SHOW



Big Day at Borden, Sask

The thought ran through the crew – we've had a midair collision! At 25000 feet in one brief moment the forward cargo door became separated from the aircraft tearing away portions of the fuselage. As the debris departed, it damaged engines, propellers, control systems – in fact, most of the major systems of the aircraft were either wrecked or damaged.

The first problem was explosive decompression. During the descent the engineer had collapsed unconscious, his face blue. He was given mouth-to-mouth resuscitation by the copilot who had first removed the man's oxygen mask. He came to, later on in the descent although his memory returned only when he was on the ground in a farm field.

The pilot had his hands full. Number 3 engine had flamed out. He called for feathering and the aircraft pitched down sharply. "I discovered that I had no aileron control; the rudders seemed normal and the elevator control was kicking badly". There was a 40 kt error between left and right airspeed indicators; the pitot-static system had gone. The number two engine throttle lever had become disconnected and fell limply forward. The 1 and 4 throttles were not working. Number 1 engine oil temperature increased beyond the maximum and the gear box oil pressure dropped below the minimum. The pilot could see the whole engine vibrating; the propeller appeared to be damaged. An attempted shutdown was a failure; it would not feather. Number 2 engine rpm was erratic.

Following the explosion, a MAYDAY transmission was made to Saskatoon, but after three transmissions the radios went dead. During that time however, they were able to transmit sufficient information for alerting search and rescue. The aircraft was monitored on radar giving a good position.

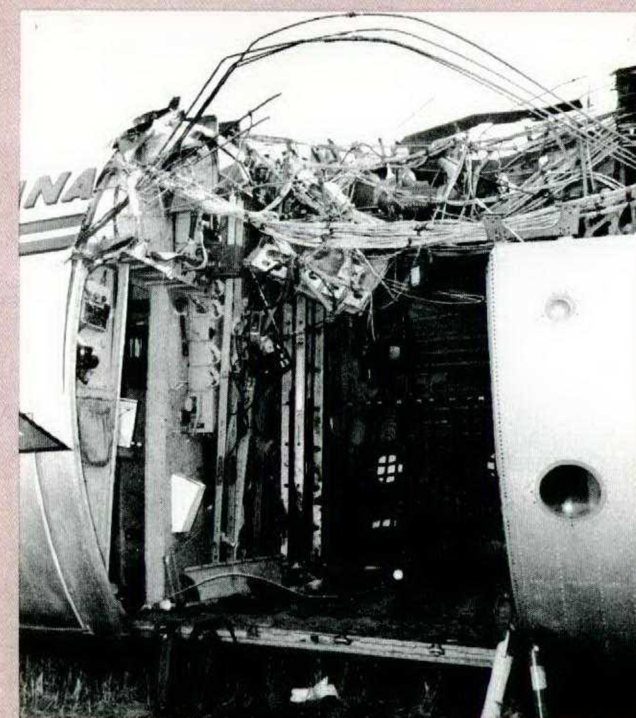
By 8000 feet the pilot picked a field to the north-east. During the descent the booster hydraulic system had gone to zero; the utility system was slowly bleeding off pressure. The pilot therefore decided to land flapless with the undercarriage up, fearing the complete loss of flight controls.

The aircraft touched down gently in a field running slightly uphill. The aircraft came to rest after a gentle slide to the left. Fortunately no one was injured, no fires developed and the aircraft sustained little damage beyond the severe fuselage damage while airborne.

Farmer's-eye view of uninvited guest.

The cause? The door had opened, becoming detached from the aircraft in flight, (later found 15 miles away). It was the door components that were vital to the accident investigation.

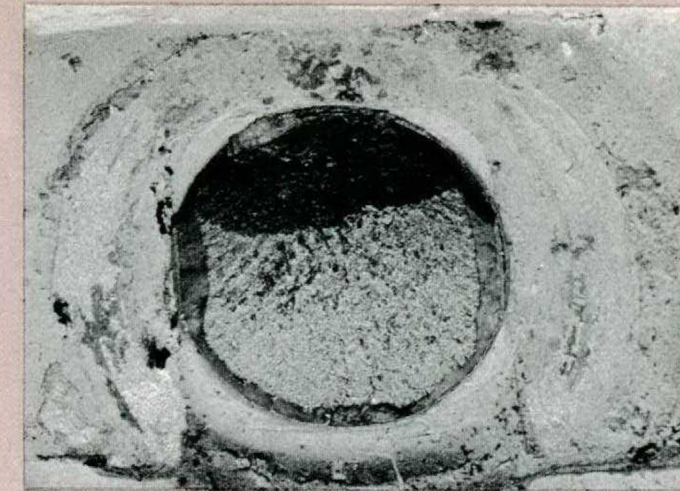
The causes were both material failure and maintenance error. The latching mechanism, consisting of four eyebolts, had failed allowing the door to tear off and with it, the top of the fuselage. The #1 eyebolt tying the door to the fuselage ruptured through over-stressing causing the #2 bolt to fail as the load was transferred to it. The fact that #2 eyebolt failed in this manner is strong evidence that the #1 eyebolt had been overloaded. Laboratory investigation disclosed that the #1 eyebolt had been cracked for some time; only ⅔ of the cross sectional area was carrying the load at the time of its failure. Analysis disclosed that both the initial crack and the ultimate failure were a result of overloading; also, rough machining during manufacture had helped the crack form. Misalignment during door rigging is strongly suspected as creating the overload.



Door locking mechanism failed, tearing away door, fuselage panels, and shredding control and systems connections.

Had the eyebolt clearances been checked and adjusted when they were reinstalled on the previous periodic inspection, the load would have been distributed so that when an eyebolt failed, the remaining eyebolts would share the load. Thus, the accident could have been prevented.

Another disturbing fact – the dye-penetrant check on the eyebolt during the last inspection did not reveal the existing crack. This points to a lack of know-how. Qualifications and training in the use of non-destructive test methods are now under review.



The eyebolt that failed and caused the accident. Note the previously-cracked portion. Overstressed by incorrect rigging, it couldn't carry the load.

The upper fuselage section torn off by the cargo door.

New eyebolts for the repairs to the fractured fuselage were first thoroughly checked at the Materiel Laboratory in Ottawa for manufacturing defects. Two of these bolts were found defective.

A top-priority fix was procured to seal off the forward cargo door in the B model C130s. (The decision had been taken administratively several months before the accident occurred.)

Worthy of note is the vital importance of high altitude indoctrination (HAI). Aircrew must know how to recognize an oxygen system failure. They must also be intimately acquainted with their symptoms from anoxia or hypoxia. The crewman who fell unconscious was a concern to his crewmates at a time when their services were needed elsewhere.

In a letter, the Chief of the Defence Staff said "...I was most impressed with the professional skill, judgement and knowledge demonstrated by the captain of the aircraft, F/L JT Moore, and the four members of his crew. Their coolness and precise action when confronted with an emergency of gross proportions prevented loss of life and destruction of a valuable aircraft." That sums it up nicely – a fine display of good show airmenship in response to as rough a ride as anyone would want on "a routine ferry flight"!

Splines Again

This is what could happen – and did – to a T33 generator drive shaft spline if it remains unlubricated and uninspected. This part was uncovered by chance – just before it failed. Admittedly this one was an exception, but spline wear is a common, well-documented and researched phenomenon.

Do other splines go uninspected?

FLASH

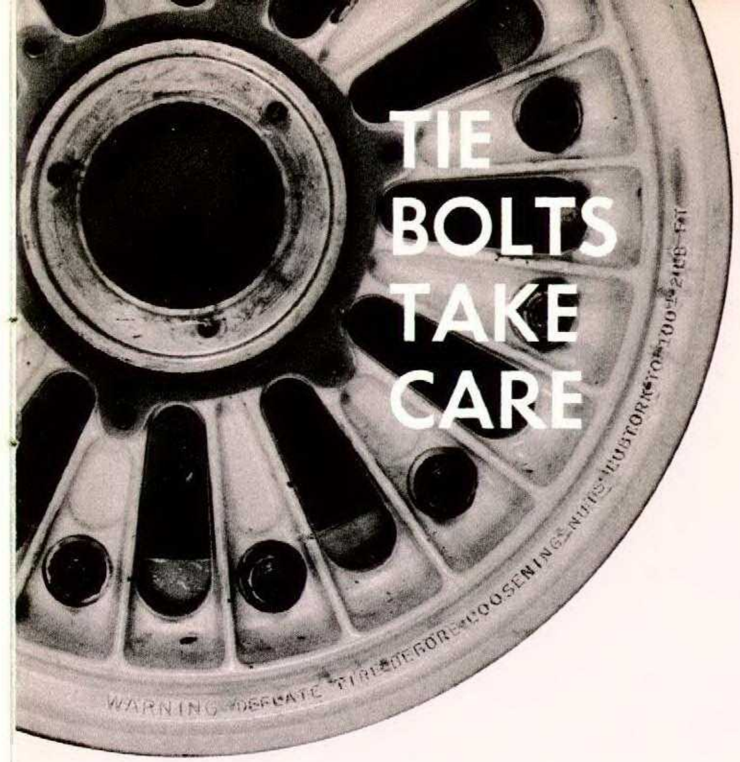
No ________

LETHAL LIGHTER!

THIS ONE'S A LULU!

It's a cigarette lighter employing a spontaneous combustion mechanism which enables the lighter to burst into flame the moment the cap is removed. Just slide off the top and *voila!* – flame. It may look like a harmless lipstick but its potential for causing destruction is enormous. In the hands of children at home, for example, the lighter can be a lethal toy with its nearly invisible flame – and in an aircraft the hazards are frightening.

This lighter, clever and handy though it may be, looks like a good item to leave on the store shelf.



TIE BOLTS TAKE CARE

Aircraft wheel tie bolts are a continuing problem. Complacency has been a contributing factor in the growth of this problem, resulting in safety and reliability being compromised by human error or neglect. The intent of this article is to create a greater interest in aircraft wheel fasteners, and to promote a better understanding of their use and the associated problems.

The armed forces utilize split-type wheels for most main landing gear, principally to facilitate assembly of tires and wheels. The heavy bead construction of aircraft tires precludes the use of solid wheels. The component halves of the split wheel are assembled on the tire, and are fastened together with bolts and locknuts. Hence, the term "tie bolts".

Wheel tie bolts are precision components, forged from high-strength alloy steel of exceptionally high quality. Special manufacturing techniques require threads to be rolled instead of machined, to retard fatigue, improve strength and dimensional accuracy. Head-to-shank fillet radius is closely controlled to resist fatigue. The net result is longer fatigue life at higher loads.

Why is such quality and strength required in a tie bolt? Wheel loads are high. An aircraft wheel and tire assembly, with the tire inflated, has often been described as a potential bomb! The 56 x 16 tire used on modern bombers contains 603,000 foot pounds of stored energy – sufficient to put a piece of tread the size of a golf ball into orbit! Add to this energy the weight of the aircraft and the radial and side loads sustained by the wheel under landing and taxiing conditions, and the need for high-quality, high-strength bolts is quite evident.

Several men have sustained critical or fatal injuries when they attempted to remove tie bolts from aircraft wheels before deflating the tires. In several cases, the wheel "exploded" while two, three, and even as many as four bolts still remained untouched. Many of these failures occurred in shops at a time when there was no external load on the wheel. There is no room for complacency with tie bolts!

Wheel halves must be clamped together with a force greater than any combination of forces that would otherwise separate them. The force that the bolts and nuts exert in holding the wheel-halves together is measured in terms of torque. (Read the applicable technical orders for these torque values.) This torque stretches (preloads) the bolt to the proper amount compatible with the design of the wheel, and is a critical factor is maintaining the strength of the joint and in determining the life of the wheel.

Fatigue failure is a prime consideration in wheel design, and fatigue is one of the chief causes of wheel and tie bolt failure. Therefore, maintenance men should be aware that they can do much to hasten fatigue or retard its progress. This will become evident as we discuss tie bolt problems.

A reasonable margin of safety is included in every wheel and tie bolt design. This margin of safety is not present if we deviate from specified assembly procedures, use unauthorized substitutions of component parts, employ substandard maintenance practices, or use poor quality fasteners.

Pre-load Variables

Since the critical relationship between the wheel joint and the tie bolts and locknuts is bolt pre-load, let's examine some of the variables that affect pre-load.

The most important factor affecting the torque versus pre-load relationship of a fastener is lubrication or absence of lubrication. Once a designer has decided upon the best pre-load for a particular wheel joint, he must specify this pre-load to the mechanic. He can do this only in terms of wrench torque. But how consistent is wrench torque in assuring a proper pre-load?

Most fastener manufacturers agree that approximately 90 per cent of the applied torque is used overcoming friction. However, friction will vary, depending upon surface roughness, plating, scale, lubrication, and other factors. Bolts installed to a specified torque without lubrication vary widely in pre-load values, often as great as two to one. This means that, of two bolts, installed side by side and tightened to the same wrench torque, one could have twice the pre-load of the other.

CORRECT

Dry-torque 70 ft-lbs	'Lubtork to 70 ft-lbs	'Dry-torque to 70 in-lbs	'Lubtork to 70 in-lbs
9900 lbs pre-load	20,600 lbs pre-load	830 lbs pre-load	1750 lbs pre-load

Lubrication can reduce the pre-load scatter to about 20 per cent of the dry condition, depending upon the lubricant and the process used. The recommended process for the services is "Lubtork" – the bolt tightening process using MIL-C-5544 (8030-21-801-8607) Anti-seize Compound, a 50-50 mixture of graphite and petrolatum, applied to every friction surface of a bolt assembly. This includes threads and all bearing surfaces of nut, washer, and bolt head. With this wide difference in pre-load between dry and lubricated, it is evident that torquing instructions cannot be compromised.

Incorrect Torquing

Normally, torquing instructions are permanently marked on the wheel. If not, they can be found in the applicable EO. Torquing instructions are given either in inch-pounds or foot-pounds (12 inch-pounds equal 1 foot-pound). Only one combination of torque value and condition will assure the proper pre-load for a particular installation. This is the one recommended by the designer, and is marked on the wheel and specified in the EO. Any other combination may result in dangerous understressing or overstressing, both of which can lead to failure. A word of caution: ***Follow instructions!*** Let's take an example: a particular wheel design requires the use of ½-20UNF-3A tie bolts dry torqued to 70 ***foot***-pounds. Note the wide variation in pre-load values resulting from these combinations.

Look Out For These

A saddle washer carelessly installed so that the sharp edge nicks the radius of the spot face, as in Fig 1, will cause fatigue cracks. These cracks are hidden by the washers until serious damage is evident.

A flat washer, countersunk to accept the bolt head-to-shank fillet, installed backwards as shown in Fig 2 cause fatigue cracks in the nicked radius of the bolt, and the bolt will fail as indicated.

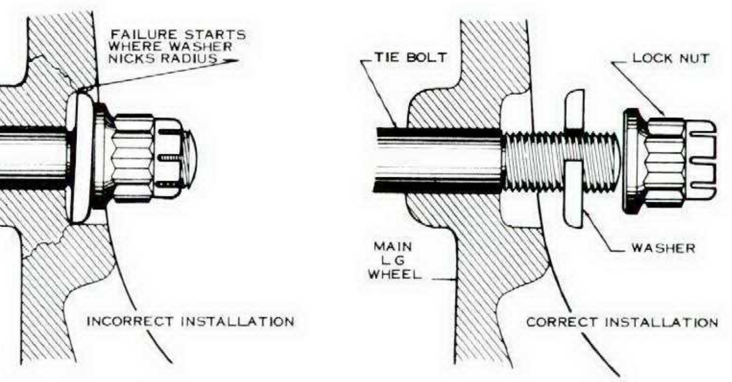
No method has yet been devised to "people-proof" precision fasteners. Here are some of the common installation errors that result from carelessness or indifference:

Mis-setting a torque adjustment.
Mis-reading the torque indicator.
Installing the wrong bolt and/or nut.
Adding an extra washer or leaving one out.
Improperly installing washers.
Failing to lubricate properly.
Lubricating when dry torque is specified, or torquing dry when Lubtork is specified.
Careless handling of tie bolts (battered threads affect wrench torque and bolt pre-load).

Treat wheel fasteners with care and respect, comply with the appropriate technical orders, and safety and reliability will not be compromised.

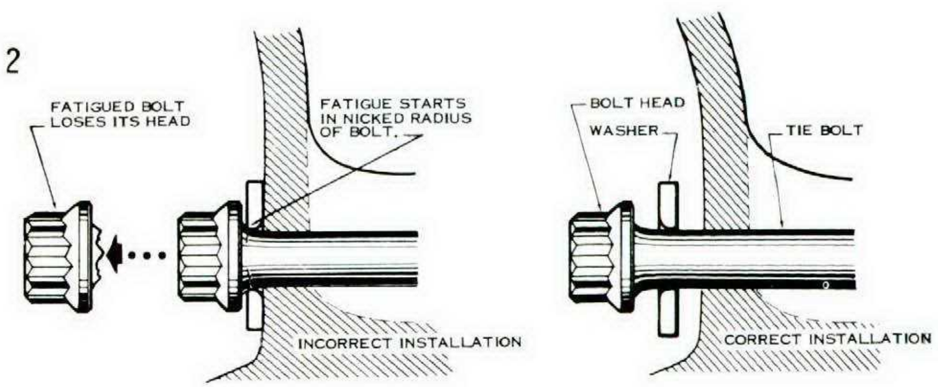
adapted from an article in
USAF Aerospace Maintenance Safety
by CJ Jewkes, OOAMA

FIG 1



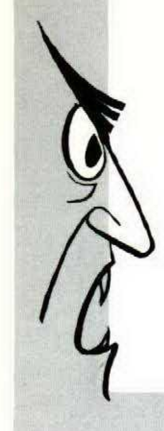
Carelessly installed saddle washers lead to fatigue cracks.

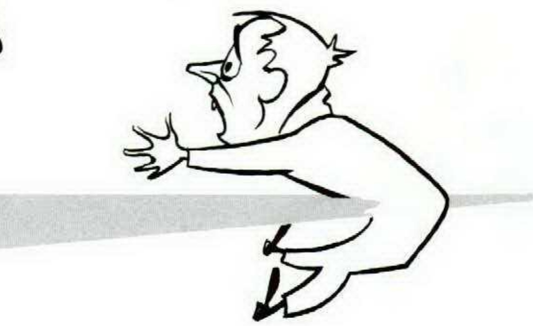
FIG 2



Reversed countersunk washers cause failure at radius of bolt.

The Forklift Has Its Points— But . . .





The old cliché "monotonous regularity" comes to mind whenever forklifts are discussed. This is what we mean; here's a nine-year summary:

FORKLIFT
- ***brakes wet*** **1**
- ***brake pedal slippery*** **1**
- ***brakes inadequate*** **1**
- ***safety stop on rails out of position*** **1**

TRANS TECH
- ***incomplete check*** **1**

DRIVER
- ***misused controls or misjudged effect*** **3**
- ***misjudged boom height, etc,***
  - ***while going forward*** **13**
  - ***while backing up*** **11**
  - ***indeterminate*** **5**
- ***misjudged fork position*** **11**
- ***unsatisfactory pallet, load, etc*** **2**
- ***human factors (driver sneezed)*** **1**

And the results? Aircraft were damaged in just about every place:

- ***fuselage skin*** **11**
- ***aileron*** **8**
- ***wingtip*** **5**
- ***tail surface*** **5**
- ***cargo door*** **5**
- ***door frame*** **4**
- ***tail boom (C119)*** **4**
- ***wing*** **3**
- ***propeller*** **2**
- ***other*** **4**

This brings the total to 51 forklift/aircraft impacts. Last year was a bumper year: seven, against the annual average of 5.6 impacts.

The dollar cost of this damage is difficult to estimate, but one authority has not found this difficulty insurmountable – he says:

direct damage – $200,000
indirect loss – $400,000

Think about that as you put yourself in the driver's seat today.

Interrupted Maintenance

BEWARE!

I'd like to express my concern for the hazard that exists in interrupted maintenance. To put my point across let me describe an incident that happened years ago that I'm happy to say had a pleasant ending. The ending, we all felt, was due to the exceptional skill of the aircraft captain, the fact that we had a really reliable aircraft – a C47 – and a lot of luck.

Our fleet of Gooney Birds were being treated to a new set of hydraulic windshield wipers in lieu of the older cable-driven type. This kite was at the front of the barn and the AF techs were detailed to carry out this mod. The boys hadn't got very far when one of the NCOs came in and said to leave the mod and tidy up as the aircraft was required for a flight to Ottawa. The writer was detailed to go along as crewman.

The Dak was towed out, the normal pre-flight carried out and the 1830s were cranked up. We proceeded to the end of the live runway, did the pre-takeoff checks – everything looked okay so the captain pulled in position and poured on the coal. At about 50 feet off the deck there appeared to be undue activity in the cockpit, so I hustled up there to see if I could assist. I soon realized what the trouble was; the flare had broken off the hydraulic line on the left-hand windshield wiper and was spewing fluid all over the pilot, co-pilot, windshield, and the cockpit area.

By holding the end of the line we found we could get approximately 150 PSI – enough to make sure the landing gear was down and locked but no more. About this time I noticed the main hydraulic gauge; like the old saying goes "There was nothing on the clock but the maker's name". Not being of any further service I thought the best place for me was in my seat with the belt done up tight.

Well, we made one pass and overshot to take advantage of a longer runway. The captain got her lined up and touched down, right on the button for a brakeless, flapless landing. Those landing lights sure whizzed by and that 8000 ft seemed like 800 ft. We were just about out of runway and there was a construction ditch ahead – I hoped the pilot had something *else* in mind. Luckily that morning there had been a heavy dew; the grass was green and fresh or the pilot might not have been able to do what he did. He applied full right rudder and opened the port engine up to almost full power. Naturally the aircraft went into a tight right turn. The wet grass allowed the Dak to skid; after one full turn we came to a stop. The aircraft was undamaged.

The pilot and co-pilot were drenched from head to foot with hydraulic fluid.

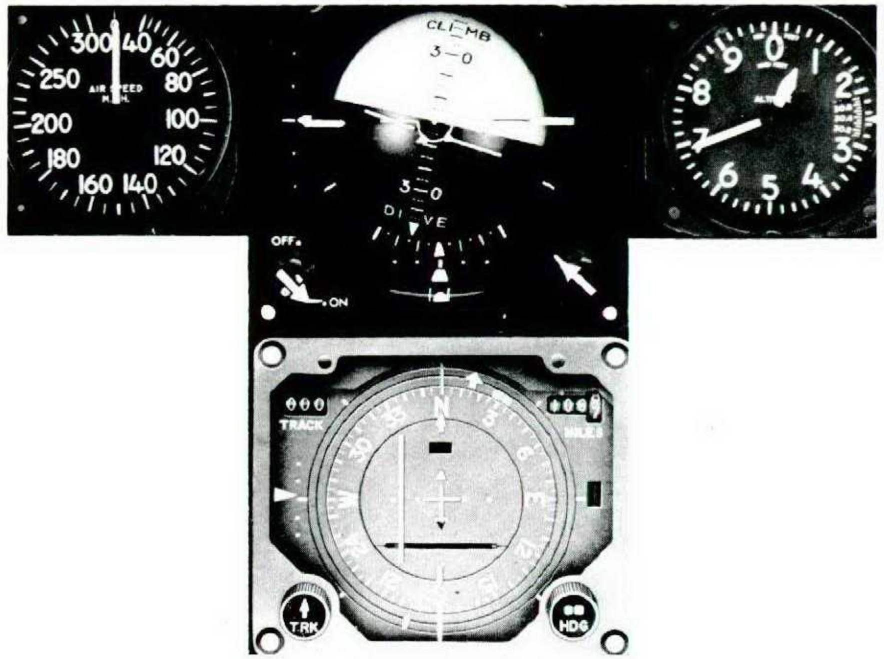
I remember the squadron leader heaving a sigh of relief and saying "Well, the boys got well oiled this morning"; even those who weren't, were plenty happy however!

What a way to learn about the value of uninterrupted maintenance – but the lesson stuck!

Sgt RC Hollington
CFB Chatham

The T Display

F/L AF McDonald



After World War II, the performance of many aircraft quickly outdistanced the capabilities of their cockpit instruments. In some instances the instrument panel actually limited the full exploitation of an aircraft's capability. Throughout this period, all agreed on what was *wrong* with the instruments and panel, but proposed solutions conflicted; ideas too often reflected narrow specialist experience and interest. To compound the problem, with each new weapon system contractors would propose another panel uniquely suited to the system's *prime* role. It became evident that without central direction the piecemeal acquisition of instruments and systems would create an unnecessary burden of complex logistics, increased training requirements, and severe limitations on pilot cross-utilization.

Until recently, instrument display and development efforts have been applied instrument by instrument and requirements were reviewed for a particular mode of flight. The result – a confusing clutter of instrument panels with single-purpose instruments.

In the mid-fifties the T33's artificial horizon and vertical speed indicators were right of centre; the needle-ball, compass, airspeed and altimeter were as far left as the engineers could get them. Plunked very conspicuously in the centre was the clock and the "G" meter, resulting in a wide scan for the pilot. A typical victim of the confusion was the Sabre pipeline pilot, who on his first flight, had not only the novel experience of having an aircraft take *him* for a ride, but he was confronted with a completely different instrument layout. Our new all-weather fighter, the CF100, came in for a share of the criticism. A visiting evaluation team from another country described the instrument panel in these words:

It looked as if the instruments had been dropped out of a bag from twenty feet above the cockpit and were placed in the sequence in which they arrived.

Not a few of us have said "amen" to that over the years.

Much has been written on the deficiencies of flight instruments; we will not re-hash them here. But the mounting rumblings from the field made it obvious that a standard layout for the pilot's instrument panel based on a whole-panel concept would have to be developed. A "T" display of integrated instruments was designed to shorten the scan and to satisfy human engineering requirements such as clarity, ease of interpolation and logicality. The aim was a fully integrated panel not only in having the information readily interpretable by the pilot, but that the control action required by the pilot be a natural instinctive result. Once this general display philosophy had been established the most readily interpretable instruments could be devised.

Attitude Indicator

The attitude indicator provides the basis for all control manoeuvers and thus was given precedence. The moving-horizon/fixed-aircraft was considered the best; this type of display has always been used in Canadian military aircraft. Universal acceptance of this display can be traced to the fact that a pilot considers himself as part of the aircraft; this display gives him that sense of orientation. Further, it assures the least effort in the transition from instrument to visual conditions (or vice versa) as the instrument horizon is always aligned with the earth's horizon. To cut down on crosscheck scan, the bank scale has been placed at the bottom of the instrument – closest to the horizontal situation indicator (HSI). These two instruments make up the vertical part of the "T".

Horizontal Situation Indicator

The HSI, like the attitude indicator, was designed to orientate its display to the pilot rather than to some external reference. For example, a pilot relates his position to the nose of the aircraft when carrying out an intercept or rendezvous. When on a visual approach to a runway the pilot is conscious of direction and direction changes with respect to *himself* rather than to changes in abstract azimuth values.

With a frame of reference established, the design of the HSI could proceed. A fixed aircraft (plan view) pointing forward was placed in the centre of the indicator to represent the pilot's aircraft. A moveable bar was added to represent the desired flight path. The displacement of this bar to one side or the other of the fixed aircraft symbol presents pictorially the relationship of the aircraft to the desired track. This presentation was then related to the earth by a standard compass rose, the aircraft heading always appearing at the top of the instrument. Other features have been added, such as a command index and a distance read-out, providing the pilot with a readily interpretable display. Making track interceptions with this instrument is as simple as a visual approach to a runway (see Flight Comment article on the HSI – Jan-Feb 66).

Airspeed Indicator

In the "T" plan the airspeed indicator was located to the left of the attitude indicator. To shorten scan during instrument approaches, approach airspeed range will be nearest the attitude indicator.

Altimeter

The altimeter was located to the right of the attitude indicator. Thus, this instrument in combination with the previous three, completes the "T".

Vertical Speed Indicator

To complete the integrated panel the vertical speed indicator is located directly below the altimeter. To shorten scan, the most used part of its scale (the zero index) has been placed closest to the vertical part of the "T".

Unfortunately, airframe hardware behind the instrument panel may cause some deviation from the ideal. The new T33 instrumentation, for instance, cannot accept the "T" display because the canopy ejection sleeve did not allow sufficient clearance for central positioning of the HSI. T-bird pilots can be assured that the best possible presentation was decided upon after months of experimentation.

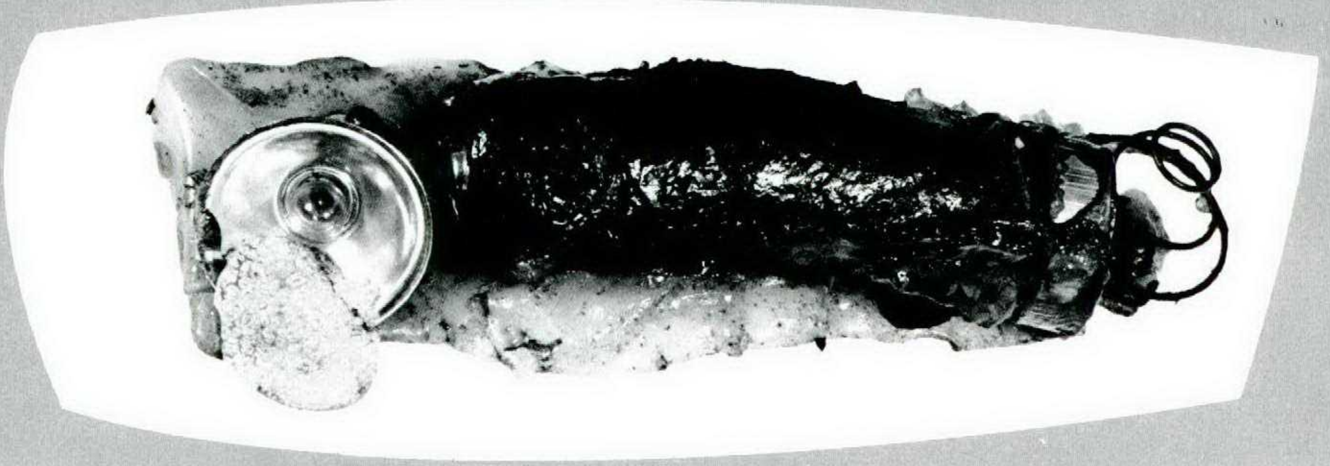
Extensive flight trials have proven the soundness of the integrated display philosophy. We think it's the best way to meet the diversified mission requirements of our future high performance aircraft. Furthermore, it is evident that the "T" concept has resulted in a welcome major simplification from the random placement of instruments of yesteryear.

Flashlight, Anyone?

No, it isn't a new species of lamprey and it isn't a fishing lure; it's what is left of a flashlight after being heated for about 150 hours in an Argus wing heater duct (adjacent to the port side of number 2 engine.) Fortunately, no damage or hazard was caused by this limp lump of light.

He's a rare bird who will lose a flashlight and not know it; it's hard to imagine anyone irresponsibly assuming a flashlight to be merely "lost" after having worked on an aircraft.

Someone's lack of integrity could have caused an accident had this flashlight been placed more strategically. In any case, someone whether a civilian or serviceman should be keeping a better tool count.



RCAF UICP

On the Dials

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

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

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

UICPs and others have often suggested that the material covered in the UICP course be given wider distribution. The sequence here – ie, a question is asked, the various answers are discussed, and the correct solution is presented – is the same as is generally used on the UICP course.

The destination is presently below VFR and forecast to remain so, but both report and forecast are adequate for Special VFR. May you depart on a VFR flight plan requesting Special VFR into the destination?

No, you may not do this. CFP 100, 10.03 and 11.03 state that flights conducted in weather below VFR will be flown IFR. Furthermore, it's not good airmanship as Special VFR can be granted only when there is no IFR traffic arriving or departing. If the weather is such that IFR rules require alternates, flying into this weather without an alternate is not a good idea. Also, an indefinite delay might be encountered because of weather or traffic; if only VFR requirements have been met, this leaves you no choice but to declare an emergency and then do a lot of explaining later.

You propose an IFR trip over designated mountainous terrain southbound (180°M) on an amber airway. The highest obstacle within the airway is 12,400 feet. Normally, what would be the minimum flight plan altitude?

Normal minimum flight plan altitude would be 14,000. Although 2000 feet above obstacles is required off airways in mountainous terrain, only 1000 feet clearance is used on airways. A word to the wise on this: high surface pressures, and temperatures below standard cause altimeters to overread – the true altitude being less than indicated altitude. Errors of 1000 feet are not uncommon, so watch out if you are planning on flying at MEA over the Rocks.

You are making an IFR flight in a turbine-powered aircraft from A to B. To meet minimum fuel requirements the cruising altitude must be FL200 or above. You receive and acknowledge this clearance: cleared to the B airport, flight planned route, maintain 5000. After takeoff you enter the overcast and experience communications failure. What is the correct procedure to follow?

The correct procedure to follow is already behind you. Don't accept a clearance like this. Even in a turbine aircraft if the clearance limit is the destination and comm failure occurs the trip must be flown at the last assigned altitude or the MEA, whichever is the higher. If ATC cannot assign an altitude which meets the fuel requirements in the initial clearance, then a clearance limit short of destination should be given. Reference for this is CFP 100 11.09, or GPH 205 special notices.

You are flying a VOR-equipped aircraft. Prior to takeoff at an airport having VOR receiver test transmitter (VOT), how would you check your VOR equipment?

Tune in the VOT. The VOT transmits the signal for the 360 radial and the aircraft equipment should indicate that the aircraft is on the 360 radial regardless of its position in relation to the station. The bearing pointer, TO-FROM, and track deviation indicator can all be checked to ensure they indicate the 360 radial. Frequency and availability of VOT is shown in the station listings of GPH 205. A more detailed explanation can be found in CFP 148. By the way, CFP 148 is the Manual of Instrument Flight Procedures, if you don't have one give Supply a call; they are now available – one for each pilot.

Gen from Two-Ten

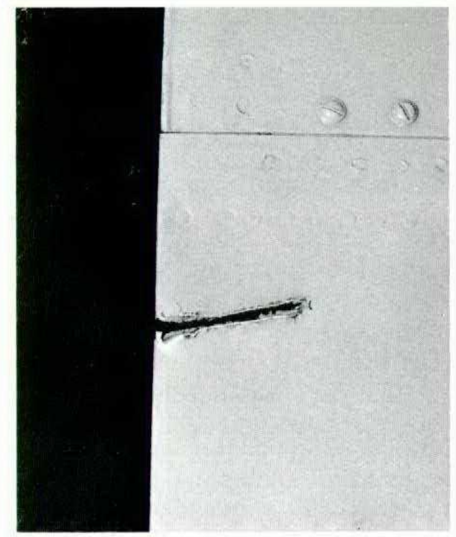
ALBATROSS, FATAL DECISION The aircraft departed home base for a flight deep into the Rocky Mountains, on a training mission which was to have been VFR. The aircraft was last seen flying very low up a valley and into deteriorating weather.

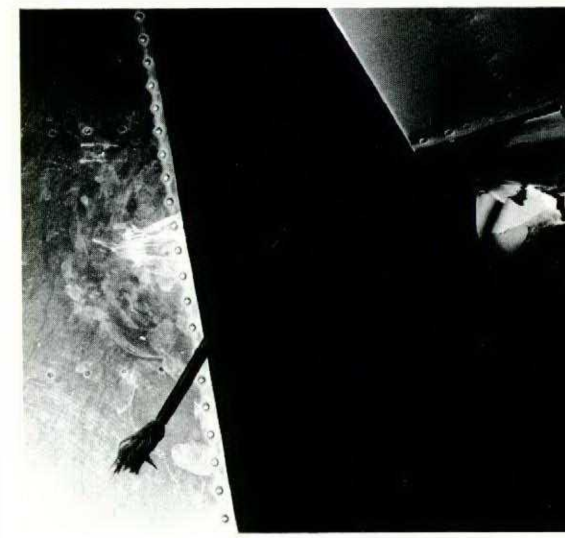
Lowering ceilings had forced the plane closer to the ground until finally the pilot elected to climb through cloud. It was his intention to climb away in cloud along the valley course, but the aircraft struck the steep rocky wall of the Hope landslide. Only one of the six on board survived.

We sincerely regret having to relate the sad circumstances of this flight, but the lesson it conveys should not go unnoticed – don't push your luck in deteriorating weather.

T33, HANGAR COLLISION The T33 was being manually pushed backwards into a hangar, (described by one of the interested parties as "far too crowded"), when it came in contact with the elevator of a Tracker.

Could these have been the same persons involved in a similar ground accident in which a T-bird and Tracker collided in the same hangar four days before?





CH112, MYSTERIOUS BANG Returning from a training mission this pilot (with few hours on type) experienced a "zing-twang" sound accompanied with a violent yaw to the right. Assuming a tail rotor failure, he elected to autorotate. He misjudged, approached short of his intended landing spot, and in the ensuing panic accomplished what an investigator described as a "fairly gentle crash".

Nothing could be found to account for the curious behaviour of the aircraft in the air. By hastily assuming this sudden yaw as possibly the loss of the tail rotor, the pilot set up the conditions for damaging one helicopter.

T33, LANDED SHORT Returning from a normal training flight with about 200 gallons on board, the captain in the front seat handed over control for a practice forced landing. By low key position they were 500 feet too high; to aggravate this error in positioning the copilot under instruction started the final turn too soon. Despite diving off some excess altitude they were still slightly high with high airspeed on final.

The captain states "...the approach looked normal at approximately 1500 to 1000 feet to the button, with 135 kts". At this point the flaps were lowered to 30°, (speed brakes were already out). "My next sensation was a very rapid sinking feeling and we were still about 500 feet short".

By this time power had been advanced – but too late. The aircraft touched short collapsing the nosewheel and came to rest on the runway.

This crash followed a bad blizzard in which the undershoot area had been covered with deep snow making visual reference to the ground difficult. Nevertheless, the "very rapid sinking feeling" suggests that both pilots permitted the manoeuver to continue beyond control.

CHIPMUNK, LOW FLYING In what was purported to be a demonstration ride in the low flying area the instructor chose to fly up a river valley, and in the process struck a power line sagging across the river. Despite the pilot's contention that he maintained the required 50 foot clearance above all obstacles the nature of the tree-lined valley exposed himself and his student to unnecessary danger from just such a strike.

At this stage of the training there was little or no justification for demonstrating this kind of operational low flying. Quite literally, the pilot was in a blind spot in the Chipmunk which obscures vision from the back seat.

The comments made later included these, "It is indeed most fortunate that a fatal accident did not occur". That about sums up the story.

CF101, WRITE-OFF FROM BLOWN TIRE It was an "uneventful" trip until the tires touched on landing. At that moment, about 1500 feet from the button, there was a loud bang and the aircraft started to shake badly. On the landing run the aircraft ran gradually to the starboard out of control. After about 1800 feet of ground roll the Voodoo left the hard surface and slammed into compacted snow ridged at 30 feet from the edge of the runway, breaking off the nosewheel. The left main gear then collapsed and the port wing dropped to the ground. The aircraft came to rest after a complete roll, tearing off the port wing. The general disintegration was followed by a fierce fire.

The pilot escaped through an opening in the broken canopy above his seat and noticed the navigator was still struggling in an attempt to smash the canopy with the breaker tool. The pilot shouted to blow the canopy. This he did, and as the aircraft was now burning very fiercely the navigator evacuated his cockpit with understandable rapidity.

Both crew members suffered minor bruises; the pilot was burned about the face and neck, undoubtedly caused by the initial flash of fire and from having lost the protection of his helmet and canopy during the final barrel roll.

The tire marks of both wheels were considerably more pronounced and two and a half times longer than those which occur during a normal landing. The port tire track exhibited two separate and distinctly heavy skid marks commencing at the point of touchdown. The starboard tire left a heavy black streak continuously for about half the distance of the port tire; at this point the tires blew.

Investigation failed to reveal the cause of the locking of the wheels on landing. A practice – now discontinued and supported by an AOI amendment – warns against pilots "testing" brakes in the air prior to landing which might have led to the locking of the wheels.

Retire one Voodoo.

ARGUS, SNOW BENDS PROP Twenty-three hours on duty in the previous forty-eight left the Argus crew in no mood to accept a diversion from homebase to a nearby airfield. To compound the situation the pilot was faced with a taxi and ramp area incompletely cleared of snow. Accepting the advice of the tower to taxi via an alternate route to avoid possibly striking a hangar with a wingtip, the captain pressed on until heavy wet snow piled in front of the bogies bringing the aircraft to a halt. Reverse pitch did not free the aircraft, even when the snow was shovelled away from the wheels.

Bringing full power into play the pilot was able to move the aircraft in reverse thrust, but in doing so, dug the propellers of 2 and 3 engines into the snow, bending the blades.

That this very experienced Argus pilot risked damaging his aircraft indicates that his impatience and frustration overruled his good judgement, there being little reason to continue attempts to move the aircraft rather than have it towed in – after the ramp area had been cleared of snow.

Comments to the editor

Dear Sir:

The section entitled "Comments" in the Mar-Apr Flight Comment includes an article on the "fighter pitch". In my opinion, this article contains erroneous premises and an illogical, implied conclusion.

In the first paragraph, the phrase "but in its day the overhead break made sense", implies that the overhead break no longer makes sense. This assertion is made before the arguments are presented, which in any case, do not prove the point. References to the fighter pitch "heyday" occurring in Air Division in the fifties, and "a fling at low-level formation sorties", surely have no basis in fact and are just propagandistic jargon. Fighters were using the flat break in World War II, and the Sabre pilots in Air Div in the fifties were merely employing what they had been taught at AFS and gunnery school.

In normal daily operations in Air Div, Sabres in formation broke flat from echelon; arrowhead breaks were used occasionally for special displays, and on these occasions, a thorough briefing and some practice were necessary because this manoeuver does have a higher accident potential.

The rapid recovery of large numbers of aircraft is not the only attractive feature of the flat break. There is the matter of the difference between cruising or circuit speed and the wheels/flaps and final approach speeds of jet aircraft as compared to these speed differences in prop aircraft. The flat break is a better method of killing off speed and arriving at touchdown compared to the time and fuel consuming square pattern. Further considerations are the circuit traffic density and type mix. For example, I would much rather fly a flat break pattern at a busy FTS or AFS where normal circuit traffic, practice GCAs, practice forced landings, practice flapless approaches, etc, are all aiming for the same patch of ground. Further, in a mixed-type circuit, it is better to have two patterns – flat break and square, than to have everyone going around a racetrack at different speeds, even if the aircraft types are separated vertically. This may not seem so to the tower operator, or to the light or slow aircraft pilot with his usually restricted cockpit visibility, but from my view in a jet cockpit, the two-pattern circuit is safer and more efficient.

With reference to the last paragraph of the subject article, it is suggested that no phase of flight should be a "ho-hum" thing to any pilot. If an occasional misjudgement during a flat break presents a continuing hazard, then so do all takeoffs, landings, formation flying, IFR let-downs, etc. A student pilot can be taught to fly a proper, safe flat break pattern, and those, inexperienced or otherwise, who "pitch on the horn" are likely to display a similar attitude in other phases of flight – this is a case for the commander, and does not call for the Air Force wide abolition of a useful manoeuver as a flight safety measure.

There may be cases where the operators of certain types of aircraft, eg, CF101, may decide to alter their circuit pattern based on their experience with the aircraft, or on local traffic conditions, but in view of other types of flying – Tutor, T33 and CF5, for example, it is wrong to make a general assertion that the flat break is an anachronistic manoeuver. In my view, anyone who cannot fly a safe flat-break pattern in an aircraft of the T33 or CF5 type, singly or from a formation break, should not be flying the aircraft at all.

S/L RW Fentiman
CFHQ

Our intention was to have one of our sacrosanct procedures objectively reappraised, and where possible, to phase out a manoeuver we regard as "a continuing hazard". To abandon the overhead break in a specific area when no sensible replacement can be found is too literal a construction to place on our Comments. As to the Air Div reference – a glance through an old logbook nearby shows a session of Lo Battle entries – the account still stands.

Dear Sir:

F/L Mold in his argument for QFE as opposed to QNH has my full support.. a full description of the advantages of QFE would be too long for a letter, however, I will make two points which illustrate the best features of QFE.

Firstly, the QFI using QFE finds that his student knows that all heights referred to in the circuit will be shown on his altimeter. No additions are necessary for airfield height.

Secondly, GCA runs are made safer. Pilots know that their heights AGL (on a 3° glide path) should be 300 feet at 1 mile, 600 at 2 miles, 1800 at 6 miles, etc. Pilots also know that their altimeter will read these heights. This is a safety feature which is difficult to ignore.

Your arguments in favour of QNH are convincing but they can all be answered. QFE has its limitations but so does QNH. Once the limitations are recognized and accepted QFE is a very simple system.

F/L RC Chambers
RAF Khormaksar

Simple indeed, but..!

Dear Sir:

Your article in the May-Jun issue of Flight Comment entitled "T33 TOE Switch" stirred a few memories and aroused my curiosity.

First, on the memories, the statement in the article, "Had the upper pump shaft broken, ie, the pump with the isolating valve, selecting TOE switch would have placed the lower pump at full stroke," did not sound correct. On checking documents I found I was right, and in fact, in the previous paragraph of your article you state, "With TOE on...Bear in mind that the lower pump is subject to normal control by the BPC and ACU."

Second, on the matter of my curiosity being aroused, just why did the engine flame out? Certainly the pump failure by itself should not cause flameout unless it was accompanied by another failure. Extending this slightly, if the pump shaft failure occurred before the TOE switch was turned off, the rpm would have dropped (and the pilot would have been warned), and when the TOE switch was selected off, no change would take place. If the pump failure occurred after the TOE switch was turned off, that is, when both pumps are sharing the load, some drop in rpm would have occurred until the upper pump picked up the load. A flameout should not occur under these conditions any more than it would occur due to rapid throttle closing. What was the cause of the flameout?

W/C A.J. Campbell
Portage La Prairie

To understand the T33 fuel system, one must know that the fuel pumps will assume minimum stroke unless servo pressure is applied to increase the stroke, eg, pump output increases with increasing servo pressure. Experience over the years has demonstrated that a pump failure with TOE switch off will cause a flameout. If a pump fails, servo pressure bleeds off through the failed pump, *through the orifice which supplies servo pressure to the pumps. This loss of servo pressure results in a sudden return to minimum stroke on the remaining pump – insufficient fuel to sustain combustion while airborne.*

On the other hand, if an upper pump failed while it was isolated (TOE switch on), the other pump would be servoed to an increased output according to its normal operation. This is because no loss of servo pressure would occur; it can't escape through the failed pump, now isolated by the TOE function.

On takeoff with TOE switch on, if either pump fails the remaining serviceable pump will be servoed to full stroke, providing roughly 88° rpm in full throttle – an unmistakable loss of thrust. Providing the pilot understands what has occurred, he simply lands as soon as possible leaving the TOE switch on.

Pilots should bear in mind that the TOE function can conceal other fuel system malfunctions. The TOE switch should not be selected off after takeoff until sufficient altitude and airspeed have been achieved for coping with a fuel problem.

To return to your first point – you are right. However, within the context of the first sentence in the paragraph, the pilot would have been at low altitude with at least climb power. In this configuration he would have his lower pump at full stroke. We should have extended our remark to read, "Had the upper pump shaft broken, ie, the pump with the isolating valve, selecting TOE switch would have placed the lower pump at full stroke capability."

Dear Sir:

In your Mar-Apr issue under "Gen from Two-Ten" you comment on an inadvertent canopy ejection in a Navy T33.

Unless their "birds" are different from the Air Force's, it would seem that the unfortunate officer "pushed" the T-handle, not "pulled" as you say. The EO states: "Pushing forward the jettison handle will jettison the canopy..."

Unless you know something I don't, will you please correct the wrong impression created by your article.

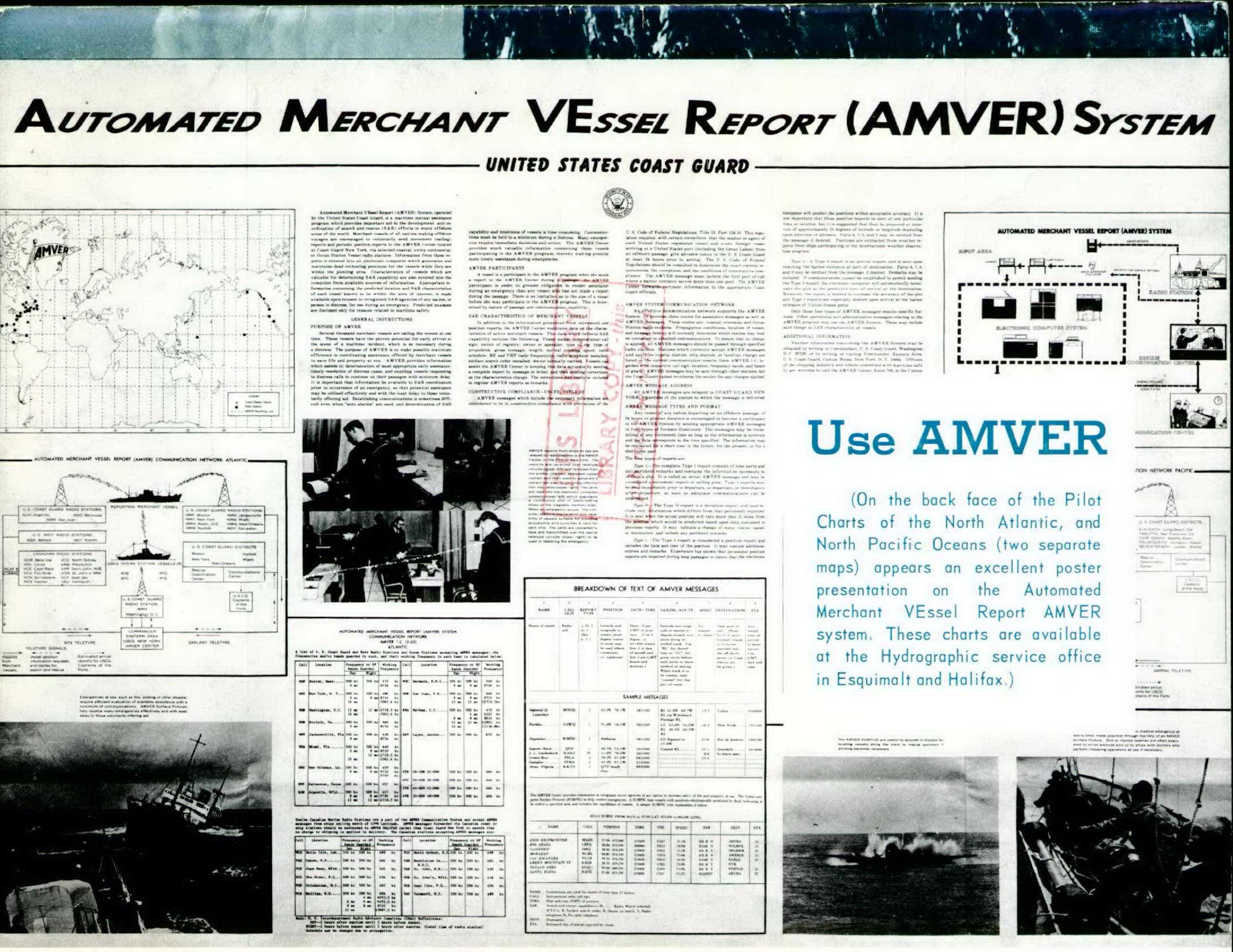
F/L Fritsch
CFB Winnipeg

Have you tried pushing *anything with a rubber oxygen hose?*

FEARLESS EARLESS FINCH

The unflinching finch depicted here is a bird watcher's delight. Regard the characteristic sleepwalker's strut, the vacant undisturbed visage, the breathless disdain for those whirling blades—here's a bird in a real aural null. Favourite habitat: proceeding to or from noisy areas. Danger approaches, onlookers shout, but Fearless turns a deaf ear to their calls and whistles idly in his silent world:

THERE'SNOTHINGAROUND   I DON'THEARASOUND



Use AMVER

(On the back face of the Pilot Charts of the North Atlantic, and North Pacific Oceans (two separate maps) appears an excellent poster presentation on the Automated Merchant VEssel Report AMVER system. These charts are available at the Hydrographic service office in Esquimalt and Halifax.)