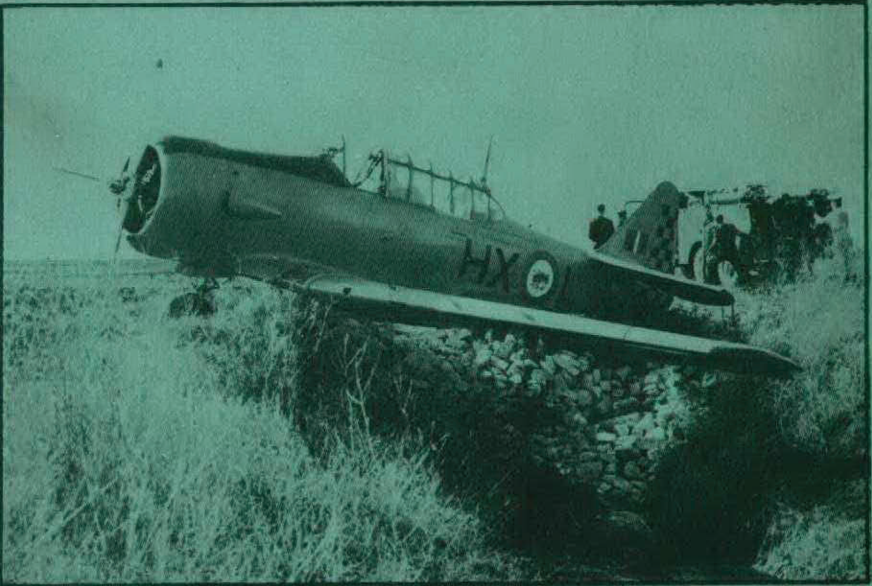
RESTRICTED

CRASH COMMENT

DFS

FOURTH QUARTER, 1953



ISSUED BY
DIRECTORATE OF FLIGHT SAFETY
R. C. A. F. HEADQUARTERS, OTTAWA, ONT.

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EDMOND CLOUTIER, C.M.G., O.A., D.S.P.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA, 1954

GOOD SHOW

30622 F/L J.R. Romanow

F/L Romanow, pilot, and F/L W. Kereliuk, navigator, were flying a Mk II Harvard on a navigation exercise when fuel pressure dropped to less than 1/2 psi.

The pilot switched from starboard to port tank and operated the wobble pump to maintain pressure. Contents gauges showed ample fuel but consumption was excessive, so he checked with his navigator as to the nearest airport and warned him to be ready to abandon the aircraft on signal if fuel ran out. Because of the latter possibility he called for and received permission to make a direct approach. While the aircraft was landing, F/L Romanow observed flames in the forward end of the front cockpit. He cut switches and braked to a stop as quickly as possible.

As the two officers abandoned the aircraft and retreated to a safe distance, flames enveloped the cockpit and appeared also from behind the engine cowlings. When the fire suddenly subsided they returned to the Harvard.

F/L Romanow pulled the extinguisher release in the front cockpit and F/L Kereliuk grabbed the hand extinguisher from the rear cockpit and ejected its contents into the engine. The fire was doused immediately. Later investigation revealed that a broken copper line between the fuel pump and the pressure gauge was responsible for the loss of fuel and pressure. Fire subsequently broke out when gasoline sprayed onto hot engine components.

Congratulations to these two officers for prompt action which undoubtedly saved an aircraft.

GOOD SHOW

S/L Schultz was authorized to fly a CF100 on instrument practice and, as look-out, carried 44884 LAC V.L. Gilsinger in the rear cockpit. As part of his "pre-flight", the pilot checked all controls for freedom of movement.

19834 S/L R.D. Schultz, DFC

At the point of take-off the pilot felt the control column jam in the nose high take-off position. S/L Schultz asked his passenger to ensure that the rear control column was not fouled by anything visible in the cockpit and was to'd that it was free

Speed built up quickly and power had to be reduced to keep the aircraft from climbing and the pilot discovered that he could maintain some control using power settings. He instructed the passenger to help maintain forward pressure on the control columns and a successful landing was completed.

Technical investigation revealed the presence of a Hydraulic Line Blanking Plug, foreign to the area, jammed between the primary floor of the aircraft and the rear control column rocker arm.

Our congratulations to S/L Schultz for his handling of a very difficult situation.

GOOD SHOW

During an air-to-flag cine gun exercise F/O Crowther suddenly discovered that his trim had failed in the rearward position, which setting he had selected as an aid to clearing the target on break away. By the use of heavy forward pressure he regained control of his Sabre and tried alternate elevator trim but found it unserviceable also. He informed the formation leader of the trouble, reduced speed, returned to base and accomplished a successful direct approach and landing. A loose screw, foreign to the area, was found in the sealed elevator trim actuator box and this screw had caused the short circuit which resulted in trim failure. In the words of his OC, "The pilot is considered to have shown good airmanship and sense of judgement in his actions, and has been complimented accordingly."

202950 F/O R.R. Crowther

CRASH RESCUE

AN OPEN LETTER TO STATION COMMANDERS

True to democratic concepts, the service has always held that the man is more important than the machine. To this end, every effort is made to provide an aircrew member with the means of saving his life in the event of an emergency.

He is provided with an ejection seat, parachute, survival equipment and escape hatches and is constantly drilled in their use. Where new flying hazards have arisen, new life-saving devices have been developed as compensation.

Obviously, use of much of this equipment is based on the premise that the pilot will abandon his aircraft at a safe altitude. When this is not feasible and he must crash land his aircraft, the pilot's chances for survival will be determined by the severity of the crash, his physical condition and outside assistance.

If he is unable to extricate himself from the wreckage but help is at hand, the odds of his coming through the accident alive and unscathed will vary directly with the effort that has been expended previously on training station personnel and educating neighboring civilians in correct and adequate crash rescue procedure.

Admitting the truth of this, you will also agree that, as a starting point for any such program, crash crews must be sufficiently acquainted with the aircraft on their units that, when a crash occurs, they know:

(1) the fastest methods of releasing and removing occupants through normal and emergency exits or by cutting away and removing wreckage;

(2) how to isolate possible fire hazards such as fuel, oil, hydraulic fluids and live electrical systems;

(3) what to do if the aircraft is armed with ammunition or bombs; and

(4) the best means of fighting fires, particularly when the equipment available is limited or makeshift.

If your crews have already received such crash training, then your unit is up-to-date and "on the bit" and can be justifiably proud of itself. However - as you will have observed already - what we have outlined here is merely a beginning. What about aircraft types that visit your station just occasionally or may divert there only in an emergency?

Frankly, if you cannot honestly state that your crash crews are fully trained to handle any type of crash at your unit, (within the limits of available equipment, of course) then you are not providing aircrew with the protection they deserve. You should organize a crash rescue training program at once.

To be really effective, your plans should include the civilian population in the area. Many accidents occur away from station territory so that civilians are often the first people on the scene. Unless they have been previously informed, they do not know how to provide effective assistance.

Time is valuable when an aircraft crashes. Three minutes may mean the difference between life and death for its crew. The findings and conclusions of boards of inquiry on fatal accidents demonstrate forcibly - and all too frequently - that the wasting of precious minutes through ineffective rescue techniques is a major factor. In a recent Mustang crash the death of the pilot might have been avoided if the civilians who rushed to the scene had had some knowledge of opening canopies and releasing harnesses.

Information bulletins providing civilians with the knowledge of how to effect rescue in such circumstances would pay ample dividends if only one life was saved. Arrange for the wide distribution of such bulletins among the civilians in your area, amplifying the information they contain through use of lectures and films whenever this is possible. Brief the RCMP, provincial and city police and firemen. By following plans similar to these we have suggested here you ought to succeed in winning outside co-operation on such a scale that every person in your area becomes, in effect, a crash crew member.

One word of warning! Canopy removers and ejection seat catapults can be lethal if actuated by someone who is unaware of their location or existence in the aircraft and of how they operate. However, no aircrew member's life should be jeopardized simply because there is a possibility that someone coming to his assistance might get hurt. There have been cases of civilians failing to go to the rescue of a pilot because they were possessed by fears engendered out of vague, alarming and inaccurate information. Intelligent, planned distribution of precise and simplified instructions to the civil populace would overcome this adverse situation and imbue would-be rescuers with confidence in their ability to perform a useful service at the site of a crash.

. . . .

This entire subject has received considerable attention in the United Kingdom and we are including here a brief outline of two methods of education presently being used in that country.

The first consists of a mobile unit - a team of experts and a mock-up fuselage complete with ejection seat, canopy and controls. The group visits cities, towns and villages, lecturing graphically to the police, fire services, home guard, St. John's Ambulance and related organizations.

The distinct advantage of this method is that it produces excellent public relations and publicity and provides accurate instruction to groups which have direct contact with a large body of the general public. The disadvantage is that it is expensive and time-consuming and can be used best only in limited areas of dense population.

A second method - adopted by the services Air Safety Committee, has already been put into general use in the U.K. A travelling lecture party, complete with films and handout material, is sent to units which operate aircraft with ejection seats and which are adjacent to heavily populated areas. The team, consisting of a minimum of five lecturers, not only instructs all crash rescue and fire personnel of all stations in the various areas, but qualifies these personnel in turn as instructors for civilian organizations in their respective areas. Since the only material used is a limited number of films, abetted by printed matter, and since the original courses last a mere five days at each central unit, this method is comparatively inexpensive although not as effective as the former either in training the public or in generating sound public relations.

The type of training to be given will depend on facilities and personnel available and on the peculiar requirements of each area. AFHQ is at present investigating opportunities to obtain material such as aircraft layout charts (showing canopy releases, emergency exits, etc.,) which would be of assistance to unit programs generally. These aids will be passed on as they become available.

Regardless of current limitations, courses should be initiated, for a great deal can be accomplished through plain ingenuity and the utilization of local resources. Later, as more material and equipment are produced, your station program can be expanded and improved. Meanwhile, however rudimentary your beginnings, you may save a life.

* * * * *

Research Problem

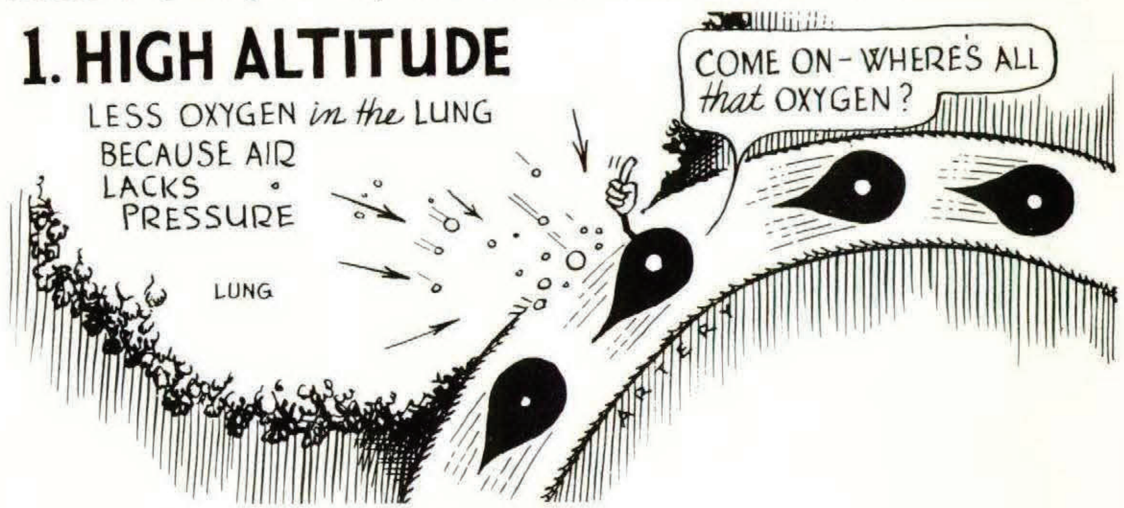
A scientist living at Staines
Is searching with infinite pains
For a new type of sound
Which he hopes, when it's found,
Will travel much faster than planes

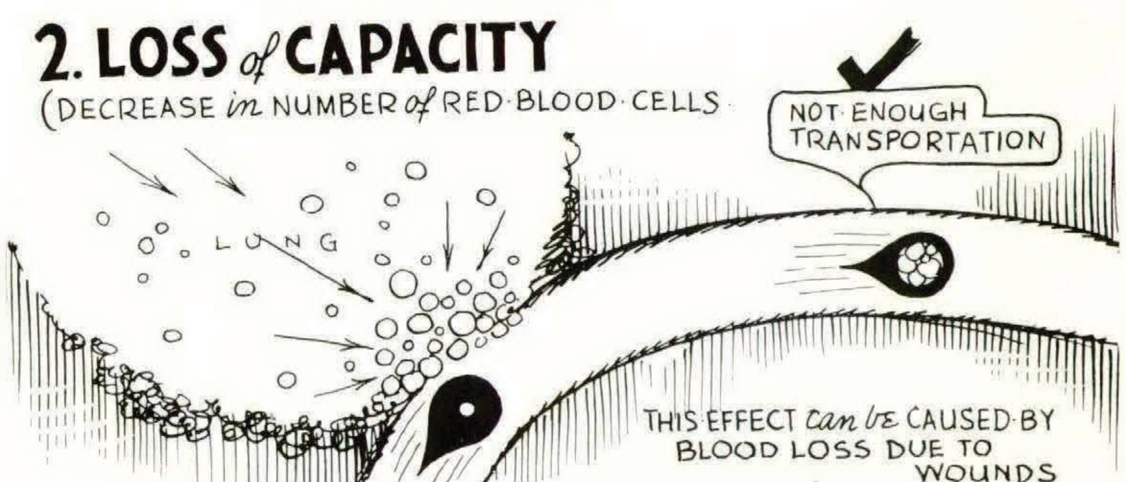
"PUNCH"

OXYGEN

This is the last of a series of articles on the subject of Oxygen introduced in our issue of Second Quarter 1953. Answers to some of the questions presented under the heading Physiological Aspects appeared in Third Quarter and are completed in this issue. It is proposed to continue the subject in future issues but from an equipment standpoint, again using pictorial illustrations where possible.

It will be remembered that two of the questions asked in the first article had reference to the effects of alcohol, sulpha drugs, and carbon monoxide. The accompanying sketches illustrate certain causes of oxygen lack from the standpoint of high altitude, loss of blood, and the deleterious effect of chemicals. Another phenomenon associated with high altitude, or reduced pressure, is that of the "Bends". This question, from Second Quarter, also is answered.





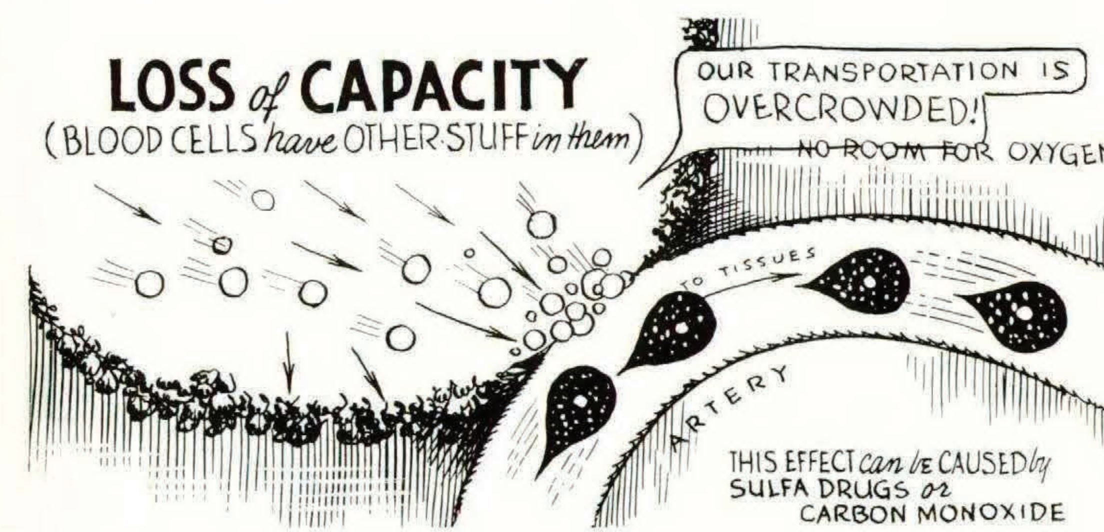
Being at altitude without adequate oxygen is the most important cause of oxygen lack, or anoxia. Altogether there are four types of oxygen lack which may affect a person.

1. High Altitude Lack, as you have learned, is the result of insufficient oxygen pressure in the lung.

2. Reduced Oxygen-Carrying Power of the Blood. No matter how much oxygen pressure you have in your lungs, it doesn't do you any good unless the oxygen can be carried by the blood to the tissues. Loss of carrying power of the blood can occur as follows:

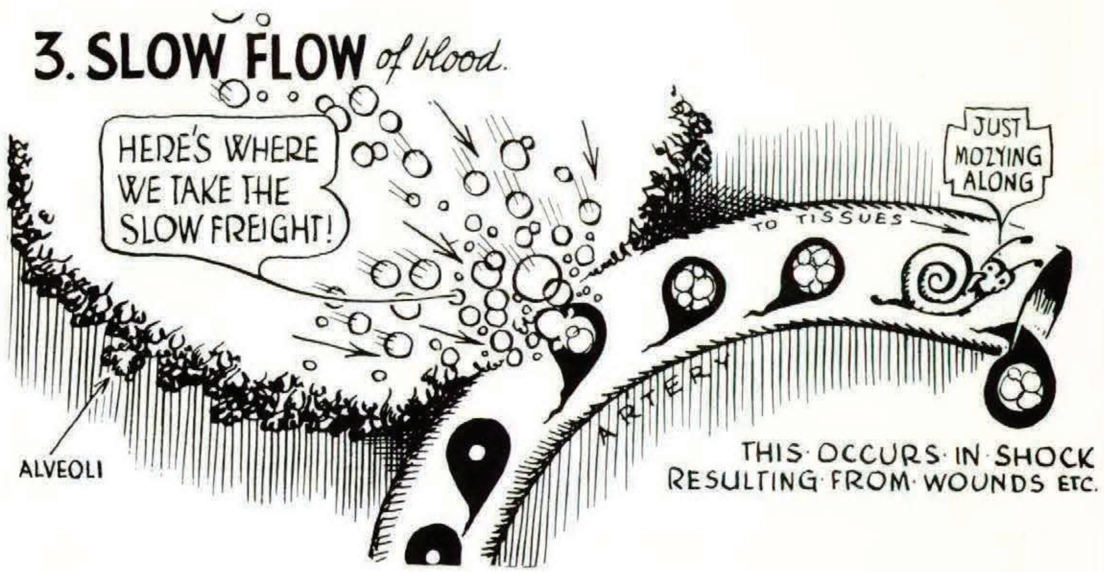
(a) There may be insufficient red blood cells to carry the required oxygen. This condition can be caused either by wounds or anaemia.

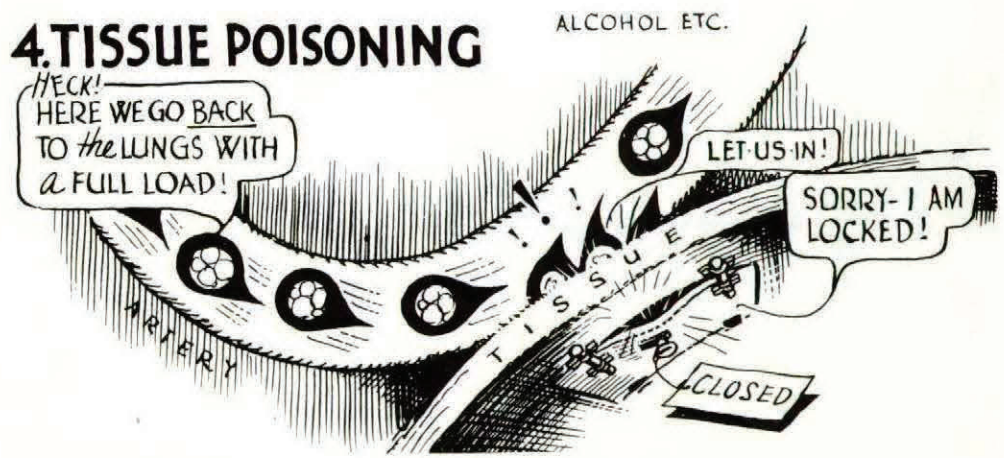
(b) Certain chemicals, like the carbon monoxide in exhaust gas, or the sulpha drugs you take for infections, can grab off the space in red blood cells that is ordinarily reserved for oxygen. Carbon monoxide is especially dangerous, because the red blood cells take it up 200 times more readily than they do oxygen, and, whereas oxygen will leave a red cell without too much fuss, carbon monoxide clings to the red cells stubbornly.



3. Slow Flow of Blood. Good supply involves not only the amount of material but also the speed with which the material is delivered. The tissues do not profit from oxygen in the blood unless the oxygen is brought in fast enough to supply tissue needs. The condition of shock resulting from wounds (injury or loss of blood or both) causes the blood pressure to drop and the blood flow to slow down. Oxygen isn't brought to the tissues fast enough. This, too, is oxygen lack. Shock calls for the continuous administration of oxygen, no matter what the altitude.

4. Tissue Poisoning. A well-filled, fast running supply train is useless if it can't be unloaded when it arrives at its destination. Chemicals like alcohol block up the tissues, so that the oxygen brought in by the blood is "locked out" and can't be unloaded.





BENDS AND THE BOTTLE OF POP

"The human body at altitude is like a freshly opened bottle of pop!"

THE BOTTLE OF POP. Carbon dioxide gas is forced into the fluid under pressure and the bottle is capped. With the cap on, high pressure keeps the gas hidden in solution. Take the cap off and the higher pressure of the gas inside the bottle starts to equalize with the lower pressure outside the bottle. With the pressure off, the gas comes out of solution and forms bubbles in the fluid.

YOU. The air you breathe (mostly nitrogen gas) goes into solution in your blood and body fluids. Nitrogen gas is kept hidden in solution by atmospheric pressure at ground level. Go to altitude and the outside pressure becomes less than the pressure inside your body. The pressures start to equalize. With the pressure off, the nitrogen gas comes out of solution and forms bubbles in your blood and body fluids.

WHAT HAPPENS TO THE BUBBLES? As you go to altitude, the circulation of your blood removes the excess nitrogen and even the bubbles from your body. On rare occasions at altitude the bubbles are not carried off fast enough, and above 30,000 feet they may accumulate in your joints, lungs, skin or brain. If they do, they may cause:

Bends - pain in the joints or muscles.

Chokes - pain in the chest, cough, hard breathing.

Creeps - hot or cold sensations in the skin.

Cerebral - headache - visual symptoms - collapse.

These phenomena are pretty much the same as similar troubles experienced by deep-sea divers and "sand hogs" who come up from below (from higher to lower pressure) too fast.

NOTE: When we speak of "bends" here, we mean "chokes" too. "Creeps" are a little annoying, but not painful or dangerous. However, bends, chokes or creeps may lead on to the cerebral type of bends which are dangerous.

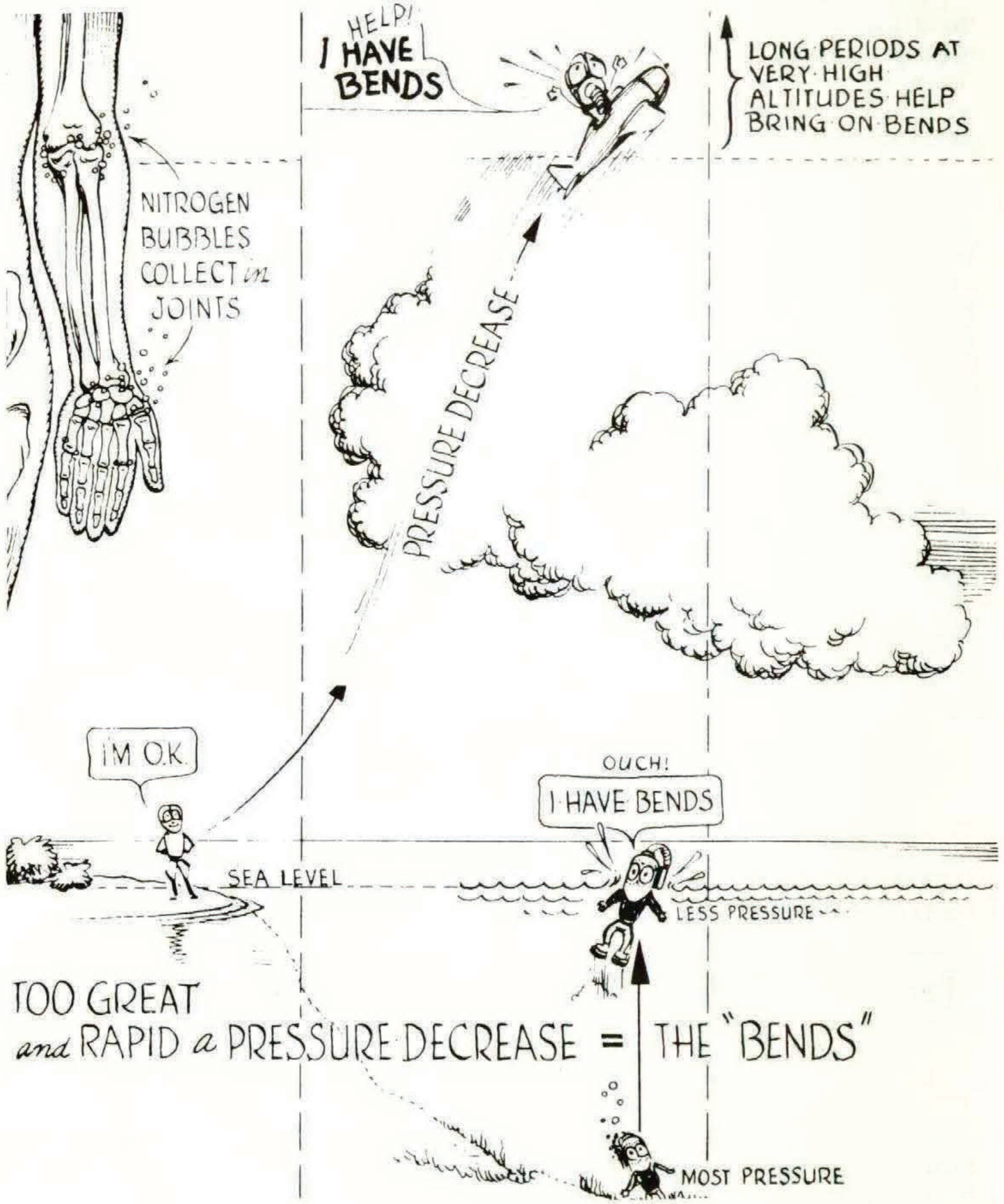
FACTORS WHICH HELP BRING ON "BENDS". "Bends" are now becoming a problem. The following are factors which help to bring on the "bends":

(a) Long periods at very high altitude.

(b) Fast climb to altitude.

(c) Exercise at altitude.

(d) Poor natural resistance to "bends".



RELIEF OF "BENDS". The only way to get sure relief from "bends" is to come down below 30,000 feet. Before you get down, though, it will help if you do not move the arm or leg that hurts. Rubbing or exercising it makes it worse! In view of the seriousness of the cerebral type it is important to descend on first symptoms of any kind of bends.

PREVENTION OF "BENDS". Bends can be prevented to a great extent by breathing 100 per cent oxygen for 30 minutes (on the ground or at any altitude up to 20,000 feet) before getting to high altitude. In this way you get rid of the body's nitrogen gas, so no bubbles can form. It can be done by turning the auto-mix "OFF" ("100% OXYGEN").

OXYGEN SYSTEMS AND THEIR OPERATION

"Crash Comment" has been carrying a number of articles dealing with the physiological aspects of flying with oxygen. This article will discuss in general terms the oxygen equipment in use in RCAF fighter-type aircraft, some of the more prevalent causes of improper operation, and how you, as the pilot, can check to ensure proper operation both before and during flight.

With the exception of the regulator, all systems are similar and consist essentially of the following equipment: storage cylinders a pressure gauge, regulator, indicator, and the necessary valves, piping and connections.

Three types of regulators are in common use: the diluter demand type such as the A12A in Mustangs; the pressure demand types such as the D1 and A14 in the Sabre; and the 11C (with economizer) used in Vampire aircraft. As the method of operating each type of regulator varies somewhat, it is important that you be thoroughly familiar with the operation of the one in the aircraft you are flying.

The indicator, which may be installed separately or as part of the regulator itself, is activated by the movement of a diaphragm which is sensitive to changes in pressure within the regulator. When you demand oxygen during inhalation, a pressure change occurs, causing the blinker to move from the closed to the open position; when you exhale, the oxygen flow ceases and the blinker will return to the closed position. It is to be noted that if you use the emergency valve or if the regulator has a leaking demand valve, the oxygen will flow at a constant rate and the blinker will remain in the open position. This is an important point to remember.

Continuous effort is being made to provide the latest and best equipment and thus you may find variations between equipment in the same aircraft type. It is therefore all-important that you, as pilot,

(a) become thoroughly familiar with the system in the aircraft you are flying. If you have any doubts about its method of operation, have someone who does know the system explain it to you;

(b) know how to carry out the necessary checks and exactly what each check tells you.

****

Review of missions aborted by oxygen lack (i.e., anoxia) has shown that 99% of them were the result of ignorance or carelessness. There is no excuse for either, so let us take a look at the reasons for this condition:

(a) Oxygen system not filled to capacity

(b) Oxygen supply exhausted by leaks

(c) Oxygen supply used up too soon by improper setting of regulator

(d) Mask leak caused by:

- (i) Poor fit
- (ii) Improper seating of exhalation valve
- (iii) Holes in mask or mask hose
- (iv) Cheek flaps not under helmet
- (v) Loose fit of "mike" wire entering mask

(e) Leaks around quick-disconnect assembly (between mask hose and regulator hose), resulting from:

- (i) Warping of metal end of mask hose
- (ii) Absence of rubber gasket at end of mask hose
- (iii) Separation of insecure disconnect

(f) Defects in regulator due to:

- (i) Loose connection of hose to regulator
- (ii) Tear in rubber diaphragm in regulator
- (iii) Openings in regulator blocked
- (iv) Leaking valves

(g) Blocked supply lines caused by freezing of moisture in the oxygen system at extremely low temperatures.

It is immediately apparent that every one of these can be discovered and rectified prior to take-off if a proper pre-flight inspection is carried out.

Here is a simple pre-flight serviceability check for your diluter demand oxygen system. It may seem long and detailed, but, once you understand the system, you will find it takes only thirty seconds to complete these tests:

(a) Check to ensure that the end of the mask accordion tubing is in working order. See that the metal end is perfectly rounded and not warped, and that the rubber gasket is in place.

(b) Check your mask and mask suspension for proper fit by connecting it securely in place, blocking off the end of the accordion tubing with the palm of your hand, and inhaling gently. If the mask is working properly it should be impossible to inhale.

(c) To check the inhalation valves, take a deep breath and again block the end of the accordion tubing. With the tube blocked, exhale slowly. If the inlet valves are seating properly, you will find exhalation easy; if the inlet valves are leaking, you will notice a build-up in pressure as you exhale.

(d) On entering the aircraft, fasten the clip to your parachute harness or clothing, connect the bailout bottle to your quick-disconnect and attach the quick-disconnect to the regulator tubing. Make this connection and then disconnect it. It must take an 8 to 12 lb. pull to disconnect.

(e) Check your pressure gauge to ascertain whether you have enough oxygen for the flight.

(f) Breathe two or three times with the dilution control lever set at "NORMAL" and note the blinker operation. Move the diluter control lever to "100% OXYGEN" and again note the operation of the blinker. You will find that it operates more sharply when "100% OXYGEN" is selected.

(g) With the diluter control lever still set at "100% OXYGEN", adjust the manual pressure breathing control to give pressure. You will find that the pressure builds up in your mask and that if you hold your breath, all flow will cease; if the flow does not cease, there is a leak either in your mask, your connecting tubing or the regulator demand diaphragm. Return the diluter control lever to "NORMAL" and repeat this test; again, upon holding your breath, you should feel a pressure in your mask and there should be no leakage in your oxygen system.

NOTE: For the A12A and C3A regulators, you will have to check for leakage by blowing back gently through the regulator hose. In these regulators there is no means of making a manual pressure setting, hence you must create this pressure artificially.

A similar systematic check can easily be developed for the type of system in your aircraft. If your squadron does not already have such a check, it is strongly recommended that one be developed and put in use now.

<u>In addition to your pre-flight check, a regular and systematic check similar to the one listed hereunder, should be maintained during your flight.</u>

(a) Check mask fit each time mask is removed and replaced. (Suck test: compressing hose and inhaling gently).

(b) Consciously and deliberately check on your own condition every few minutes to determine that you have no symptoms of anoxia.

(c) Check pressure gauge frequently.

(d) In low temperature, squeeze mask at intervals to prevent ice from forming.

(e) Check flow indicator at frequent intervals.

(f) Never remove your mask without following exactly the prescribed technique.

(g) If for any reason you suspect your regulator of being faulty, don't hesitate to use your bailout bottle and descend to a safe height. The oxygen in your bailout bottle will last about ten minutes, which should give you ample time to get down. When using the bailout bottle you will find it necessary to disconnect your mask from the aircraft demand regulator; if you remain connected to your demand regulator you may find exhalation difficult due to the pressure build-up from the constant flow bailout oxygen regulator.

When you have completed your flight, ensure that any defects in the oxygen system are brought to the attention of maintenance personnel by a detailed entry in the L14.

Besides your pre-flight and in-flight checks, you should know what to do if you have an oxygen emergency at altitude. If you have given such emergencies some thought and are prepared for them before they happen, you are less likely to get into trouble. Think of all the things which could go wrong with the system, what indication you would have of incorrect operation, and the corrective action for each.

It should be apparent after reading this article that, with a little effort on your part, you can avoid trouble if you

(a) know your equipment thoroughly;

(b) know how to check and re-check your equipment;

(c) know what each check tells you and ensure proper operation prior to take-off; and

(d) check systematically and conscientiously during the flight.

Engineering Order 20-115-1G (Oxygen Equipment) contains valuable information on the use of oxygen and the operation of the various systems in use in the RCAF. It is strongly recommended that you procure a copy of this order and read it thoroughly. Have a specialist clarify any doubtful points. You will find that you have picked up a wealth of knowledge which will ensure intelligent use of your oxygen system.

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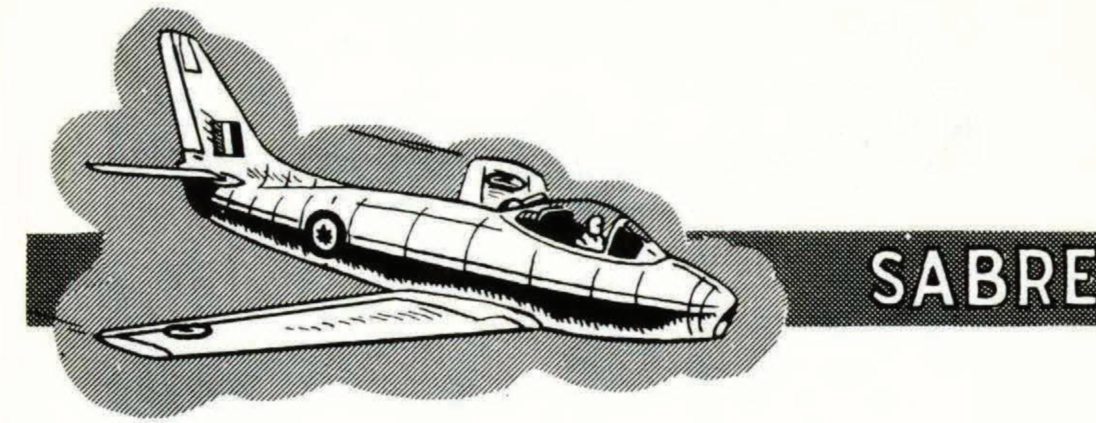
Erratum

The attention of the staff of "Crash Comment" has been called to certain errors in the explanation of "hyperventilation" which appeared in an article on that subject published in the issue of "Crash Comment" for the Second Quarter of 1953.

To atone for our mistake we have asked the Institute of Aviation Medicine if they would let us have a complete and authoritative explanation of this condition. IAM have consented to grant our request.

So watch for "The Facts on Hyperventilation", by W/C J.C. Wickett, which article will be a leading feature for our First Quarter of 1954.

ACCIDENT RESUMÉ



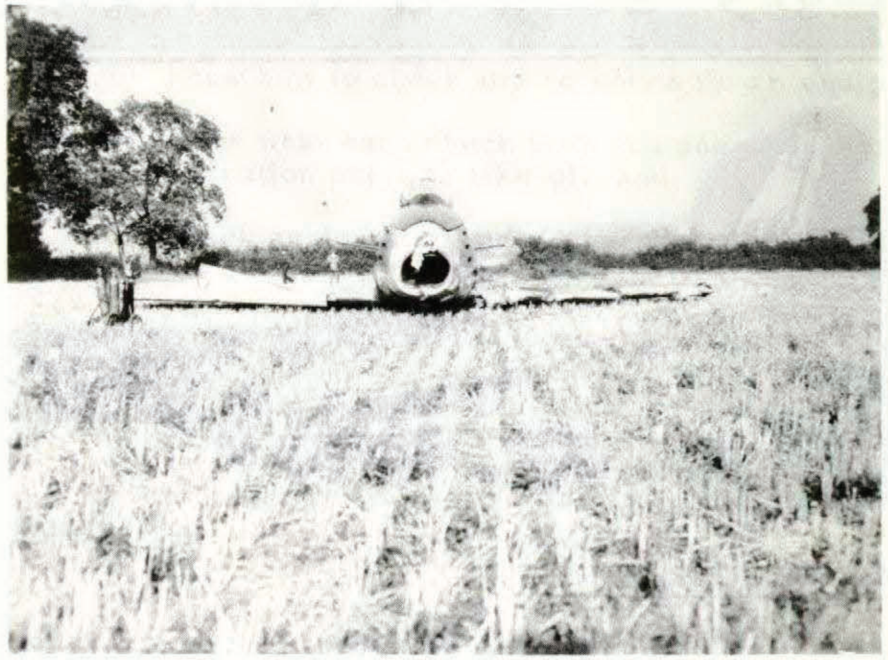
1 -- WATCH YOUR WEIGHT

Shortly after take-off, the pilot of a Sabre tow aircraft discovered that his cable had parted and he was minus a flag. Instead of burning off some of his fuel, he elected to land with 3500 lbs of kerosene aboard. The aspirator of the heavily over-loaded aircraft struck the runway on touchdown.

2 -- MAINTENANCE

After take-off on a test flight the pilot selected undercarriage "up" but the gear unsafe light remained on. Fairing doors were observed to be down. A "down" selection resulted in the main wheels being locked down, but cockpit indications lead the pilot to believe that the nose wheel was down but unlocked. Emergency nose gear extension failed to rectify the apparent unsafe condition of the nose gear. The pilot accomplished a successful precautionary landing and the nose gear held. Technical investigation revealed that the nose gear jack linkage had been wrongly reassembled and, although it tested serviceable on the ground, it broke loose under air loads so that the nose gear could not be retracted.

3 -- FUEL STARVATION



The pilot of the aircraft was returning from a routine air exercise when his generator suffered from a temporary over-voltage condition causing him to think it had failed completely. Arriving at his base he became confused by poor visibility and put the aircraft through three overshoot procedures. On the final overshoot the engine failed through fuel starvation and an "A" category crash resulted.

4 -- LOST DROP TANK

During his pre-flight cockpit check, the pilot of this Sabre noticed that the clasp was off the emergency jettison handle and that the handle itself was hanging with half an inch of cable showing. Instead of reporting the aircraft unserviceable for a check, the pilot replaced the handle and clasp and carried on with the exercise. At 10,000 feet the tank dropped off and the aircraft immediately rolled to the left through about 40°. The pilot corrected, notified the tower, returned to base and landed without further incident. Responsibility for the released handle could not be placed with any accuracy but pilots are reminded again to report any such condition when found.

5 -- CHECK THAT FUEL STATE

The pilot experienced a flame-out following surging at approximately 16,000 feet. A forced landing was accomplished with some damage to the aircraft. It was then the pilot realized that his aircraft was out of fuel. He had made the following errors of omission:

(a) Failed to notice, when signing the L14, that the Sabre had not been refuelled.

(b) Failed to check fuel contents during his start-up procedure.

(c) Failed again to check fuel contents during drill of vital actions before take-off.

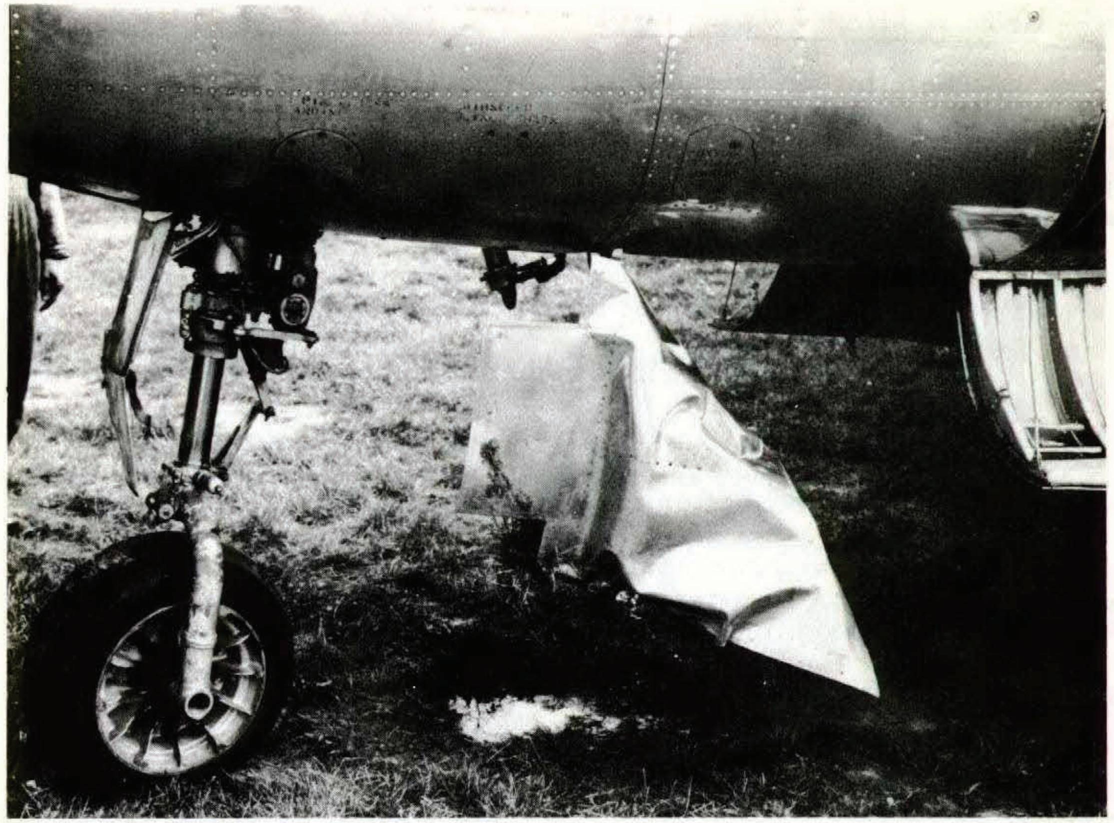
The partially successful forced landing avoided major damage to the aircraft. Full tanks could have prevented an accident. Fuel Checks Are Vital.

6 -- SELECTION ERROR

Shortly after his Sabre became airborne the pilot advised tower that he was having undercarriage trouble. He later reported that, at an airspeed of 300 knots, in an attempt to place the undercarriage selection lever to the combat position, he inadvertently selected "undercarriage down". Because the gear was cycled at an air speed in excess of the laid-down maximum it sustained considerable damage. The pilot had been briefed as to the correct method for undercarriage selection and had also been advised of the danger of committing this error through careless handling.

7 -- PRE-FLIGHT CHECKS ARE IMPORTANT

On returning to base and preparing to land, the pilot was unable to lock down the Sabre nose-gear. Normal and emergency procedures were followed but without success. The pilot tried bouncing the aircraft on the runway but even this failed to correct the situation.



The primary cause of the accident is assessed as "Pilot Error" because the pilot, during his pre-flight inspection failed to notice that the nose-gear ground safety lock had not been removed. "Maintenance" is assessed as the secondary cause for the following reasons:

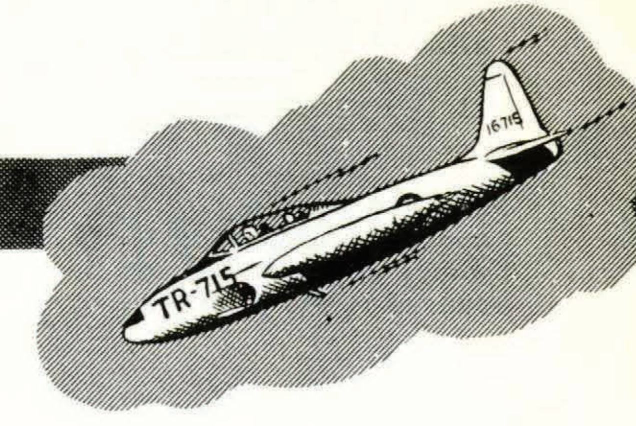
(a) The crew-chief did not remove the nose-gear ground safety lock on <u>his</u> pre-flight inspection.

(b) The safety pin was not installed in the nose-gear ground safety lock, so the lock worked loose and, while allowing the nose-gear to retract, jammed when the "down" selection was made.

(c) There was no red warning flag on the nose-gear ground safety lock.

The importance of observing complete laid-down checks cannot be over-emphasized.

SILVER STAR



8 -- <u>DIVIDED CONTROL</u>

On completion of a formation training exercise the instructor demonstrated the correct procedure for joining and flying a proper circuit. At an altitude of 300 feet and some 400 yards from the runway the student was given control and instructed to complete the landing. The round-out was high and a heavy landing resulted with considerable damage to the starboard undercarriage. The following errors were committed by the instructor:

(a) Handed over control to the student at too late a stage of the approach;

(b) Did not warn the student, previous to handing over control, that he was to complete the landing; and

(c) Failed to take corrective action when the student rounded out too high.

9 -- <u>MAINTENANCE</u>

During a gentle dive to lose height the pilot of the aircraft selected dive brakes to restrict his speed. He heard a loud bang and correctly assumed that a dive brake had failed. After checks by the pilot of an accompanying aircraft the landing was made without further incident. Technical investigation revealed that the dive brake casting had broken as a result of maladjustment of the actuator arm after removal of the rubber up stops.

10 -- <u>FUEL MISMANAGEMENT</u>

On completion of a practice beacon let down, a pre-landing check was done. As the pilot prepared for overshoot at 400 feet altitude the engine flamed out. From this position the pilot was fortunate enough to accomplish a successful forced landing on the aerodrome. The near-accident has been assessed as "Pilot Error" because, with plenty of fuel available in the wing tanks, the pilot allowed the fuselage tank to run dry.

11 -- UNDERSHOOT

While giving a demonstration of a flapless landing to a student, this instructor allowed his aircraft to get too low on the final approach. The T-33 touched down short of the runway at a point where construction was being carried on. Considerable damage was caused to the underside of the aircraft.

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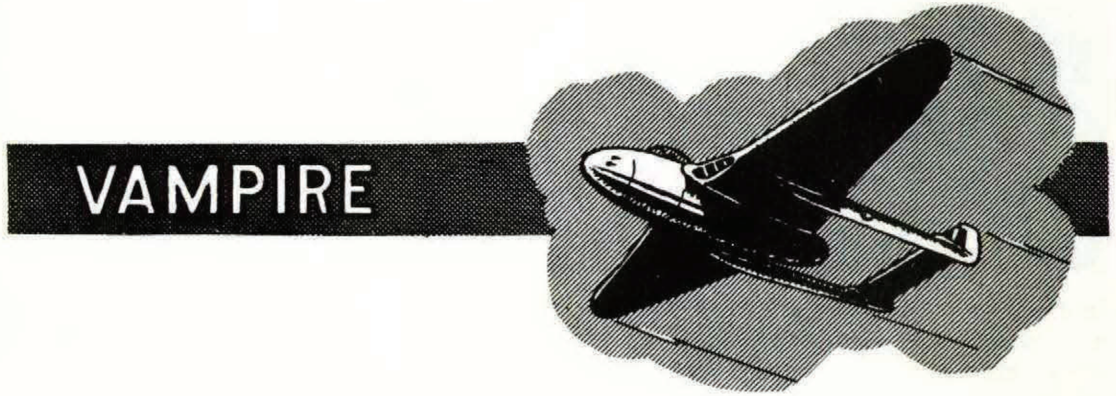


12 -- LOST CANOPY

After approximately 40 minutes flying the canopy, complete with rails, blew off this Vampire. The pilot returned to base and landed without further incident. Technical investigation revealed the fact that the jettison mechanism was in the unlocked position. This mechanism was not damaged and spring tensions and operating parts were normal. It is evident that the mechanism was not checked by the pilot or that he inadvertently made a jettison selection.

KING WINTER VS THE CHATHAM JETS

by

F/O I.D. MacMillan

F/L T.R. Wheler, MBE, DFC

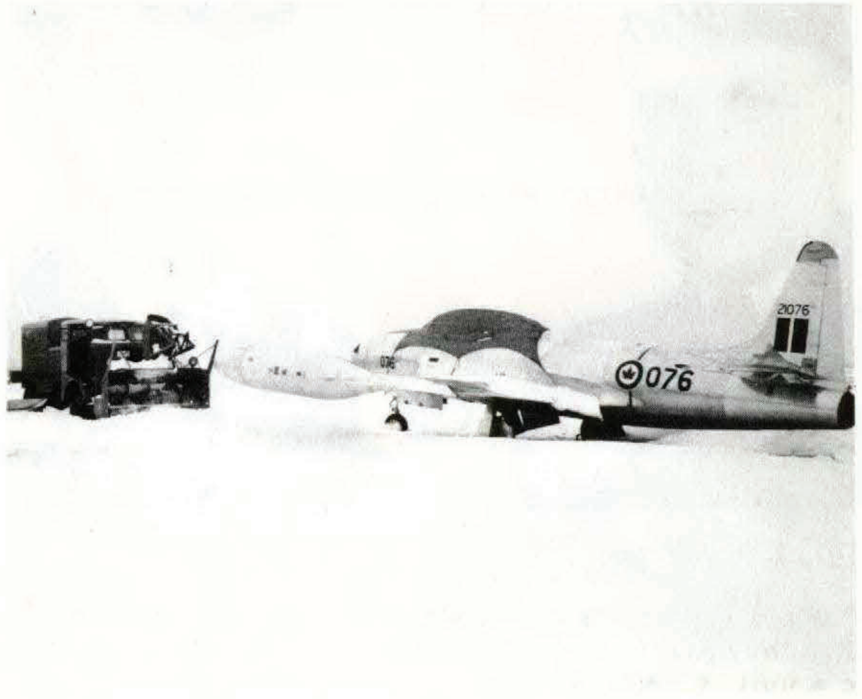
When snow flies and the cold settles down, the problems involved in the operation of aircraft are roughly doubled. Regardless of where a unit is located in this country, the winter season brings with it increased responsibilities for both aircrew and maintenance.

At Chatham, New Brunswick - site of 1 (F) OTU - all types of winter weather conditions are prevalent. Because of this factor the Directorate of Flight Safety feels that readers of Crash Comment will be universally interested in an exposition of the Chatham unit's handling of flying problems as related directly to winter operation of the Sabre and Silver Star.

Snow Removal

After a snowfall the Construction and Engineering Section (CES) follows a priority snow removal work order. Fire and ambulance routes are tackled first, fuel and food routes second and hangar areas and runways last. This priority pattern does not imply that flying must wait until these other tasks are complete, but there is often a delay in snow removal around hangar areas, runways and taxi strips simply because of the heavy demand on available equipment.

It is important to clear these locations in a manner that will provide a maximum of space in which to manoeuvre aircraft. In addition, a continuous check has to be maintained to ensure that dangerous banks of snow are removed to out-of-the-way areas. If this precaution is neglected, the hazard of obscured vision is intensified and heightens the rate of collision damage.



Another valuable safety measure is the placing of small flags or evergreen trees along the peripheries of runways and taxi strips so that these limits may be clearly visible to pilots.

Ice

The problem of ice removal from runways and taxi strips is a difficult one. Lamp black was found unsatisfactory because of uneven melting and the filth encountered by groundcrew when servicing aircraft.

The use of hot sand improves braking action but must be applied at a certain condition and temperature of the ice and snow. To illustrate: Sanding is useless if a layer of water covers the ice or snow because the sand merely settles to the bottom and the water freezes over. Again, sand spread cold on ice or hard snow is blown away by wind and jet blasts. Finally, sand gives maintenance a headache by adhering to oleo legs, undercarriage wing slots and flaps.

The use of salt as a de-icer is prohibited since its effect on aircraft metals is corrosive.

"...hot sand...!"

Thus, despite its limitations, sand has proven to be the best material for the job. Used intelligently - in conjunction with keeping unit drains and sewers open throughout the winter months - it can lend a sizeable assist toward solution of the problems peculiar to this season of the year.

In cold weather it is advisable to hangar as many aircraft as possible when the day's flying activities are over. Limited space will generally preclude the possibility of storing all aircraft so that those left outside overnight will require close attention the next morning. It is inevitable that the wing surfaces will be covered with a layer of hoar frost, snow and ice. These will have to be removed with a Herman Nelson heater and broom as they constitute many major hazards in winter operations, being responsible for loss of lift and an increase in stalling speeds. Great care must be exercised to prevent the resulting water from trickling down into the aileron and elevator hinges as it will freeze there and restrict movement severely. Liberal use of alcohol in these areas and around fittings will be a help.

Heater nozzles must be directed into wheel wells and micro switches thawed out, dried and tested. These steps will inhibit the appearance of a maze of red lights and eliminate unsafe undercarriage conditions. A close inspection of micro switches after each flight is recommended since slush thrown up on landings soon freezes them. Care should also be taken to ensure that no lumps of ice are adhering to the nose wheel as this will throw it off balance and make landings difficult.

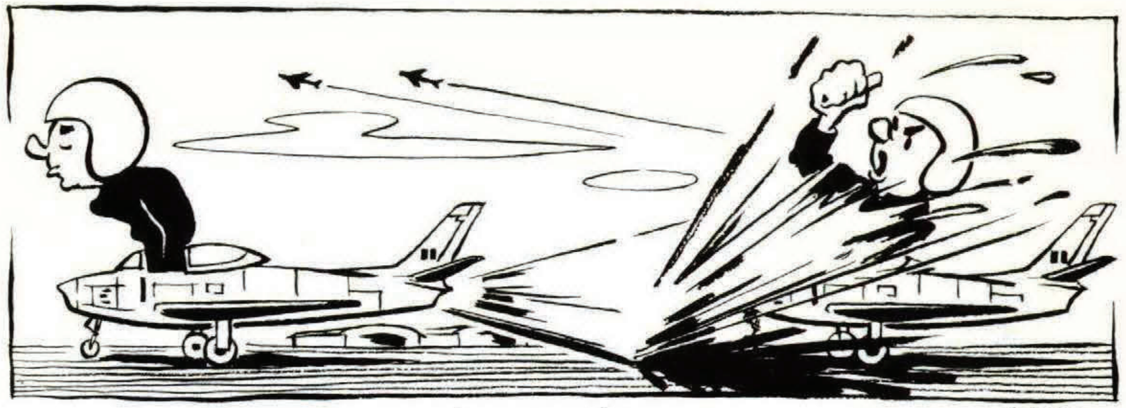
All moisture and ice must be thawed and removed from the canopy and canopy seal. Hot air should be turned on the canopy motor until it is thoroughly dried. Any moisture on this motor will stop it working and the hood will freeze in the "up" position.

Careful attention to a number of details by pilots is a prerequisite if needless accidents are to be reduced and avoided. Before accepting an aircraft, a pilot should make certain that his L14 is properly signed out and that he has checked the state of his fuel, oil and de-icer fluid. A scrupulous external inspection should then follow to determine that chocks are holding; that oleo legs are free from ice and sand; that no ice adheres to the pitot tube; and that the wing slats operate easily.

If the aircraft has been standing out in extreme cold, the turbine wheel should be checked for rotation as it may be frozen and could cause a burned out starter motor if a start is attempted. Cold weather start-up is normal but engine thrust development is quicker in cold air.

Starting the T33 with JP4 fuel in winter presents no problems as this fuel is now standard and no alternative start is contemplated. Taxiing a T33 on ice presents problems which at times are virtually insuperable. Maintaining momentum with minimum use of brakes is paramount. Every effort to prevent the nose wheel cocking is imperative. A sudden stop or violent use of the brakes is disastrous. Should the nose wheel cock, the aircraft is to be halted and groundcrew called to straighten the wheel manually. No effort should be made to straighten the aircraft without help as possible damage may ensue. Once on the runway power should be applied smoothly, with brakes on, until the aircraft starts to slide. Then release the brakes and proceed with the normal take-off.

Before taxiing out, it is sound policy to check on surface conditions and the distance of the aircraft from snow banks. While taxiing, deep snow, slush and water should be avoided to reduce the risk of frozen brakes, undercarriage and slats. Because of its weight and inertia the Sabre - in spite of a steerable nose wheel - will travel sideways over ice and snow with full brake on. Consequently, reason dictates that pilots ought to taxi slowly and increase their space intervals. Engine run-up should be carefully controlled to prevent water, ice and snow being blasted over following and parked aircraft. Finally, pitot heat is turned on before take-off.



— how not to

Often it is impossible to perform engine run-up and emergency fuel checkout if braking action is poor. Slippery surfaces also necessitate the cancellation of formation take-offs and substitution by five-second interval take-offs. The throttle must be opened smoothly and the aircraft allowed to roll before side-slipping can take effect. Crosswind drift should be watched closely on take-off and snowbanks on the edge of runways avoided. It is necessary to check temperatures and pressures closely and to make decisions swiftly enough to stop the aircraft safely if take-off must be aborted. If slush and wet snow are encountered it may be important to keep air speed low and operate the undercarriage and flaps to prevent freezing.

During flight, the cockpit heater, defroster and fuel filter de-icing systems should be operated as they are required. When descending - since colder air is often encountered at lower levels - pilots should be aware of inversions which result in canopy misting and windscreen frosting. Attention must be paid to the possibility of filter icing as fuel will bypass the iced-up filter and the engine receive unfiltered fuel. Filter de-icing alcohol is provided on both Sabres and Silver Stars.

Approach is normal under winter flying conditions but greater spacing between aircraft is desirable. Touchdown position and speed are extremely important in landings on slippery surfaces. It is risky to touchdown at excessive speeds too far down the runway and to expect a safe stop on ice or snow covered surfaces. Overshoot areas are hazardous, usually filled with packed snow or soft slush. Aircraft striking them at excessive speed are generally involved in an A or B category crash. Patchy surfaces are dangerous because aircraft may be spun into snowbanks when wheels braked for ice suddenly grab on bare pavement.

Touchdown presents no problem unless there is considerable drift. Every effort should be made to correct this with rudder only in order to eliminate a possible skid at high speed by applying brake. Control should be retained with rudder during the early stages of a landing and brakes applied sparingly after half the landing run. The aircraft should be slowed down while rolling straight and turned off when the sanded area at the end of runway is reached. At any time that an incipient skid is felt, brake pressure must be released. Markers positioned three-quarters the way down the runway should serve as a point to flame out should the aircraft be out of control. An overshoot area with eighteen inches of snow should bring the aircraft to a halt. This area should be cleared after each storm and maintained at about that depth.

After turning off the runway the aircraft should be stopped for the post-landing check in a large cleaned space so that there is a reasonable area for manoeuvre should the nose wheel cock slightly on stopping. Taxiing should be carried out by maintaining momentum with minimum use of brakes. No sudden stops, no violent corrections, but a steady forward speed. At any sign of trouble on a narrow taxi way or on the flight line the aircraft should be halted and groundcrew summoned to straighten the nosewheel. If well out in the field, get towed in. Excessive use of throttle when taxiing and parking will only melt ice and create a slippery mess which is aggravated each time this happens and presents problems to all aircraft.

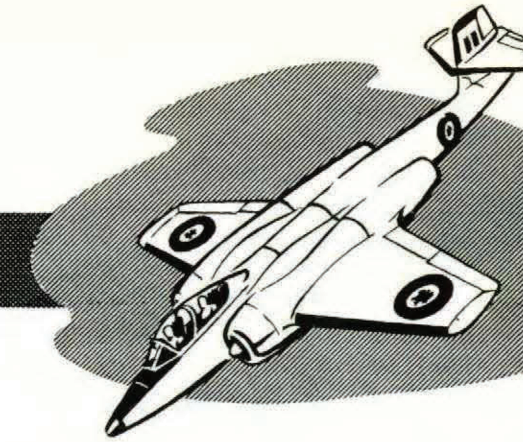
Pitot heat is next shut off and the Sabre is taxied slowly and carefully back into the line for parking. A pilot should not take instructions from groundcrew unless he is certain the aircraft can be manoeuvred safely into position. Where the situation is doubtful the engine should be shut down and the aircraft can be pushed into position. Better this method than to have a successful mission ruined by careless taxiing.

Following shut down, engine temperatures are permitted to stabilize over the required period of time in order to reduce excessive temperature change. Brakes are next released after the wheels are chocked. Last of all - weather permitting - the canopy is left open slightly to prevent frosting and possible cracking.

Successful winter jet flying has been carried out in all types of weather at Chatham and with a minimum number of accidents. Many of those which have occurred could have been avoided if the personnel involved had been more aware of the extra precautions demanded by winter flying.

Safe operation - not just of Sabres but of all aircraft - at this season of the year calls for a greater appreciation of, and a more rigid adherence to, all the rules that govern flying safety.

CANUCK



13 -- A COMBINATION OF CIRCUMSTANCES

This pilot accepted this Canuck for a flight to his home base knowing that the starboard brake was not fully serviceable. After take-off the nose wheel did not retract fully so the pilot continued to base at reduced air speed. This unexpected speed reduction resulted in the aircraft arriving at base after dusk, which was later than intended. After landing, the pilot, because of the faulty brake, was unable to stop the aircraft on the runway and elected to run off to the port side rather than the end of the runway. Because of the dark he could not see a pile of gravel until too late to avoid it. By this time the aircraft was travelling quite slowly but the nose gear collapsed on contact with the gravel pile. Construction personnel had been requested to remove the gravel but the job had not been completed.

14 -- RICOCHETS

While practicing air-to-ground gunnery exercises, the pilot was warned by the range officer about a low pass. The exercise was completed and the aircraft landed with no further apparent incident. Subsequent examination, however, revealed damage to the starboard engine caused by a ricochet which was undoubtedly picked up during the one low pass. The accident, for this reason, is assessed primarily as "Pilot Error". The secondary assessment is "Ground" because of the steel and concrete construction of the target which is conducive to ricochets.

15 -- WHEELS-UP -- WELL AND TRULY

On return from a practice night interception the pilot joined the circuit in preparation for a landing. When the aircraft was on final the tower operator made the usual caution "----undercarriage down and locked". In spite of this warning and that of the red indicator light blinking in the corner of the cockpit, the Canuck was landed on its belly with considerable resultant damage. NUF SED!

● OXYGEN EQUIPMENT UNDER WATER

Without auxiliary breathing equipment a man submerged under water cannot survive more than a few minutes. It follows, then, that any means of supplying oxygen to aircraft pilots involved in water landings in land aeroplanes would increase the time available for under water escape, survival, or rescue, and ultimately save lives. Exhaustive tests have shown that oxygen equipment in various combinations, using A-13 and A-14 oxygen masks with 2858-B1 or 2862-C1 regulators, operated satisfactorily with any body attitude at depths as great as 65 feet, which was the maximum depth tested.

Of the two masks tested the A-13 pressure breathing oxygen mask was found to be superior to the A-14 if the regulator is delivering positive pressure since the pressure compensated valve of the A-13 mask will hold the pressure and prevent continuous flow through the mask. There is little or no tendency for either mask to leak water inboard since the water pressure helps seal the mask to the face. It was found that a full 514 cubic inch oxygen cylinder sustained the subject for 31 1/3 minutes at 33 feet (2 atmospheres). The duration would decrease slightly at greater depths and increase slightly at lesser depths. Efforts to increase duration by holding each inspiration to the maximum were of limited value since CO_2 increase rather than O_2 lack is the limiting factor.

A pilot who is about to make a water landing in a land aircraft has a tendency to discard his oxygen equipment before hitting the water. If, because of mechanical difficulties or unconsciousness, the pilot is unable to abandon the aircraft before it sinks he is in danger of drowning before effective aid can reach him. If normal escape is possible but he does not extricate himself before going under water, there is a tendency for him to become panic-stricken as the water rises over his head. Such a mental state would further decrease his chances of co-ordinated effort to free himself.

Research indicates that if the pilot keeps his oxygen mask on and connected to his oxygen supply with the regulator on "dilutor off" (100 percent oxygen) when a "ditching" is imminent, his oxygen equipment will protect him for an extended period if normal escape from the aircraft is impossible for mechanical reasons such as a jammed canopy, or if he loses consciousness on impact. If he were in shallow water (less than 100 feet) he would remain alive for an average of 31 minutes longer than without the oxygen, which would increase the chance of his being able to extricate himself or allow time for outside aid. If he lands in deeper water and normal escape is impossible, several more minutes would be available for escape while the aircraft is sinking from the surface to excessive depths.

If a "ditching" becomes necessary remember the following:

(a) Leave your mask on and connected to the oxygen regulator.

(b) Select the diluter control lever to "100% OXYGEN".

(c) After ditching, remain connected to your ozygen regulator until the last moment before leaving the aircraft.

REMEMBER - Your mask and regulator will enable you to breathe under water to a depth of 30 feet.

WINTER JET FLYING AT NORTH BAY

by

Wing Commander E.D. Crew

(W/C Crew, DSO, DFC, (RAF), is from Higham Ferrers, Northants, England. He attended school in Essex and graduated from Cambridge University in 1939 as an M.A. Commissioned in RAFVR in 1939, he joined 604 Blenheim Night Fighter Squadron in 1940 and participated in the Battle of Britain. In March, 1943, he joined 85 Mosquito Night Fighter Squadron and, in July of the same year, commanded 96 Mosquito Night Fighter Squadron as a Wing Commander. He remained with 96 Squadron until it disbanded in Dec, 1944, and then attended Staff College for six months.

W/C Crew has 12 aircraft destroyed and 21 flying bombs destroyed to his credit. In 1947 he went to Malaya and served 2 1/2 years there flying Beaufighters. For the last 18 months of this tour he commanded the Beaufighter Squadron. It was while in Malaya that W/C Crew was awarded the Bar to his DSO. Arriving in Canada in February, 1952, on Exchange duties, W/C Crew has been serving in Canada as Officer Commanding No. 3 All-Weather Fighter OTU at North Bay, Ont. - Editor)

The reasons for safety precautions in flying are generally obvious, but - as in other realms of human experience - the obvious is often overlooked until too late.

Because the truth of this observation assumes a special significance when applied to jet operation in winter weather, this article will attempt to give "Crash Comment" readers a picture of how winter problems are tackled at 3 (AW) OTU, North Bay, Ontario. The accompanying suggestions stem from 3 OTU's experience operating the Canuck and Silver Star. Not all of them can be easily implemented, and, for this reason, some of the suggestions made are not in force at North Bay. They have been included here for their thought-provoking value.

Airfield Maintenance

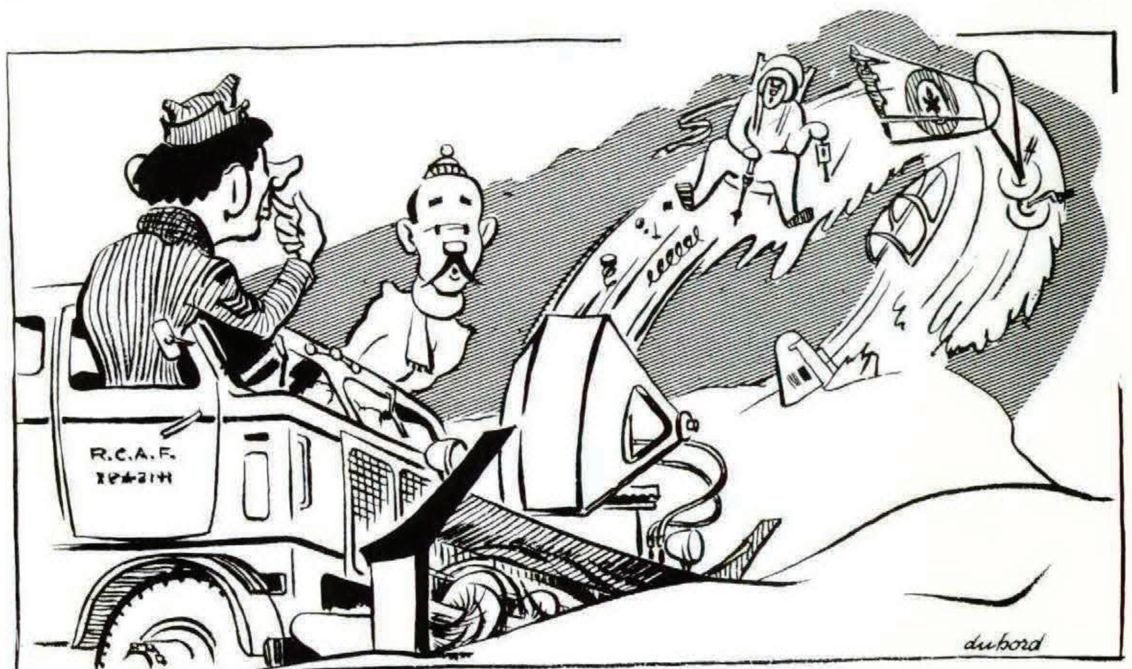
The overall purpose of a winter safety program is to reduce airfield hazards. There are two main difficulties to be overcome - the problem of snow and ice removal and problems of vision.

Snow and ice clearance is mainly a problem of doing the right thing at the right time. As conditions vary from station to station and latitude to latitude, local knowledge is a big advantage. Broadly speaking, before starting to clear, one must consider what state the surface will be in after snow has been removed. With wet snow there is little risk of a hard crust being left on the runways after clearance, although there will certainly be a good deal of water or slush. Unless freezing is imminent this can be left to Nature for disposal, although - until the slush has gone, braking action will probably be poor.

If, however, frost is expected before the surfaces are dry, an attempt must be made to provide adequate braking action on the glare ice which will inevitably form. The surface must be watched for the onset of freezing. When this begins (but not before!) sand or, better still, black powdered slag, should be spread over the runways.

The most effective means of spreading sand or slag is to get it frozen into the top of the ice film so that it not only roughens the surface but is retained in the ice as long as that particular film persists.

A further word on slag may be useful. This material, obtainable from the nearby nickel mines in the North Bay area, has certain advantages over sand and soot. Slag, like sand, must be kept in a heated shed to prevent it from freezing solid. The heating also speeds up the rate at which it will settle into an icy surface. Being black, it absorbs more heat from the surrounding atmosphere, an action which assists its melting action on snow. Lacking the hard, gritty characteristics of sand, it is less injurious to aircraft and engines. Slag is superior to soot in that it does not have the latter's soft, oily quality - features which contribute to poor traction and unnecessary filth on aircraft.



"... until blowers have cleared ... no other traffic ...."

Another point to remember is that, until the ploughs and snow blowers have cleared all they can, no other wheeled traffic should be allowed on the runways, or rolled and icy tracks will form. Thus, though the grader can in some circumstances reduce the remaining compressed snow, its front wheels will do more harm than good if the equipment is allowed on the runways too early. When the layer of snow is very thin and powdery, front-mounted brooms are best.

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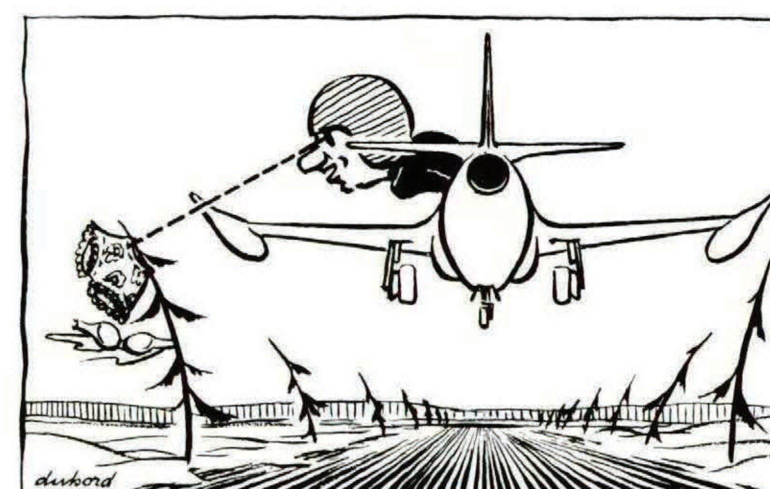
There are three main aspects to the problem of vision. Firstly, landing and taxiing areas must be clearly defined. This is accomplished by placing small evergreen trees along the sides of these strips. The alternative of red fluorescent panels, supported by small posts, is presently being tested at North Bay. Preliminary observation during snowfalls has revealed an unsatisfactory condition - snow sticks to the surface of the panels and blots them out. Fir trees, on the other hand, appear to provide a distinct contrast under any conditions. The runway threshold itself can be effectively marked through use of clusters of small, red, fluorescent flags at each corner. Because of their flexibility the flags do not collect snow.

Opinions differ on problem number two - how to break up the whiteness in overshoot areas on final approach. At some stations fluorescent paint is favoured. However, it is felt by others that it is not so much the whiteness of the snow that matters as the fact that it is unbroken, making depth perception as difficult as it is over a glassy sea.

At North Bay, evergreen trees have been found to be the most effective markers, as their size provides a rough means of estimating height. (This point will likely be appreciated most by those trained on grass strips who later tended to misjudge heights on concrete runways.) Evergreens have an extra advantage in that they are not buried by every snowfall so that the need for renewal is diminished. Also, their flexibility prevents them inflicting damage to aircraft which strike them on the overshoot.



"... evergreen trees .... a means of estimating height ...."

Finally, there is the need to make the ends of runways clearly visible as soon as possible to pilots approaching on instruments. The need, of course, is as applicable to rain and fog conditions as it is to snowstorms.

Although flags and trees are a help, the real answer here is good lighting. Units which do not have the benefit of high intensity approach lighting ought to have the alternative of sodium lamps placed at the ends of runways facing the approach. An additional lamp on the corner facing the downwind leg would certainly help pilots on visual approaches. The sodium lamp is not used in North Bay at present but is well vouched for elsewhere, being in fairly general use at RAF all-weather bases.

Control of Snow Clearance

There is no disputing that the operations side of snow clearance should be controlled by the Chief Operations Officer (COpsO). The Chief Technical Officer (CTechO), however, is responsible for conducting the actual snow clearance.

Apart from ensuring that men and equipment are ready in sufficient numbers at the right time and that priority snow removal schedules are in effect, there is little or no need for greater rigidity in snow clearance plans. What is needed is the continuing close co-operation between CTechO and COpsO so that the shift and change of daily requirements may be handled adequately.

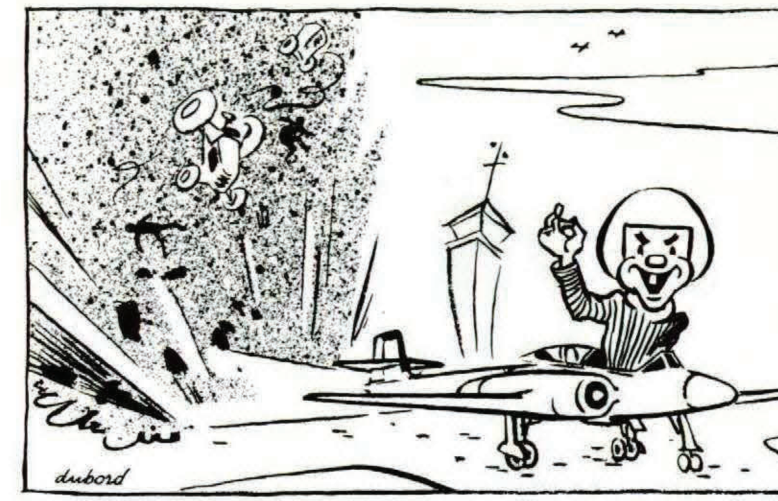
It is considered likely that the weather will continue to be a factor influencing day-to-day snow clearance decisions. Where COpsO and CTechO differ in their conclusions as to the means by which a particular situation can be tackled, the only solution is reasonable discussion and the adoption of a workable compromise.

At North Bay the CTechO's responsibilities are undertaken by the Airport Manager since the airfield is under the jurisdiction of the Department of Transport. The advantage of this system is that, since an Airport Manager normally remains longer at one unit than a CTechO, he has on his side continuity of experience and an accumulating knowledge of local conditions. These are valuable assets - and an Airport Manager is a valuable man.

Runway Surfaces

The superiority of black-surfaced over white-surfaced runways deserves a mention here, although most units will have to bear with their existing facilities.

Even when snow has been cleared, there is still the question of what to do with the remaining ice. A black-topped runway, with its better heat-absorbing qualities, will often attend to the job itself, assisted by the winter sun or a slight rise in temperature above freezing. Readers will have noticed that concrete readiness buttons retain ice far longer than black runways. Closer inspection of concrete runway ends reveals that, where there are black tire marks, the ice melts more quickly than on unmarked concrete.



"... tarmac is unsuitable for.... jets...."

While tarmac is completely unsuitable for parking jets, it seems to the author not impossible that the winter serviceability of concrete could be immeasurably enhanced by tinting or painting it black. Those stations which are contemplating the addition of extensions to parking areas might do well to experiment in this direction.

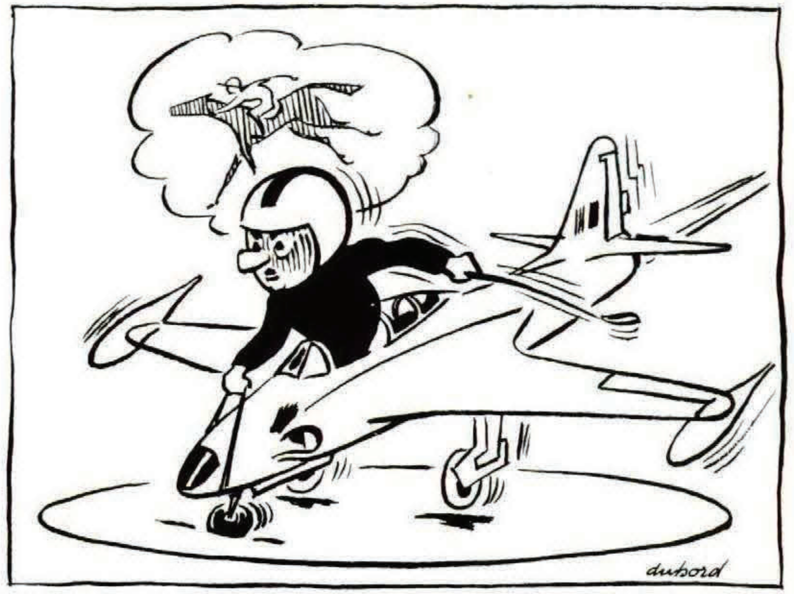
Unnecessary quantities of white paint on black-topped runways are another source of trouble. Markings of this sort are best kept to a minimum, for they are fruitful sources of persistent glare ice. During the winter months the majority of them are decidedly more of a hindrance than a help.

Flying

Despite all the ground precautions that can be taken, there is still much that only the pilot can do to conserve his aircraft.

First, movement on the ground. Taxiing must be slow and the aircraft's immediate surroundings checked before turns are made. (Incidentally, it is during such ground manoeuvres that the steerable nose wheel is appreciated). During the landing run - and at all times while on the ground, for that matter - a lookout should be kept for ice patches and braking on them should be avoided as far as possible.

Turns on the ground, both in the Canuck and Silver Star, should be wide to avoid skidding forward with too great a nose wheel angle. Before moving off from the line, pilots should check to see that the nose wheel is straight. Making the check a regular habit will obviate the embarrassment of being stuck on the button.



"...the embarrassment of being stuck on the button."

Obviously landings should be made at the lowest comfortable speed when icy conditions are present. In gusty weather, though, the wisest plan is to keep one's airspeed a little high. Where this is the case, the engine should be cut off after touchdown - the sooner the better. In the Canuck particularly, reduction in stopping distance on shut-down is very marked since axial flow engines take time to slow down and lose their thrust.

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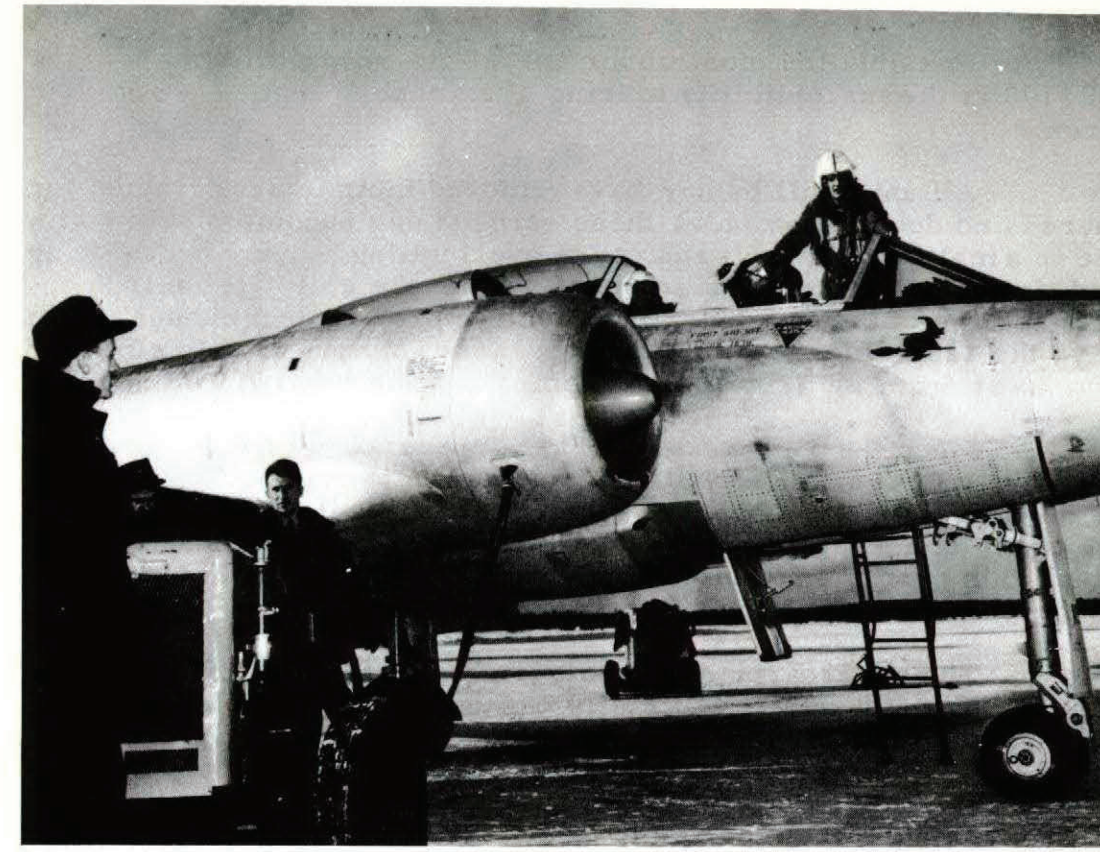


The Silver Star — A printers error. RCL

In addition to these general points there are others peculiarly applicable to Silver Stars. The first is the problem of fuel filter icing which - it should be remembered, occurs as often in clear blue sky at the right temperature as it does in cloud.

Although a warning light is fitted, it is hidden under the curve of the left-hand cockpit wall on the Mk I and can easily be forgotten or missed. At North Bay it is standard practice to de-ice before take-off, every 20 minutes during flight and just prior to landing. This particular procedure not only serves to keep the filter clear but focusses attention upon an important light which might otherwise pass unnoticed. On the Mark III this procedure is unnecessary because the light and switch are now more prominent on the main panel and the de-icing alcohol tank has only a small capacity.

Lastly, on landing rolls it pays to remember the advice in pilots notes - to raise the flaps after touchdown. This action indubitably reduces lift and thereby increases the traction of the tires.

Canucks

Possibly the most important fact to remember about the CF-100 is the susceptibility to icing of axial flow engines - e.g., the Orenda.

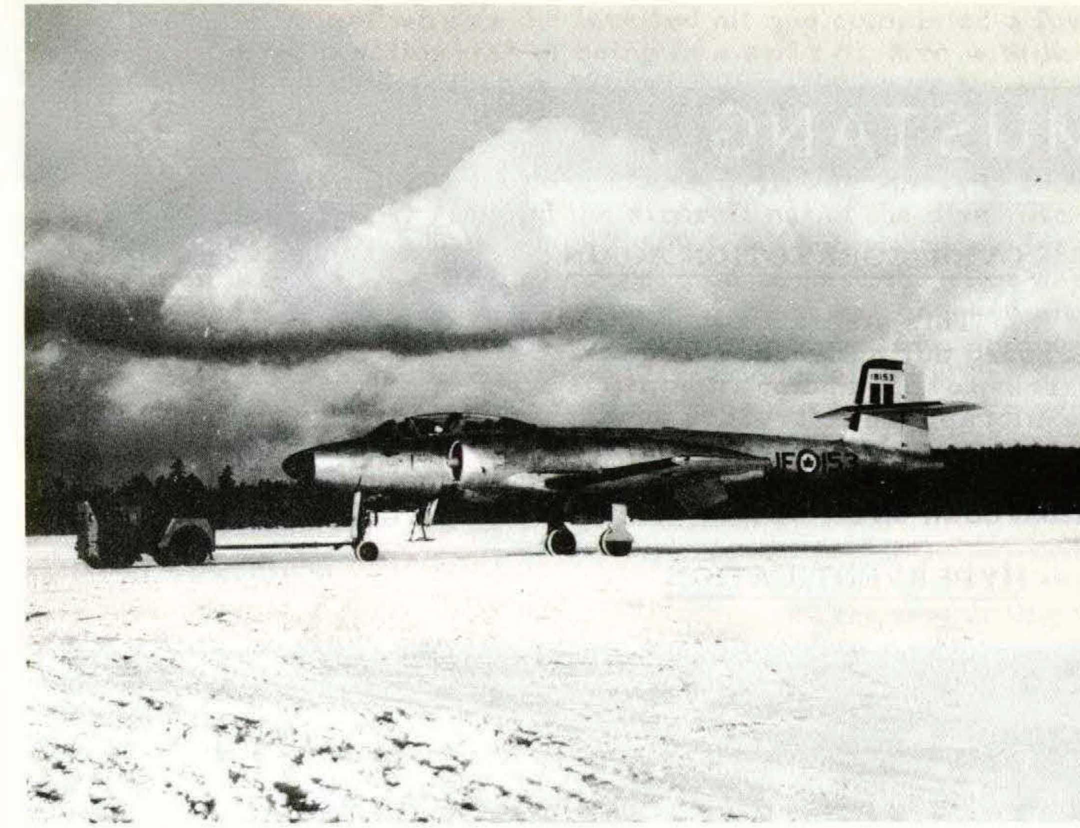
All units will by now have removed their intake screens; for there is no doubt today that these screens can become blocked with ice in a matter of seconds and cause overfuelling, severe overheating and fire. Even without the screens it will take only a few minutes - perhaps two or three - before the guide vanes collect enough ice to have the same effect, although this allows ample time to climb or dive away from the level at which icing is encountered.

Since the aircraft's outside temperature gauge is very responsive to skin friction (it has been known to register as much as 25 degrees with an outside temperature of zero), it is as well to note the likely temperature before take-off. In addition, the conditions in which this type of engine icing occurs will not necessarily cause dangerous airframe icing.

The undercarriage micro switches on the Canuck are easily upset by dirt and water, especially in the nose wheel well. Groundcrew should be constantly on the lookout for dirt and slush in the wheel wells, and round the brakes, and this is an important point to note in the pilot's pre-flight inspection. Even so there may well be occasions when the red or green lights show after retraction. Apart from a check by the tower, the pilot himself can tell whether the wheels - particularly the nose wheel - are still down by a noticeable shuddering which becomes more pronounced as speed increases.

The rather deep canopy rails of the aircraft are easily blocked with frozen slush or snow. Pilots should therefore be careful not to step on the rail when getting into the aircraft and the canopy should not be left open longer than necessary.

Bad winter weather will continue to appear just as regularly as the season it accompanies. Since it is a facet of flying which man can neither dispose of nor ignore, careful planning and rigid compliance with local procedures will ensure a safer and less costly winter operation.



Monkey Warning

The monkeys were here before us, and they may be here after us. Approach of the Comet Jetliner to Johannesburg three times a week is anticipated by the zoo inhabitants long before human ear can detect any sound.

Two chimpanzees have taken leadership in the Air Defence Watch. The male rushes up a tree to scan the sky. The female, not sure whether it's a raid or just the Air Force coming to town, jumps up and down with enthusiasm anyway.

(U.S.) Flight Safety Foundation

MUSTANG

16 - OVER-CORRECTION AGAIN

This aircraft swung to starboard during touchdown on a three-point landing attempt. The pilot applied left rudder and full power in an attempt to overshoot. The Mustang swung to port, ran off the runway onto soft ground, nosed up momentarily and then settled down on all wheels.

17 -- HYPERVENTILATION

The pilot was flying a Mustang on a practice climb to 30,000 feet. During the climb he experienced what he thought was oxygen lack, relieved by his selecting 100 per cent oxygen. He continued

the climb to 33,000 feet where he levelled off and completed a few turns. His next recollection was of being in a spiral dive with the artificial horizon toppled. With the ASI indicating 300 knots the pilot closed the throttle and tried to stop the gyration but neither stick nor rudder pedals would move. Elevator trim was moved tail heavy with no reaction so the pilot trimmed nose heavy. The spiral ceased at once and he gradually trimmed the aircraft out of the dive. Recovery was effected at approximately 7,500 feet, but with considerable strain on the aircraft. After his return to base the pilot was examined by the Medical Officer. Oxygen equipment was checked and found serviceable and further tests were completed by IAM. Indications are that this was another case of "Hyperventilation". The accident was assessed as "Briefing" because the pilot had not received the lecture on oxygen as required by CAP 100.

Law and Manners

Mere obedience to law does not measure the greatness of a nation. It can easily be obtained by a strong executive, and most easily of all from a timorous people. Nor is the license of behavior which so often accompanies the absence of law, and which is miscalled Liberty, a proof of greatness.

The true test is the extent to which the individuals composing the nation can be trusted to obey self-imposed laws. Between 'can do' and 'may do' ought to exist the whole realm which recognizes the sway of duty, fairness, sympathy, taste, and all the other things that make life healthy and society possible.

Lord Moulton

• EVEN THE BEST

TEN THOUSAND HOURS' flying time is NOT a cast-iron insurance against flight hazards - least of all, FIRE. Conclusive proof of this sobering argument is contained in the report of an accident involving two highly experienced pilots and a twin-engined Expeditor.

Fire developed in the aircraft's port engine during the climb following take-off on a night flight. Seconds earlier both engines had been checked normal on run-up; and at no time throughout the entire incident did any of the engine instruments indicate abnormal conditions.

The Expeditor had attained an altitude of 200 feet when the fire warning light came on. The pilot reduced power at once, made a visual check of his motors, concluded that a possible fire was indicated and promptly operated his extinguisher. He then made a normal landing with reduced power on his port engine, the aircraft sustaining only minor damage in the form of burning at the point where the exhaust tailpipe is fastened to the manifold.

Needless to point out, it is quite remarkable that both crew and aircraft got off so lightly in the face of inadequate and poorly-executed emergency procedures for fire in the air. By failing to take all the safety measures laid down in EOs, the pilot dangerously aggravated the possibility of severe injury or death to himself and his co-pilot and total destruction of the aircraft.

Closing the throttle and operating the extinguisher are only the first and the last steps of the air drill in case of fire laid down on page 80 of Pilots Operating Instructions General (EO 05-1-1). There are FIVE steps to the drill - NOT two!

1. CLOSE THROTTLE
2. FEATHER PROP
3. SHUT OFF FUEL
4. SHUT OFF IGNITION
5. OPERATE EXTINGUISHER

Failure to take steps 2, 3 and 4 of the emergency procedure sustains all the elements necessary for the outbreak and feeding of a second fire: The efficiency of the extinguisher charge may have been reduced through propwash. The fuel and oil flow continues. Ignition is on. And the exhaust manifold remains at a high temperature. It is important to attend carefully to the steps preceding use of the extinguisher because REFILLS ARE DOWNSTAIRS.

The point of this article - well worth stressing again - is that the crew of this aircraft had logged between them OVER 10,000 HOURS OF FLYING! Consequently, it is ridiculous to assume incompetence on the part of these two pilots. They are both highly trained, mature and experienced fliers. What happened, then?

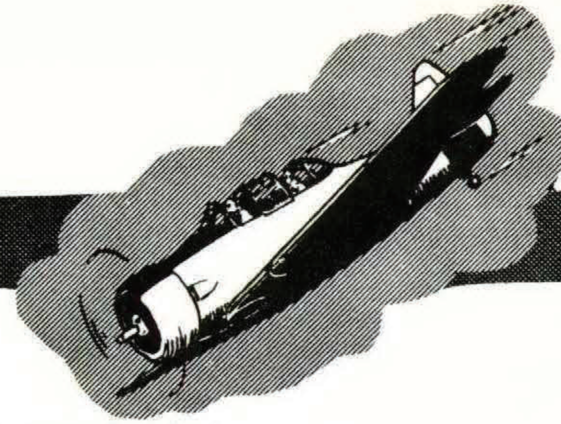
Here at Flight Safety we are in business to reduce accidents. Our job is to uncover and evaluate honestly the causes of accidents in order to determine whether the training or the individual is at fault. Upon reaching a decision, it is then our responsibility to recommend alterations and improvements in training methods, publicize mistakes and stress proper procedure. Would you agree that in this particular incident there was a hint of carelessness? Our conclusion is that an important procedure had become a little rusty for lack of running through it mentally once in a while.

All of which leads us to dumping another slogan in your lap:

SELF-CONFIDENCE CAN SAVE YOUR LIFE

OVER-CONFIDENCE CAN LOSE IT.

HARVARD



18 -- MAINTENANCE

A Mk II Harvard was on a navigation exercise with a crew of two when fuel pressure suddenly dropped and excessive consumption was noticed.

While making a direct approach landing a few minutes later, the pilot spotted flames in the forward end of the front cockpit. As he and his navigator got clear, fire enveloped the cockpit and appeared also from behind the engine cowlings. When the flames appeared to subside for a moment the two returned to the aircraft and doused the fire with the engine fire extinguisher and the hand type in the rear cockpit. Prompt action saved the Harvard from severe damage and possible total loss.

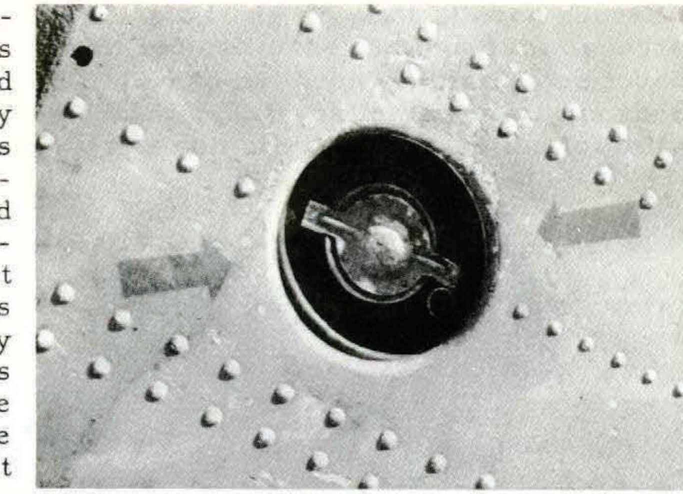
Subsequent investigation revealed that a copper line from the fuel pump to the cockpit fuel pressure gauge had broken because of work hardening and permitted fuel to spray on hot engine components.

This is the second accident of this type since 1950. Following the first - which resulted in the death of a pilot - a modification recommendation was urged to eliminate fatigue fracture in the fuel pressure line. The primary cause of the present accident has consequently been assessed as "Maintenance", because it is considered that 2 1/2 years for implementation of a recommended modification was an undue delay when a known hazard existed.

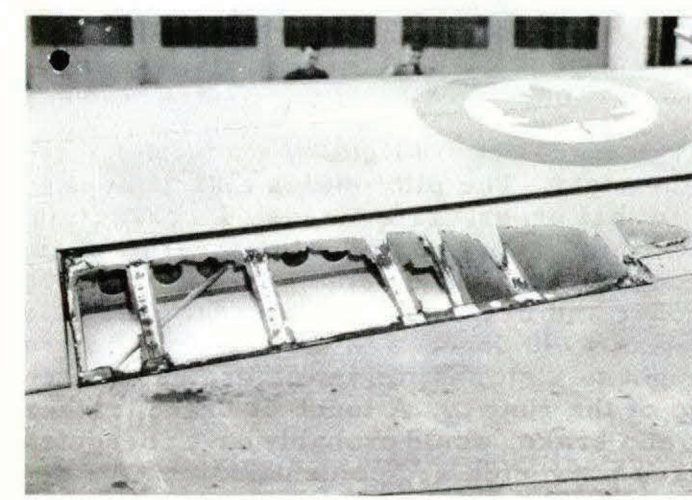
19 -- CORRECTIONS AND OVER-CORRECTIONS

Because of wind conditions the student pilot correctly elected to do a flapless landing. Unfortunately, however, his landing was three-point in spite of a gusty crosswind. After touchdown the aircraft swung left. Right brake was used as correction and the aircraft swung right. Left brake was applied and an attempt made to overshoot but when the Harvard again started to swing right the pilot stopped and shut down the engine. Damage was sustained at the port wing tip and the port wing outer section. Check your landing technique in gusty crosswind conditions.

20 -- FUEL FILLER CAP INSECURE



During aerobatic manoeuvres fire was noticed on the starboard wing. Upon recovery from a spin the fire was extinguished and a normal landing accomplished at base. Technical investigation revealed that the gas tank cap was loose and just hanging by its chain. The cap was found to be serviceable but when installed in the fully tightened position it was not in line with the red arrows painted on the wing. It can only be assumed that the cap was not tightened properly after refuelling and the accident is assessed "Maintenance". The fire damage shown might have been worse and points the need for extreme care in all phases of refuelling operations.



21 -- RUDDER vs BRAKE

After touch-down with full flap in light wind conditions the Harvard swung sharply to the right. The pilot states that he applied full left rudder and brake, in that order, as a means of correction. Before the initial swing was completely corrected the aircraft again swung right and left the runway. Again the same corrective action was used - namely, left rudder and brake, and the aircraft was held straight in the new direction at 90 degrees to the runway. Before the Harvard could be brought to a stop it ran into a drainage ditch some 300 feet from the edge of the runway. A touch of brake, rather than the sequence of rudder and brake, would probably have corrected the initial swing and thus have prevented an accident.

22 -- HIGH ROUND OUT

The student pilot had made what appeared to be a normal approach but held off too high above the runway. He allowed the aircraft to continue in the same attitude without applying power until the starboard wing stalled and struck the runway. The subsequent groundloop resulted in considerable damage to the aircraft. An overshoot and new approach might have prevented this accident.

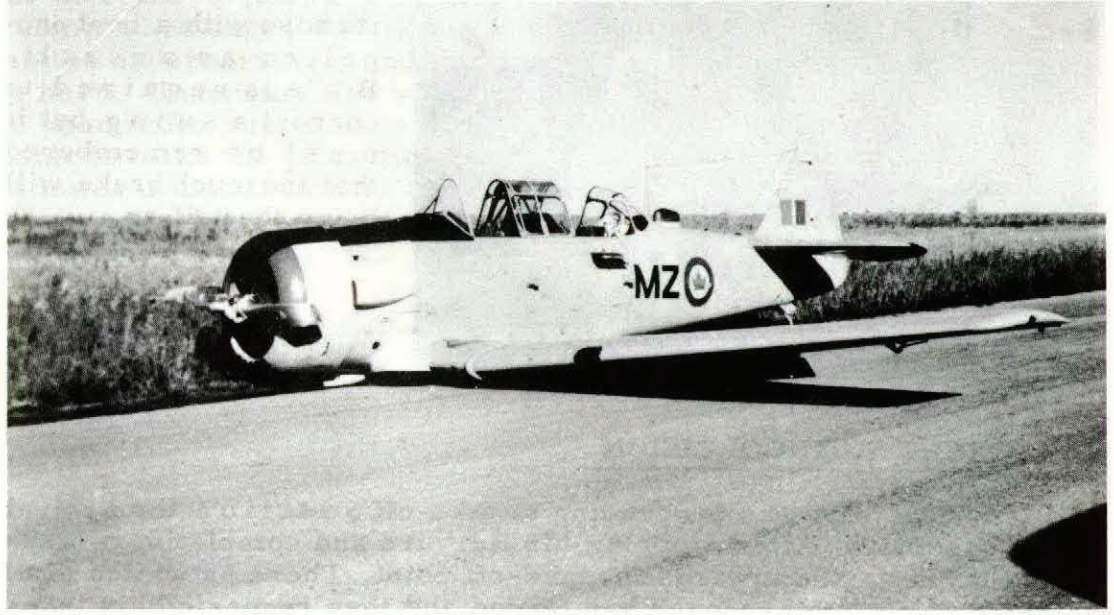
23 -- CROSSWIND-DRIFT-FLAPS

While on the approach the student pilot altered course to correct for drift. In spite of this indication he continued the approach and landed using full flap. Drift had not been eliminated on touch-down, a swing developed and a wing tip struck the runway. Inexperience and a strange aerodrome combined to induce the following pilot errors:

(a) Misuse of flap in crosswind conditions.

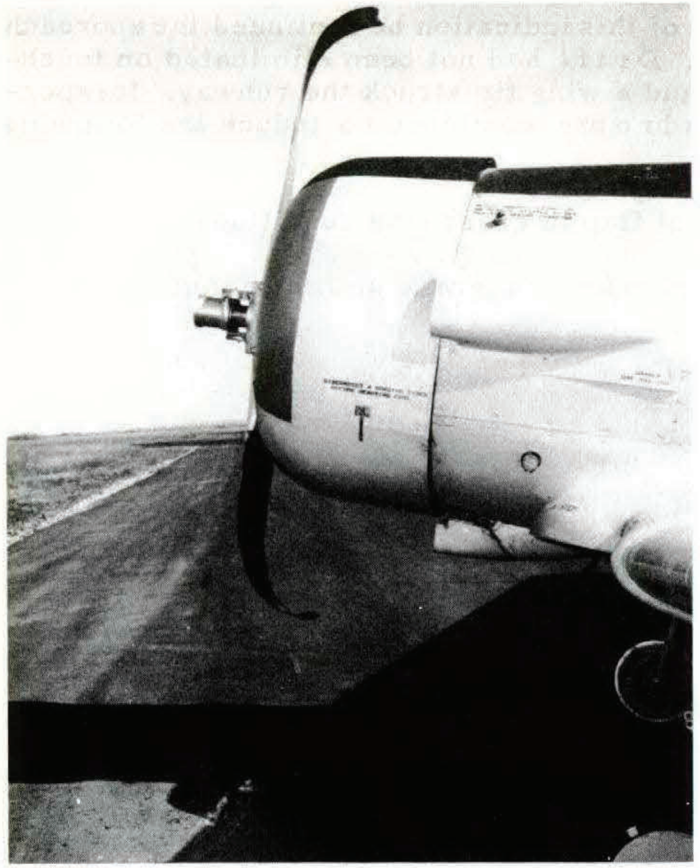
(b) Late application of brake in attempting to correct a swing.

24 -- WRONG SELECTION



During a period of dual instruction the student was being checked on 90° and 180° glide approaches. He had selected 15° flap following his cockpit check and was then advised by the instructor to increase the flap setting. In error he raised the flaps. This condition he corrected; but, in the ensuing confusion, the student apparently selected "wheels up", a situation which only became apparent when the Harvard touched the runway. Doubt exists, not only as to the efficiency of the undercarriage warning horn, but also as to whether it was serviceable in this instance. However, constant vigilance could have prevented the accident no matter what the serviceability of the warning horn.

25 -- HARSH BRAKE



On landing after some practice over-shoot procedures the student pilot allowed the Harvard to commence a swing to starboard. The instructor took over and corrected for the swing but used sufficient brake to stand the aircraft on its nose with a bent propeller as a result. Brake is required to correct a swing but it must be remembered that too much brake will bring the tail up.

26 -- NIGHT TAXI COLLISION

The pilot was proceeding to take-off position for a night flying exercise. After stopping his Harvard and completing a take-off check, he taxied towards the take-off point. There he waited until an aircraft on the approach had landed and then requested his take-off clearance. He failed to notice an aircraft on the taxi strip ahead of him in spite of its flashing lights until his aircraft had struck the tail of the parked machine. Inadequate lookout was responsible for the accident which resulted in damage to two aircraft.

27 -- NO TRAFFIC LIGHTS HERE

Following landing the student turned his Harvard off the runway and, without checking on traffic, started to cross a parallel runway on which another Harvard was landing. The instructor saw the danger and applied brake. Suddenly becoming aware of the situation the student also applied brake - and the aircraft stood on its nose. A combination of errors contributed to this accident. Firstly: the student failed to clear his path before attempting to cross a live runway. Secondly: the instructor - who was keeping a lookout - had his microphone switch off and could not warn the student of what was happening. Thirdly: the instructor applied brake without telling the student that he was assuming control.

28 -- DRILL OF VITAL ACTIONS

Because of high wind conditions at his base the student pilot was diverted to an alternate airport. While on the downwind leg he accomplished only part of his landing check. Completely forgotten was the undercarriage, and this in spite of the noise from the warning horn. Undercarriage warning horn noise was partly responsible for poor radio reception with the result that the tower operator was unable to make the pilot understand. The latter merely acknowledged the tower transmission as a landing clearance - and touched down wheels up! Alertness and a complete landing check would have prevented this accident.

* * * * * *

Know Your Compasses

by
S/L N. Levitin

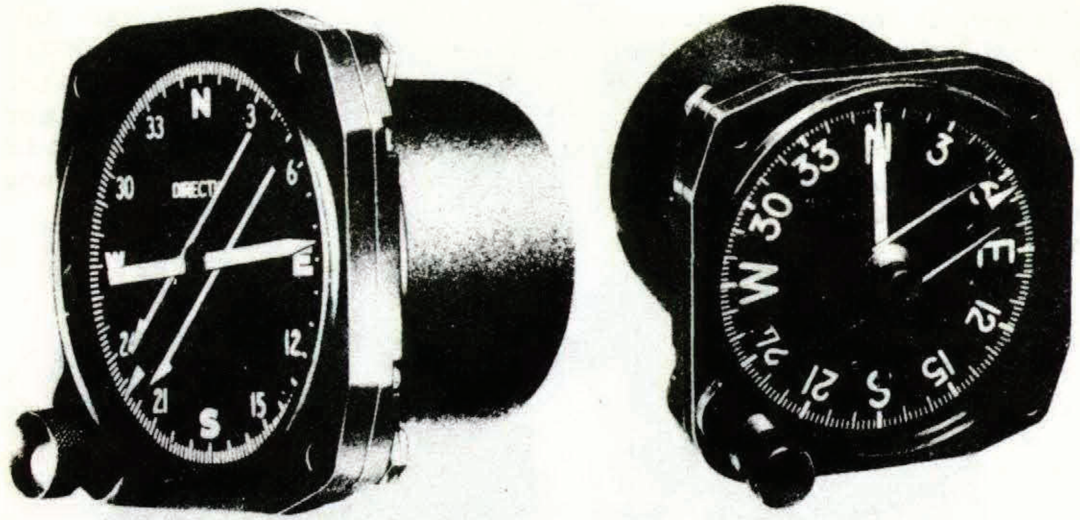
At present, many different types of compasses are used to present heading information to pilots on similar-looking indicators. This had led to some confusion in the minds of those who have not studied the matter, and many pilots either do not know what to expect from different types of compasses, or they do not realize when the heading indication is reliable. The purpose of this article is not to describe in detail the compasses in use in the RCAF, but rather to stress those differences in performance of compasses which may have some bearing on flight safety.

The old liquid-type magnetic compass formerly used for heading indication has been relegated in most aircraft to the role of a stand-by compass, to be used only as a check and in the event of failure of the modern electrically-driven remote indicating compass. It has many faults, including indicating errors caused by aircraft turns and accelerations, oscillation due to liquid swirl, and deviation errors caused by its required position in the cockpit of the aircraft. It cannot drive repeaters to give remote heading indication, nor be used to feed ancillary equipment such as the API. For these reasons the liquid-type magnetic compass has been replaced by modern compasses which can be located in aircraft positions where deviating effects are small, and which can drive repeaters and feed ancillary equipment as desired. It nevertheless serves an important function as a stand-by compass, and should be so used.

The remote indicating compasses most frequently used in the RCAF are the DRC, Magnesyn, Fluxgate and Gyrosyn compasses. Of these the DRC has its own characteristic presentation, presents no ambiguity, and as it is considered obsolescent it will not be discussed. The other three compasses have approximately the same heading presentation, and as an uninitiated pilot might therefore expect similar performances from them, he would either get into difficulty if the expected efficiency was not obtained, or he might consider the system in use as unserviceable when sufficient knowledge would allow him to correct the instrument.

THE MAGNESYN COMPASS

The Magnesyn compass is a remote indicating compass which is not gyro stabilized, and therefore has all the faults and instabilities of any ordinary liquid-type direct-reading compass. It is subject to turning and acceleration errors, has even greator pivot friction than the P-type compass, and has transmission errors when tilted which may amount to as much as 10^{o} for steep angles of tilt. It can therefore be seen that in climbs or dives or in turning and accelerations the compass is unstable and inaccurate. At high speeds because of the large acceleration involved, the Magnesyn compass becomes very unstable and at speeds in excess of 400 knots is virtually useless.



Pilot's Indicator

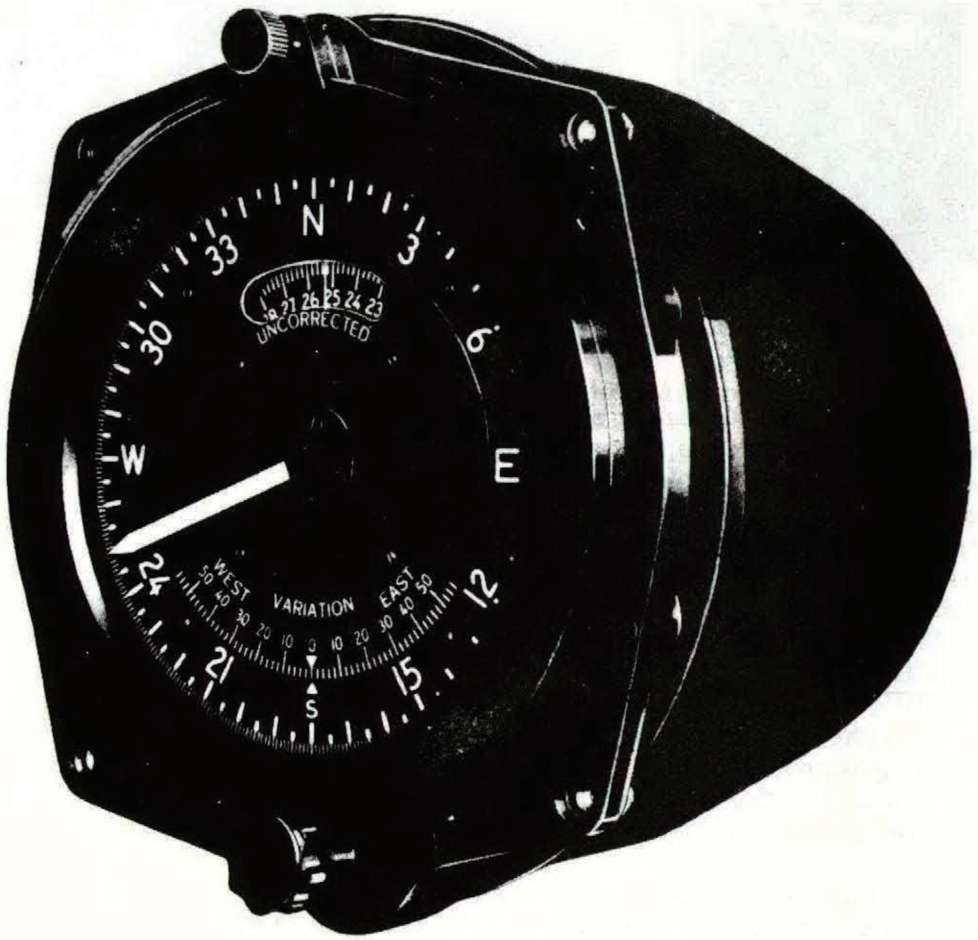
The only advantage of the Magnesyn over the P-type compass is that the magnetic element can be remotely positioned to reduce deviation and the heading indication can be presented vertically on the pilot's panel. It has no advantages and many disadvantages when compared to modern gyro-stabilized compasses and although the presentation may be the same to the pilot, he must remember the many limitations of the Magnesyn compass.

THE FLUXGATE COMPASS

The Fluxgate compass is also a remote indicating compass providing heading indication on a repeater on the pilot's panel. In addition to using the flux principle instead of a magnetic needle fo find direction it has other advantages over the Magnesyn compass.

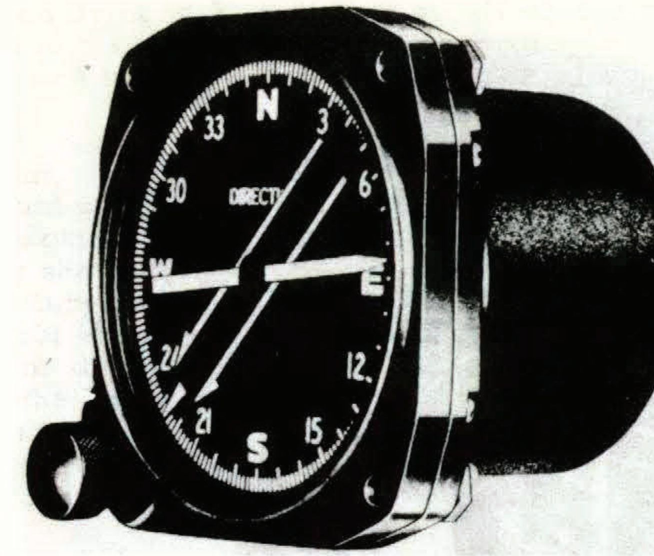
The first is that the magnetic element or "Fluxgate" is stabilized in the horizontal plane by a gyro. This does not mean, as so many pilots seem to think, that the gyro is "slaved" or that it stabilizes the heading indication, but only that the gyro keeps the Fluxgate from tilting out of the horizontal plane. This eliminates turning and acceleration errors, and errors in a climb or dive, which in itself is quite a valuable improvement.

Although the gyro is not a directional gyro in itself, it is nevertheless useful since it maintains the Fluxgate in the horizontal plane up to a limit of 65^{o} of tilt of the aircraft. At higher degrees of tilt than this, the gyro will topple and will require erection before the compass will again indicate correct heading. Erection will be accomplished very slowly by the instrument itself, but it can be done quickly by the quick erection button usually located in the navigator's position. It should be noted that this erection mechanism aligns the gyro with the aircraft fuselage and not with the horizontal plane although the latter is required for accurate functioning of the compass. It is important for the pilot to realize that the instrument will not function properly until the gyro has been erected with the aircraft in level flight, and if used without this precaution the compass will not indicate the correct heading.



Master Indicator
Fluxgate Compass System

Another point that should be brought to the attention of the fledgeling pilot is that magnetic variation can be put into the Fluxgate system at the master indicator. This cannot be done with either the Magnesyn or C2 Gyrosyn compass, although the latter has been modified in some aircraft to allow this operation. This is an advantage when true heading is used by a navigator, and it is a necessity for those aircraft using mechanical computors such as Air or



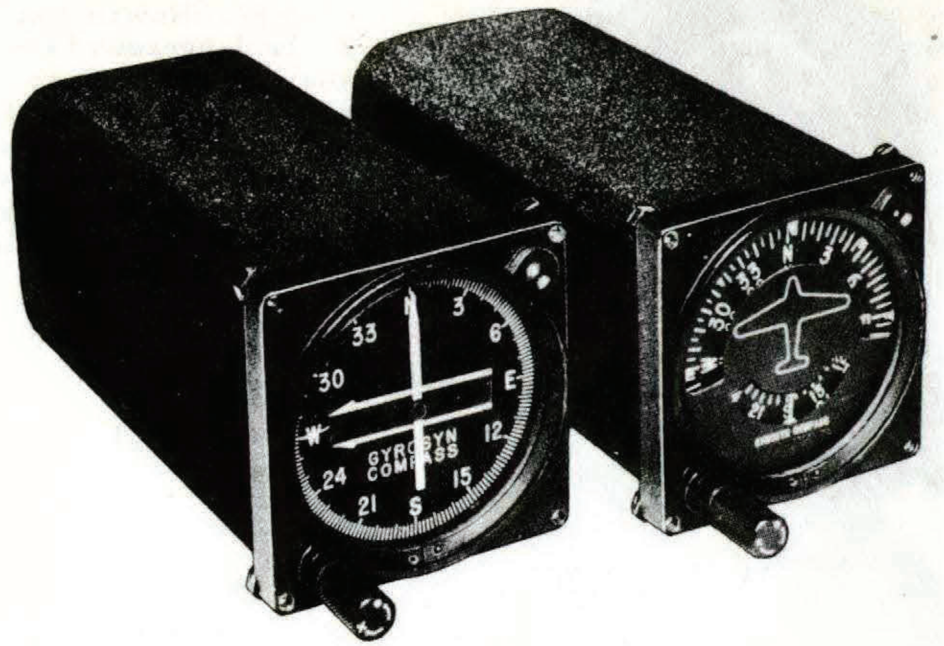
Pilot's Repeater Indicator
Fluxgate Compass

Ground Position Indicators. However it may be dangerous in other situations. When a pilot enters an aircraft unaware that variation has been entered into the system, he may unwittingly attempt to steer a magnetic heading when true heading is being indicated on the dial. This, of course, may lead to complications, especially if a large amount of variation has been used. It is important, therefore, for the pilot to realize when variation is included in the pilot's heading presentation, and to ensure that this feature is being used correctly.

THE GYROSYN COMPASS

The C2 and J2 versions of the Gyrosyn family of compasses have been adopted as the standard compasses for use in the RCAF although some C1s are still in use. These instruments are magnetic slaved gyros and may be used either as magnetic compasses or as free gyros. The danger that exists for the careless pilot, of course, is that he may mistake the instrument for a compass when it is operating as a gyro and may attempt to fly magnetic headings on the indicator. He must therefore know how to control the instrument to take advantage of the two choices offered and must know at all times which mode of operation is in use.

Another advantage of the Gyrosyn compass over similar instruments is that the gyro is non-tumbling up to 85° of tilt. This allows a greater degree of manoeuvreability of the aircraft before the compass is non-effective. It must still be realized however, that after manoeuvres exceeding 85° the gyro will require resetting. In the C2 the necessity for resetting is indicated in the annunciator window. In the J2 no indication is given and the pilot should be prepared to take the necessary steps whenever he performs violent manoeuvres.



C2 and C2-A Gyrosyn Compass Indicators

In the C2, the function of the annunciator in the window on the upper-right face of the indicator is to show whether the correct magnetic heading is being indicated. If there is a steady dot or cross showing in this window the gyro must be synchronized to the earth's magnetic field by turning the synchronizing knob. This knob is found on the indicator and is also marked with a dot or cross. It must be turned in the direction of the symbol appearing in the window. The alternating appearance of the cross and dot is a sign that the compass is synchronized and functioning properly. The steady appearance of either the dot or the cross in level flight indicates malfunction. When the instrument is used as a free gyro neither dot nor cross is visible in the window.

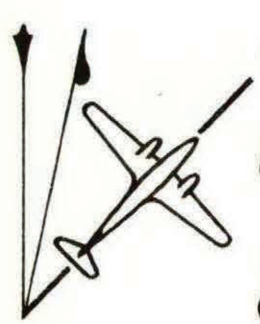
In the J2 compass no annunciator is provided to indicate when the gyro has toppled. Therefore the pilot must realize that after violent manoeuvres the instrument requires synchronization with the earth's field. In this system this is done by means of a push button which causes the gyro to be realigned quickly in the proper direction.

A modification of the C2 incorporating the G4B Master Unit is used in some Expeditor aircraft. This allows variation to be set into the system and true heading to be used. In this case, when variation may be left in the instrument by the navigator without the pilot's knowledge, precautions similar to those mentioned under the Fluxgate compass are necessary. The pilot must therefore know

when flying in Expeditor aircraft whether this feature is incorporated in his compass and whether any variation correction is being applied before he can use his instrument effectively.

One fault of the Gyrosyn compass is that the magnetic element, usually positioned in the wing, is pendulously mounted. This would normally lead to turning and acceleration errors since the "fluxvalve" is not always in the horizontal plane. However, in ordinary short period oscillations this tendency would be dampened by the large moment of inertia of the gyro, and no apparent oscillation would be noticed in the indicator. Nevertheless in long sustained turns the effect of the accelerations caused by change of direction on the fluxvalve would permit wrong signals to be transmitted to the heading indicator. Thus the compass is not entirely free from acceleration errors, as is generally believed to be the case by most aircrew, although these errors rarely exceed 10°.

It can be seen from the above resume that a pilot cannot accept without reservation, the direction indicated to him on the compass dial. He must know what type of compass is being used and realize its limitations; whether it is a gyro stabilized magnetic compass or not; whether or not variation can be set in at the navigator's position without this being indicated at the pilot's position; whether the gyro is erect or toppled if a gyro is being used to stabilize the magnetic element; whether or not the indicator is synchronized with the earth's field; and whether the compass or the gyro is being used when this choice is offered. All this must be known if flight safety is to be maintained.

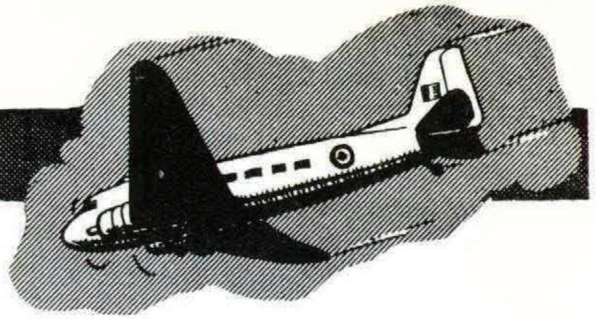


don't be easily satisfied !

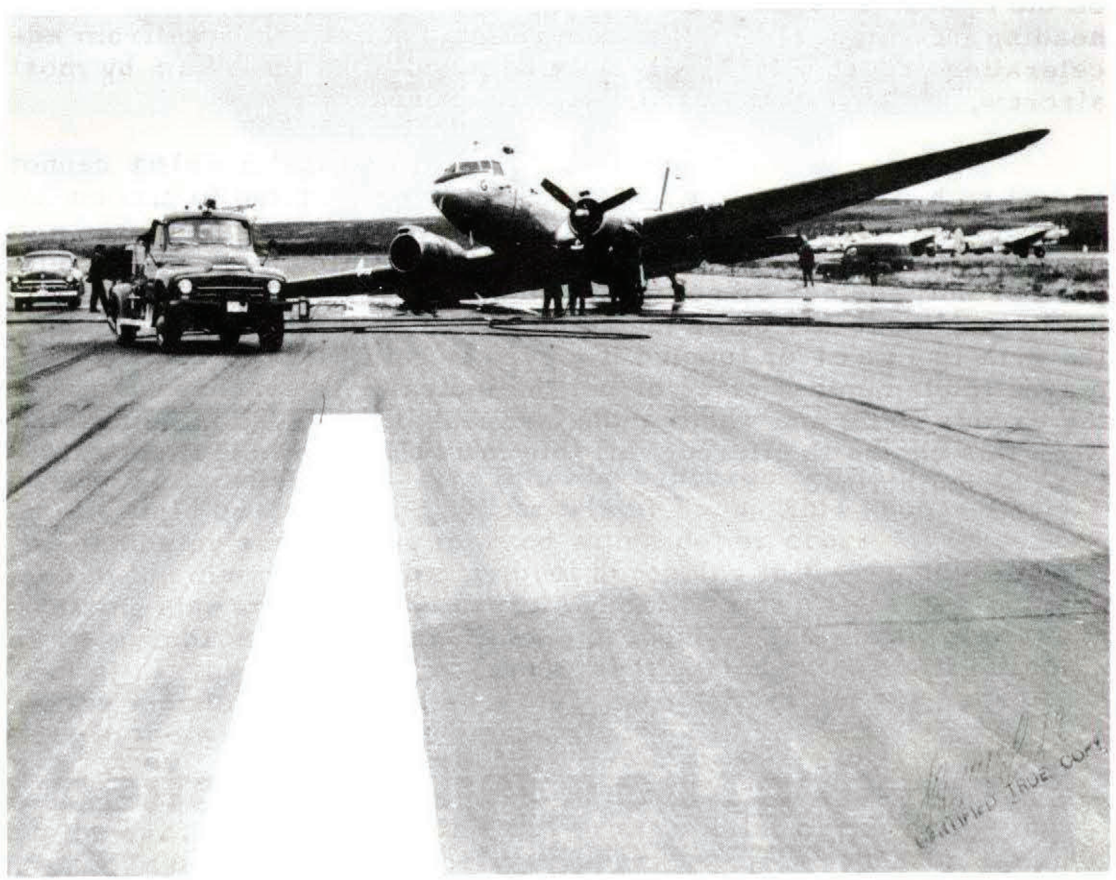
Check and cross check to

PROVE THAT HEADING

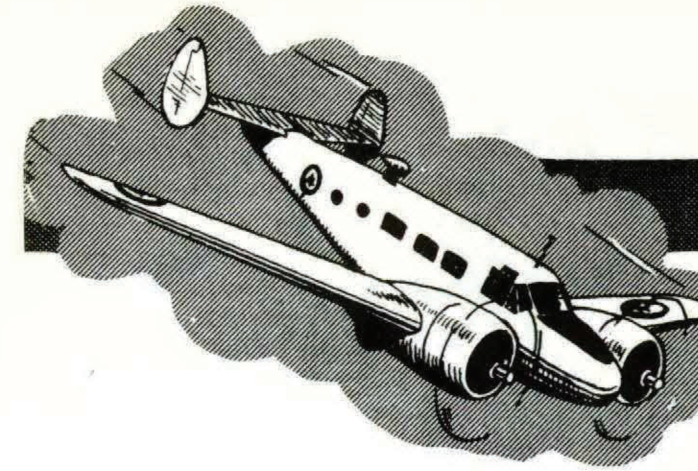
DAKOTA



29 -- DIVIDED ATTENTION



During the take-off run the pilot of this Dakota glanced down to see if the co-pilot was making a correct undercarriage "up" selection. While his attention was diverted he permitted the aircraft to sink back to the runway where both propellers struck. Because of fire and loss of power in the starboard engine, the feathering button was pressed and the fire extinguisher operated. A single-engined circuit and landing were completed, but following touchdown the starboard undercarriage collapsed.



EXPEDITOR

30 -- FAST TAXIING vs GOOD CONTROL

After completion of a local training flight the pilot was taxiing to the parking area. A marshaller directed the pilot to a parking spot and the pilot states, "I followed his directions and used my own judgement". Taxi speed was high and the turn radius correspondingly large. The aircraft struck a post and dented the port fin. The accident is assessed primarily as "Pilot Error". A secondary assessment is charged to "Ground" because of inexperience on the part of the marshaller. Ask yourselves: Is fast taxiing worthwhile?

* * * * * * * * *

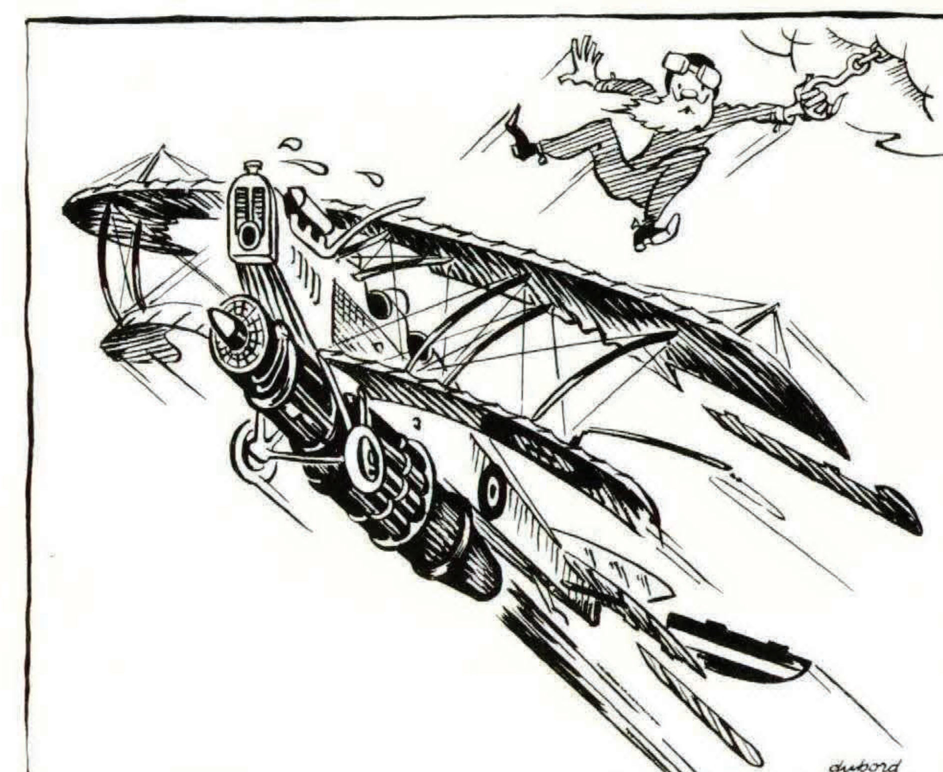
One of the most significant factors affecting the design of modern aircraft has been the quest for speed. The era of high sub-sonic and supersonic flight is no longer a vision of far-sighted aeroplane designers - it has arrived! The classical reciprocating engine-propeller combination is no longer suitable as a source of power for high-speed aircraft. The development of the turbo-jet engine has been largely responsible for the many notable advances made in the field of high-speed flight; it has led to a tremendous increase in the amount of power available to push our aircraft higher and faster through the air.

A turbo-jet engine is a very powerful machine. Although much simpler to operate than its reciprocating counterpart, it must not be treated with indifference. Normally it is your friend - but it may easily become a roaring beast, belching smoke and fire. The most satisfactory way of showing respect for these engines is to ensure that the operating limitations of the engine are adhered to. In particular, it is most important that the maximum allowable operating temperatures are not exceeded. The adverse effects of prolonged over-temperature operation are discussed in more detail below.

The nature of a turbo-jet engine is such that very high temperatures are necessary for its efficient operation. For a particular type of engine, the thrust developed is reflected by the jet pipe temperature. The rotating parts of a turbo-jet engine must be able to withstand very high centrifugal stresses and high temperatures; unfortunately, these two requirements are not compatible. The mechanical strength properties of metals decrease rapidly with an increase in temperature. Some materials, such as ceramics, are highly resistant to elevated temperatures but they do not possess the required mechanical strength. Many notable advances have been made in the development of temperature-resistant, high-strength alloys. However, even the best alloys presently available will withstand extremely high temperatures only for a relatively short period

of time. Our design engineers are constantly striving to increase the normal engine operating temperatures, as this makes it possible to build more efficient and more powerful engines. In the final analysis, however, it is usually necessary to effect a compromise between many factors such as the weight, cost, availability and the mechanical strength at elevated temperatures of the materials considered.

The optimum operating temperature of a particular type of engine is necessarily determined by design considerations. The maximum allowable temperatures are obtained by applying a suitable factor of safety to the optimum temperatures. Consequently, when an engine is subjected to an over-temperature condition, the safe limits of the engine are exceeded and some damage is bound to take place. The amount of damage which does occur is a function of the temperature and of the time element involved. This heat damage is cumulative. The amount of damage done to an engine when it is momentarily subjected to an overheat condition may not be sufficient to jeopardize the safe operation of the engine. However, if the condition is repeated several times, there may soon be cause for serious concern.



"... the quest for speed."

What are the possible ramifications when an engine is subjected to an over-temperature condition? It is known that the internal structure of the engine may be considerably weakened, and a possibility exists that the engine may fail in flight. When an engine failure due to over-temperature operation does occur, it is usually accompanied by disintegration of the compressor and/or turbine. Furthermore, it is known that such failure of turbo-jet engines in flight, with subsequent fire and explosion, is the predominant cause of accidents in which fire occurs before impact.

Turbine rotor blade failure is usually attributed to improper starting procedures by pilots and maintenance personnel whereby an over-temperature condition is induced in the turbine. During a climb at constant throttle setting, the rpm and jet pipe temperature of some types of engines may rise with increasing altitude. At high altitudes, this temperature rise may be as high as 10°C per thousand feet. The throttle setting must be adjusted throughout the climb to keep the rpm and jet pipe temperature within limitations. A compressor stall is invariably accompanied by a rapid increase in jet pipe temperature. However, it may also cause sufficient damage to the compressor to initiate failure.

It should be mentioned that the predominant cause of compressor failure is foreign object damage to the compressor rotor blades, with subsequent vibratory fatigue and compressor disintegration. The prevention of accidents due to foreign object damage depends upon the diligence of all personnel in keeping foreign objects away from the air inlet of the aircraft. This may be accomplished by thorough cleaning of parking areas, taxi-strips and runways. It is also possible for the jet wake of preceding aircraft to blast foreign objects into the air inlet of following aircraft. Proper operational control of formation taxiing and take-offs will help to prevent this cause of foreign object damage.

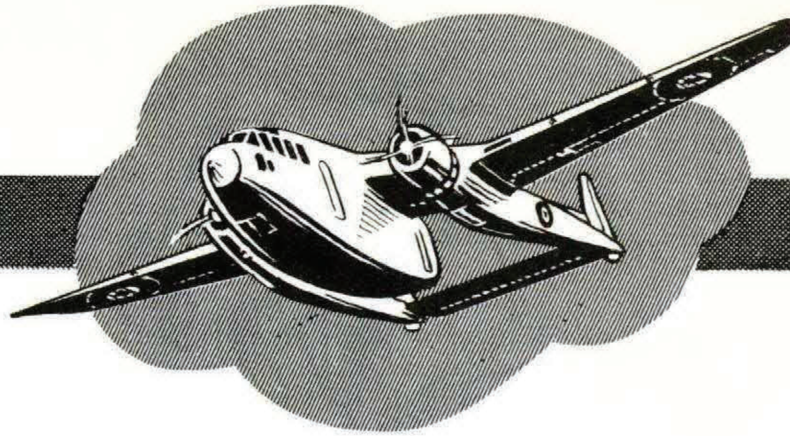
On compressor failure, the blades usually exhaust aft through the combustion chamber. However, compressor blades have been known to be thrown through the compressor casing. Turbine failure usually causes the blades to be thrown through the exhaust cone and fuselage, which results in the engine combustion products being emitted through the holes. This condition leads to smoke and sometimes fire coming from the aft portions of the aircraft, other than the tailpipe area. It is also possible for thrown compressor or turbine blades to damage fuel or hydraulic lines, or the flying control system of the aircraft. This could easily result in complete loss of control of the aircraft.

"... reporting .... over-temperature conditions."

The importance of reporting and recording all over-temperature conditions cannot be over-emphasized. The procedures to be followed are detailed in Engineering Orders and Pilots Operating Instructions. It is the responsibility of all personnel concerned to become acquainted with the regulations applicable to the type of engine with which they are concerned, and to ensure that they are complied with.

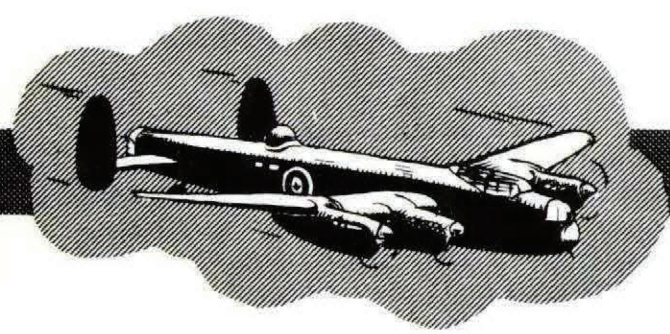
There appears to be a certain reluctance among personnel to perform this very important duty; they feel it is a reflection on their operating technique and ability. However, these regulations were devised for the protection of our aircrew and aircraft. Remember! If you fail to do your duty, you are risking the lives of pilots who fly the aircraft on future flights. It may be you!

C·119



31 -- MAINTENANCE

Following a training flight this "Box Car" joined the circuit for a landing. When power was reduced the starboard engine began to back-fire violently. The instructor instituted overshoot action by applying power and the back-firing ceased. When back-firing recommenced with a further power reduction, the propeller was feathered and a single-engined landing accomplished. Technical investigation revealed a spark plug loose through improper installation.



LANCASTER

32 -- FAULTY MAINTENANCE

During flight in formation the pilot noticed a bad engine oil leak and attempted to feather the propeller of that engine but without success. Technical investigation revealed the fact that a feathering line end fitting had failed as a result of over-torquing at installation. It was also disclosed that the failed part should have been replaced by a similar one of stronger material and that the modification had been signed for but not completed.

"PRICELESS PROSE"

Our readers have occasionally credited the staff of Crash Comment with the origination of the accident report extracts appearing in our "Priceless Prose" column. The bouquet is appreciated but undeserved. These pearls have been borrowed verbatum from accident summaries. No credit for either theme or wording can be ascribed to personnel of the Directorate of Flight Safety.

Pilot states:

> "On noticing the aircraft was high on approach full selection of flap was made, however, student feels that at that time the wrong lever was selected, which consequently contributed to a wheels up landing being carried out.
>
> The undersigned feels that inexperience on this sequence contributed to this unfortunate accident".

Pilot states:

> "On completion of feathering action the co-pilot informed me that the starboard engine was on fire. I switched the fire extinguisher selector to the starboard engine. Before pulling the toggle I asked the co-pilot, "Has the prop stopped?" He answered, "We haven't got one." I then pulled the fire extinguisher toggle."

You think you have trouble! Listen to this flying instructor's story:

> "The student began his take-off run and the a/c weathercocked toward wind, instead of keeping straight and taking off the student panicked, applied brake violently and closed the throttle. This caused a violent swing to develop to the right. The a/n officer did not have a chance to react as his head was slammed against the coupe top hard enough to shatter it, and the a/c looped to the right."

Instructor states:

"Just as -- was completing the check of fuel contents, we heard a tearing noise and felt a sudden jarring of the aircraft. On looking around I noticed the propeller of aircraft-- --quietly resting on the horizontal stabilizer of my aircraft."

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Fascination

The U.S. Aero Medical Association recently dealt with the problem of "fascination", currently believed to be responsible for some unexplained crashes.

This is defined as "a state of narrowed attention associated with excess concentration on some object or task, with resulting loss of voluntary control over response". A ground target toward which a fighter pilot is diving may "fascinate" him and cause him to forget to "pull out". Or concentration on an engine difficulty, or on an approach altitude, may obliterate from the pilot's consciousness the warning blast of a landing gear warning horn - and result in a belly landing. To circumvent these and other "fascination" errors, medical scientists pointed out that lives might be saved if they can devise a cockpit device which can blast loose a pilot's concentration on any "idee fixe" or on an all-too-specific flight function at a critical moment.

(U.S.) Flight Safety Foundation

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