FLIGHT COMMENT

ISSUED BY

DIRECTORATE OF FLIGHT SAFETY
R.C.A.F. HEADQUARTERS • OTTAWA, ONT.
JANUARY · FEBRUARY · 1955

RESTRICTED

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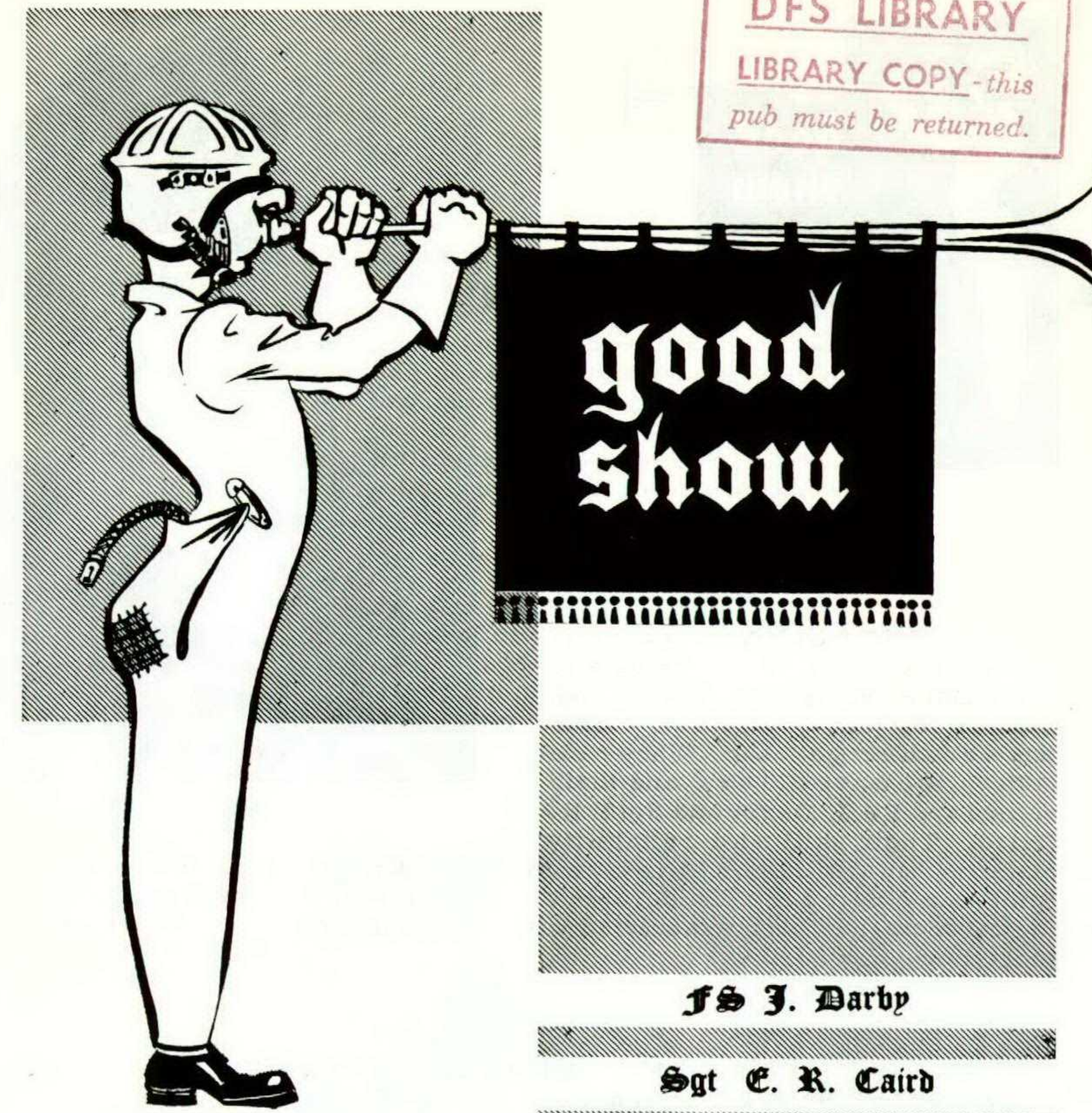
C O N T E N T S

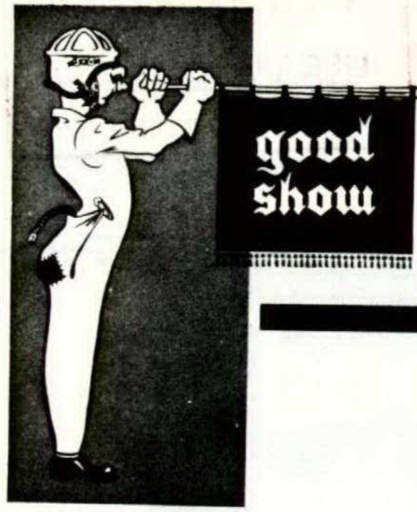
★ ★ ★

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



FS J. Darby

Sgt E. R. Caird



SGT E.R. CAIRD

FLIGHT COMMENT takes this opportunity to pay special tribute to two RCAF NCOs who distinguish themselves just about every time the weather gets bad. They are both GCA controllers and their names are FS J. Darby and Sgt E.R. Caird. Their skill and reliability are credited with helping to avert a number of major aircraft accidents. Both men have had considerable experience in their field. FS Darby, for example, has been associated with flying control since 1940 and has logged over 1200 GCAs.

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FS Darby was duty GCA controller when an RAF Canberra was compelled to land at his station one night. Flying conditions were hazardous—visibility and ceiling had been reduced to zero by rain and fog, and personnel on duty in the control tower could not even see the runway. Although he was unfamiliar with the Canberra, FS Darby nevertheless controlled the pilot's approach and brought the aircraft safely down onto the runway. On another occasion—again at night—he "brought in" three Dakotas which had been diverted to his station because of bad weather at their base. Among the passengers on board the Daks were the (then) Minister of National Defence and 18 Army VIPs.

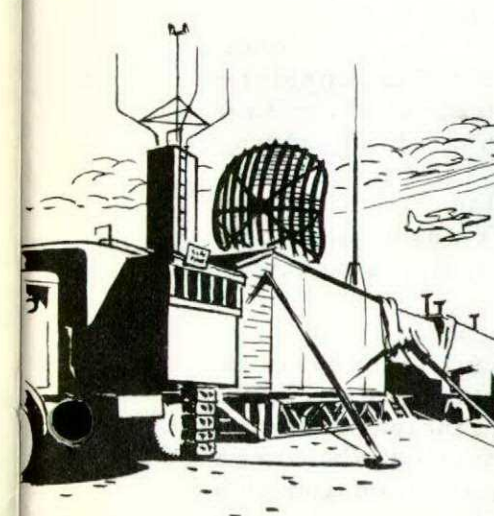
*

One of the more spectacular highlights in Sgt Caird's airforce career occurred on the RCAF's 30th anniversary. Four Canucks, flown by student pilots on a training exercise, were recalled to base when the weather suddenly closed in. The weather continued to deteriorate below GCA limits but the aircraft could not be diverted because of low fuel supplies. Three of the pilots began their descent while the fourth climbed to 36,000 feet to conserve fuel.

Sgt Caird brought the first three Canucks into the GCA pattern and their pilots landed successfully. The fourth pilot then descended and began his GCA. On the first run, excessive icing on the windscreen prevented him from landing. He next declared his fuel supply so critical that he doubted whether another GCA could be completed. In the face of this crisis, Sgt Caird brought the Canuck around on an extremely abbreviated pattern and, because the pilot's vision was now completely obscured by ice, talked him right down onto the runway instead of releasing him 50 feet above the button and 500 along the runway, which is normal GCA action.

*

Such incidents are typical of the manner in which these two NCOs have performed their duties under the strain of emergencies. To the pilot sweating it out in zero-zero conditions, the best sound in the world is the calm, clear, confident voice of the operator saying, "You are now in GCA contact". FS Darby and Sgt Caird deserve great credit for the job they are doing because it is the skill of such men on the ground that makes safe flying possible for those in the air.



FS J. DARBY

Hi-level met

by
C.L. Johnstone
Meteorological Adviser
Air Defence Command

SUBSTANTIAL KNOWLEDGE in the realm of high-level meteorology has been gleaned only during the past ten to fifteen years. Prior to World War II, relatively little was known about the weather above 20,000 feet, and forecasts of conditions beyond that altitude would be classed by even the most charitable standards as mere intelligent guesses. To-day routine forecasts of conditions up to the 40,000-foot level are issued with a high degree of confidence and anything below 20,000 feet is considered low-level. Aeronautical developments in the next decade will undoubtedly bring forth a whole new set of meteorological requirements the fulfilling of which may revolutionize our present-day approach to the study of high levels in Earth's atmosphere.

Present day high altitude flying is largely restricted to levels between 20,000 and 45,000 feet. The principal meteorological phenomena associated with these levels—apart from frontal cloud and the tops of cumulo-nimbus which occasionally reach the level or slightly above the level of the tropopause, are the jet stream, clear air turbulence and condensation trails.

THE JET STREAM

ATMOSPHERIC cross-sections indicating the existence in the upper westerlies of a narrow stream of very strong winds, were published in Germany as early as 1933. The significance of this initial indication of the phenomenon now known as the "jet stream" was not realized until 1944 when Dr. H.C. Willett of the Massachusetts Institute of Technology, in his book "Descriptive Meteorology", presented mean cross-sections of the atmosphere over North America which clearly showed a localized high-velocity stream of air in the upper levels. These cross-sections, together with reports from American high-altitude bomber pilots (who were then encountering exceedingly strong high-level winds over Japan), undoubtedly sparked the subsequent wide-scale investigations into the principles responsible for this phenomenon.

An important paper by Dr. C.G. Rossby, then of the University of Chicago, appeared early in 1947. Dr. Rossby made certain assumptions and drew conclusions regarding the general circulation of the atmosphere which were essentially a solution to the problem; but it was left to the staff members of the Department of Meteorology, University of Chicago, to name and describe the jet stream. This they did later in 1947 in a paper entitled "On the General Circulation of the Atmosphere in Middle Latitudes". Since that time, a great deal of research has been

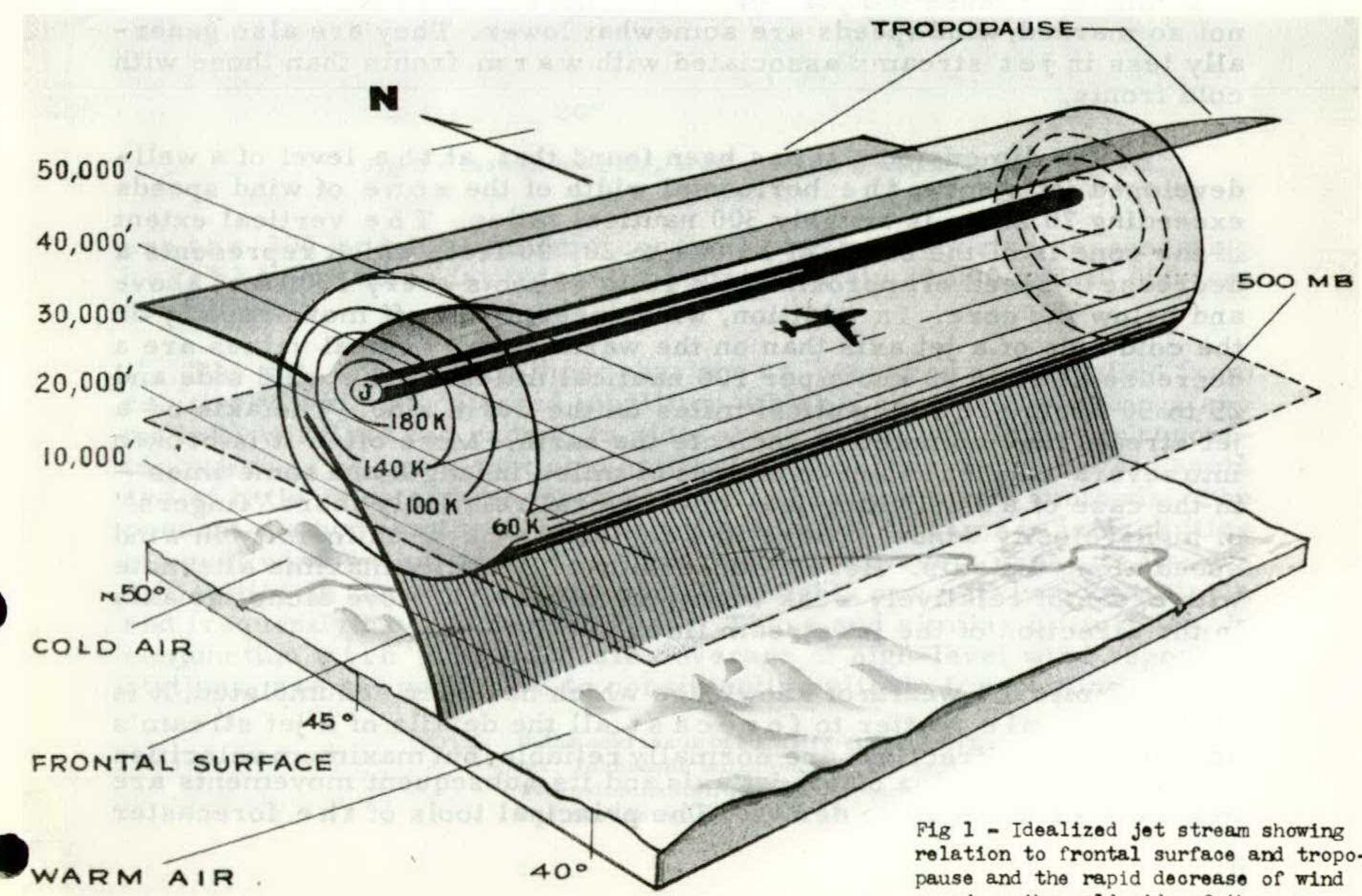


Fig 1 - Idealized jet stream showing relation to frontal surface and tropopause and the rapid decrease of wind speed on the cold side of the core.

devoted to the problem, including investigations by the Meteorological Service of Canada.

So that further research may be more readily carried out, a technical report, entitled "The Jet Stream", has been prepared and published under a contract between Project AROWA of the United States Bureau of Aeronautics and the University of Chicago. This document provides a complete evaluation and summary of all applicable jet stream information up to the beginning of 1953. Every study has shown that jet streams, as part of the prevailing westerlies, are largely confined to the regions between the 30th and 60th parallels of latitude and are closely associated with frontal systems. Their cores are at the tropopause level, almost directly above the 500 millibar position of the associated front, where the tropopause often becomes discontinuous due to its sudden changes in height over adjacent warm and cold air masses. It is therefore evident that any frontal surface separating air masses of sufficiently different temperatures can support its own jet stream.

Because they are closely connected with frontal systems, jet streams tend to meander over a broad area. Normally there is a westerly component to the direction of the winds; on rare occasions there may even be an easterly component. In the winter, wind speeds in a well-developed jet stream may range from 150 to well over 200 knots; in summer, because temperature differences between air masses are not so marked, wind speeds are somewhat lower. They are also generally less in jet streams associated with warm fronts than those with cold fronts.

As for dimensions, it has been found that, at the level of a well-developed jet's core, the horizontal width of the zone of wind speeds exceeding 70 knots is roughly 300 nautical miles. The vertical extent of the zone is of the order of 15,000 to 20,000 feet, which represents a decrease in speed of approximately 10 to 15 knots every 1000 feet above and below the core. In addition, wind speed drops off more rapidly on the cold side of a jet axis than on the warm side. Typical values are a decrease of 60 to 80 knots per 100 nautical miles on the cold side and 25 to 50 knots per 100 nautical miles on the warm side. The axis of a jet stream may completely encircle the earth. More often it is broken into several sections some thousands of miles in length and sometimes — in the case of a dissipating jet — into several relatively short "fingers" of high-velocity winds. There is a decided lack of uniformity in wind speed along the axis. Here a succession of velocity maxima alternate with areas of relatively weak winds, all of which move along the axis in the direction of the jet stream flow.

Despite the wealth of knowledge which has been accumulated, it is still no simple matter to forecast all the details of a jet stream's activity. Wind directions are normally reliable; but maximum velocities and the exact location of the jet axis and its subsequent movements are much more difficult to derive. The principal tools of the forecaster

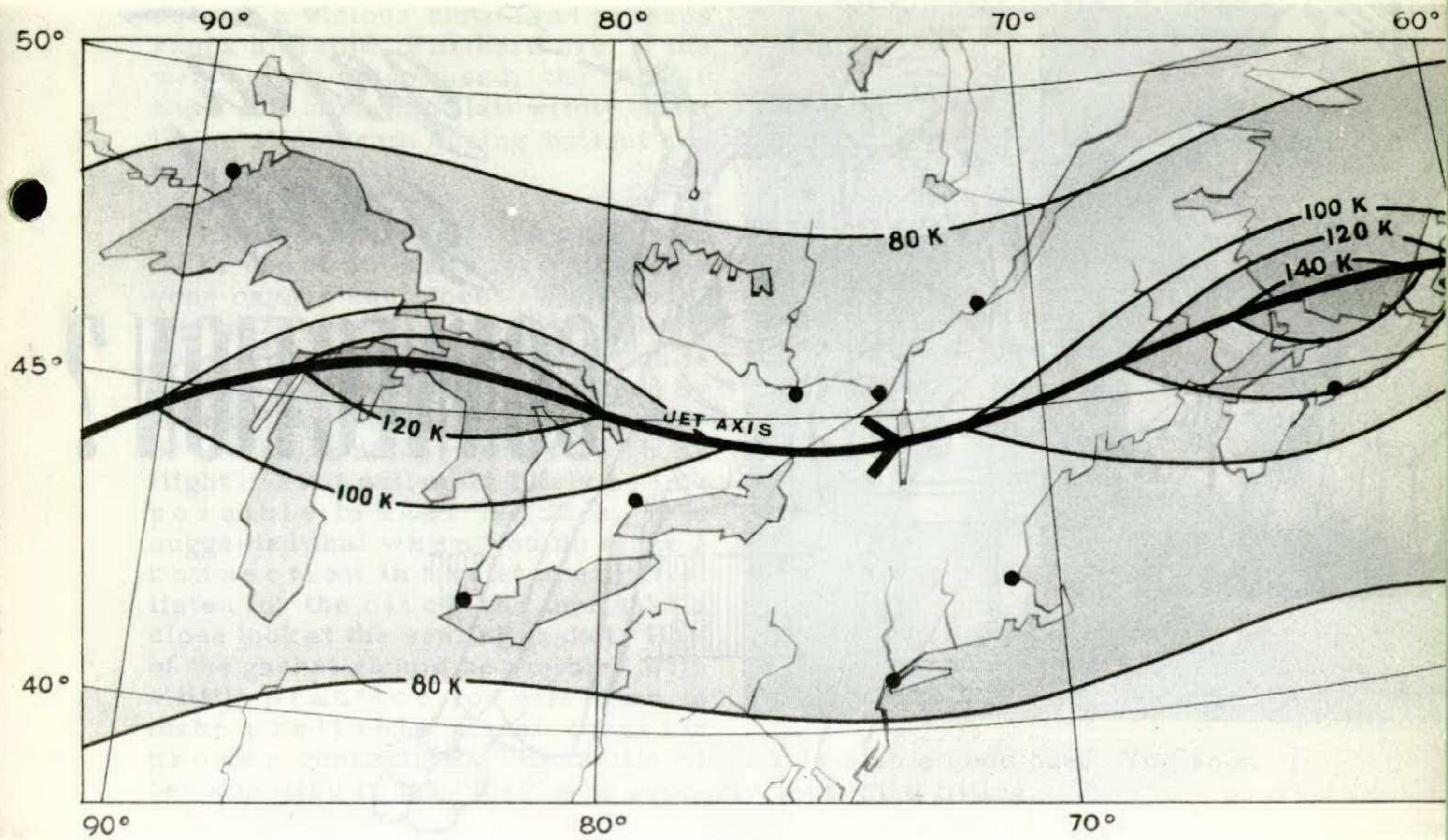


Fig 2 - Isotach analysis, showing velocity maxima along a jet axis.

are the 300-and 200-millibar constant-pressure charts, representing heights — in these latitudes — of approximately 30,000 and 40,000 feet respectively.

The data from which these charts are prepared are supplied from relatively widely-scattered localities where upper air soundings are made by wireless and radar. In most cases the distance between reporting points is so great that conventional analyses of upper-level charts are of little value and recourse has had to be made to new methods. The present method employed in connection with jet streams is isotach (line of equal wind speed) analysis. This method, however, presents its own difficulties in that winds to the desired heights are not always available and frequently have to be computed. These and similar difficulties, in conjunction with the inadequate coverage of high-level wind reporting stations, are not conducive to consistently reliable forecasting.

NOTE: In the next issue of FLIGHT COMMENT, Mr. Johnstone will conclude his article with a discussion on clear air turbulence and condensation trails.

Got a good CONNECTION ?

DURING CERTAIN MANOEUVRES in high-speed jet aircraft, separations of the quick-disconnect fitting on oxygen lines have been occurring from time to time, and in some cases the separation has not been noticed immediately. There is no need to draw pictures on the seriousness of this sort of occurrence at high altitude. In similar fashion, oxygen masks and helmets have been lost during ejection even though they have been properly fastened. There is reason to believe that these difficulties may have been incurred through improper use of quick-disconnect anchoring devices—for example, the web strap on the male end of the accordian hose which connects the mask to the oxygen regulator.

Some pilots have admitted that they never use the strap. This is a dangerous practice. Perhaps we can win you over to a saner attitude by telling you frankly what could happen during bailout or ejection. When a pilot leaves his aircraft or seat with the quick-disconnect fittings intact, a considerable amount of tension builds up before the fittings separate. The accordian hose may even stretch to several times its own length before it automatically disconnects from the female fitting. Once released, the energy in the stretched rubber is quite sufficient to pull the male fitting end back into the pilot's face with enough force to

deliver a vicious blow—and perhaps knock him cold. Furthermore, if the web strap is not used, the rubber hose will certainly flail wildly about in the slipstream during bailout and may cause injury.

Here are a few tips on how to make use of the safety features on your oxygen equipment. When hooking up the mask hose to the regulator hose, ensure that the connection is positive. This can be ascertained by listening for the click on the connector locks. In noisy areas such as flight lines it will most likely be impossible to hear the click. It is suggested that when you do make a connection in a quiet area, first listen for the click and then take a close look at the sealing gasket. Half of the gasket should be visible. With a little practice you will learn to make a reliable visual check for proper connection. The tactile check is also a good one. You soon become used to the "feel" of a properly connected fitting.

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Now let us consider how you use the attaching devices. The object is twofold: To anchor the end of the accordian or mask hose so that no pull on it is transferred to the mask; and to secure it so that the end will not flail about in the air. If you abandon your aircraft at so high an altitude that you require your bailout bottle, its oxygen line will aggravate the flailing of the mask hose if the latter is not fastened down. The web strap on the male fitting is provided to anchor the end of the accordian hose. So that it will remain with you, it should be attached to your parachute harness. One turn around the harness will not be sufficient to take up the slack. The strap should be wound around the harness twice, if possible, and care taken to see that the snap fastener is secure. These precautions will ensure that any strain likely to be put on the accordian hose will be taken by the web strap, prevent an inadvertent disconnect, and keep the heavy metal fitting from flailing about after ejection.

The next step is to fasten the oxygen regulator hose securely to the quick-disconnect fitting in the manner prescribed earlier. Once the connection is made, the alligator clip is then used to absorb any strain that might be imposed on the regulator hose and to prevent an inadvertent disconnect at that end of the line. Differences of opinion exist as to where the alligator clamp ought to be attached. In order that the clip itself will function properly, it must be fastened as closely as possible to the web strap so that no strain will be applied to the connectors. This can best be done by attaching the clip to the loose end of the web strap and making certain the strap is positioned so that the load is pulling across the fastener rather than lifting the button from it. One other method of attaching the clip is to fasten it to the seat harness. The objection to this is that movement of the body may change the relative positions of the web strap and the alligator clip, thus inducing an inadvertent disconnect.

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We at DFS sincerely hope that the information contained in this article will stimulate readers to give some extra thought to the safety features incorporated in their flying gear. They are there for a definite purpose and there is no reason why they shouldn't be used. The next time you climb into that aircraft, try out the hookup suggestions we've made here and see for yourself how those features can be used to advantage.

THE OLD ORDER CHANGETH

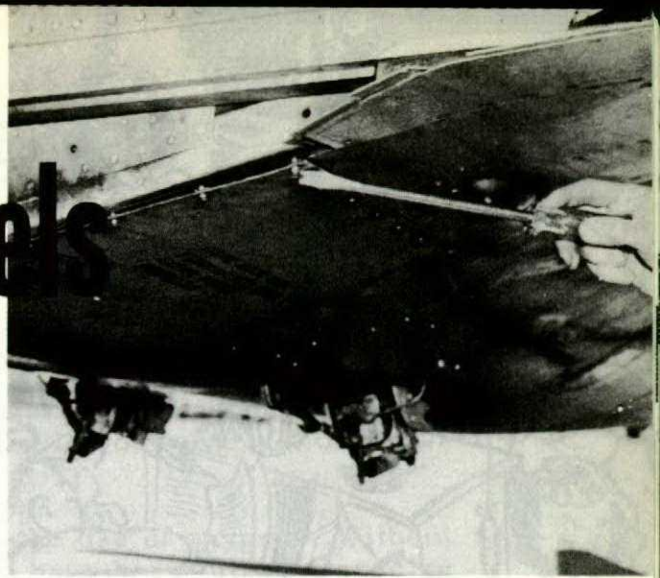
A new AFAO pertaining to the reporting and investigation of aircraft accidents has been published. The reference is AFAO 21.56/01, AIRCRAFT ACCIDENTS — REPORTING AND INVESTIGATION. This order, dated 7 Jan 55, replace AFAO A6/3. A useful check list for quick reference is outlined in Appendix "B". The differences between the old and the new orders will be apparent from this appendix.

GETTING YOURS?

Here is a list of the A.I.BRIEFS published by the RCAF's Directorate of Flight Safety during the past year. If you haven't been seeing them, check with your Flight Safety Officer or the unit publications section.

BEHIND THE 8-BALL	AT ALTITUDE—YOUR LINK WITH LIFE
AIR-TO-AIR	YOUR PLIERS CAN KILL
DANGEROUS DEBRIS	KNOW THAT BROWN PUFF
JET BLAST	FROIN

LOOSE Panels

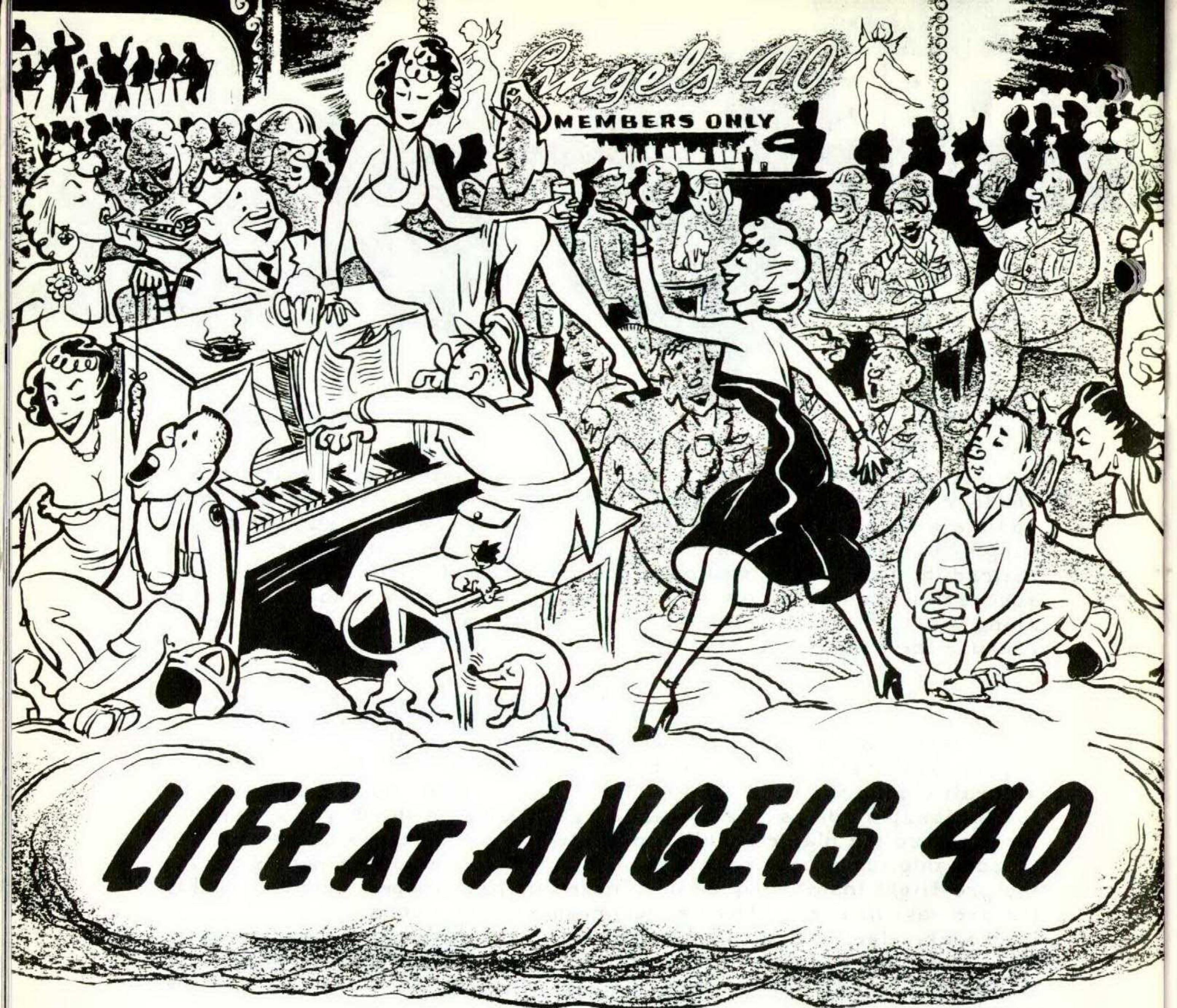


"A loud roar was heard from behind the pilot's seat and a sharp shudder was felt." "At approximately 380 knots the pilot heard a noise and the aircraft started to vibrate. In flight, pilot was advised by his wingman that his starboard ammunition door was missing." "It was noticed that the canopy was open one and one-half inches. After an unsuccessful attempt to close it, the canopy tore away in the slipstream along with both crash helmets." "The radio had fallen out, apparently because the supporting panel had not been properly fastened."

*

These quotations are all extracts from a few of the too-numerous reports received dealing with the disappearance of bits and pieces of aircraft during flight. In some cases, pilots were named responsible for the loss; in others, maintenance was at fault. A third type of assessment placed the blame equally on pilots and maintenance. However, the inescapable conclusion is that if pilots had noticed loose panels during the pre-flight inspection, and unlocked or partly-open canopies during the pre-takeoff check, these occurrences would never have happened. Improperly-fastened panels have produced a wide variety of results. They have caused fatal accidents. They have also damaged wings and tailplanes. In the lucky cases, damage was limited to the loss of the panels.

External pre-flight inspections are done to ensure, among other things, that detachable or hinged panels are firmly secured and that dzus fasteners are locked so that slots are aligned properly with the indicators painted on the panels. During your check, remember NOT to hammer panels so violently with your fist that you damage them. Such treatment can lead to bending and distortion—and subsequent loss of the panels in flight. Panels found to be insecure should be correctly fixed before the aircraft's engine is started up. Pilots should always bear in mind that, although the securing of panels is primarily the responsibility of groundcrew, it is the pilot's responsibility to ENSURE before takeoff that those panels are fastened.



LIFE AT ANGELS 40

Recent issues of FLIGHT COMMENT (and its predecessor, "Crash Comment") have contained articles on anoxia, hyperventilation, oxygen equipment and other subjects associated with the use of oxygen. Why has so much emphasis been placed on this one topic when there are so many other interesting aspects to high-altitude flying? The answer is simple. There have been too many accidents, incidents and near misses in which oxygen or oxygen equipment was a contributing factor.

Why is this so? Well, although maintenance and equipment may have been contributing factors in a few instances, the main cause was AIRCREW'S LACK OF KNOWLEDGE—lack of knowledge of oxygen

equipment and of the physiological aspects of oxygen use. Let us examine this accusation. You are responsible for a pre-flight check of your oxygen equipment prior to takeoff. If properly done, this check will assure that your complete system, including the mask and regulator, are serviceable and that you have sufficient oxygen for the flight. THERE IS NO EXCUSE FOR ANYONE TAKING OFF WITH UNSERVICEABLE EQUIPMENT! And the likelihood of an unserviceability occurring in flight is rather remote—as we will point out later. If you get into trouble then, the most probable cause is your own lack of knowledge or misuse of your equipment.

Why is so much importance attached to the use of oxygen? Without going into the physiological aspects (which have been fully covered by your M.O.) there is one indisputable reason: YOU NEED IT TO LIVE. It is as simple as that and as important as that; and the higher you go the more vital oxygen becomes.

*

In a complex modern aircraft there are many things which can go wrong—and they sometimes do. Losing the use of certain equipment may make flying difficult or even impossible; but you may still make a safe landing or, at worst, successfully abandon your aircraft. That is the important thing: Most damaged equipment may adversely affect your aircraft and yet leave you in complete command of all your faculties—including your ability to make decisions. This is not the case with oxygen. Oxygen and oxygen alone affects you and your personal performance.

The greater your height when any other aircraft unserviceability occurs, the longer the time you have in which to make a decision. Exactly the reverse situation is true when your oxygen equipment is involved: The higher you are, the less time you have. For example, if you have a flameout at 40,000 feet in a T-33, you have roughly 20 minutes in which to decide whether to force land or abandon your aircraft. At a cabin altitude of 30,000 feet, without oxygen you have one to two minutes before becoming unconscious; and you would not be in complete command of your senses during

a sense of well-being

the whole of that time. The crisis is heightened by the fact that there are no horns, clanging bells or flashing lights to warn you at the onset of anoxia. You have only a pressure gauge, a blinker and your own senses. Unfortunately the effects of anoxia are such that your senses, rather than warn you, often react oppositely and fill you with a sense of wellbeing which persists until it is too late.

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Discouraged? You have no need to be, because the odds are largely in your favor. However, it is important to realize that, because your senses are not entirely reliable where anoxia is concerned, you must depend to a high degree on your personal oxygen equipment and the aircraft's oxygen system. How reliable is this equipment? Let's take a look at it. The A-13A oxygen mask has been in use for some time. Although there have been complaints about its comfort, functionally it performs very well. Its serviceability can be determined quickly by a few simple tests prior to flight and there is little possibility of it becoming unserviceable during flight.

In addition to the mask you have an emergency and bailout assembly which, when connected to the A2 disconnect, provides a second oxygen system entirely independent of the aircraft system. By pulling a handle you may provide yourself with a constant flow of oxygen for a period of from seven to ten minutes — ample time to get you down to a safe altitude. Obviously these units have not been fully appreciated in the past; it has been found that some aircrew do not even carry them, while others fail to plug them in. There is on record one instance of a pilot who was noted carrying around an empty one. The boys in the back room call that sort of thing "cutting down on your odds".

Now for the aircraft system itself. All oxygen units consist essentially of the following: cylinders to hold the oxygen supply, a regulator, a blinker, contents gauge, and the necessary piping and connections. Aside from leaks which may develop, there is little that can happen to the oxygen cylinders or to the plumbing between cylinders and regulator. Aircrew should have no worry in that quarter. Leaks in the tubing between regulator and mask are another matter. However, if you make a proper pre-flight check you should discover these leaks easily and be able to have them rectified prior to takeoff. The regulator is a relatively simple device which, as the name implies, regulates the flow of oxygen to ensure that a proper ratio of oxygen to cabin air is available for all altitudes up to approximately 30,000 feet—at which point 100 per cent oxygen is supplied. Beyond 30,000 feet, the regulator will supply oxygen under pressure either as selected by aircrew or automatically.

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Summing up, then, it does not appear that there is anything complicated or troublesome about an oxygen system. Nevertheless, it would be wise to look closely into the sort of problem that could arise. The big headache is ANOXIA. If it ever overtakes you, it will have sprung from one of these six causes:

- No oxygen in the system
- Pressure line to the regulator blocked
- High outward leakage causing excessive loss of oxygen
- Regulator diaphragm torn or high inward leakage between you and the regulator causing excessive dilution of oxygen
- Loose mask allowing excessive dilution of oxygen
- Inadvertent disconnect with complete deprivation of oxygen.

Possibly a little discussion of each cause would be in order. One step in the pilot's pre-flight check is an examination of the contents gauge to ensure that he has sufficient oxygen for his trip. He should also check this gauge periodically while enroute. If these precautionary measures are conscientiously complied with there is no possibility of taking off with little or no oxygen aboard the aircraft—or running out of oxygen in flight.

not feeling up to snuff

Should the pressure line to the regulator break, the contents gauge will drop quickly to zero and the blinker stop blinking. If the line is blocked, the blinker action will stop.

High outward leakage will deplete the oxygen supply when the regulator is delivering pressure. This could be caused by poor connections between you and the regulator or by a hole in the regulator diaphragm. Outward leaks can be discovered prior to takeoff provided an adequate preflight check is made.

Regulators are replaced every six months so that a torn diaphragm is a remote possibility in the cause list. Additionally, it is considered that the tear would have to be a fair size to affect the oxygen dilution characteristics of the regulator. If you do a proper preflight check for outward leakage you are also doing an adequate inward leakage check. This statement is based on the assumption that any hole, tear, or poor connection in the tubing or diaphragm will cause both outward and inward leakage.

A loose mask will cause excessive inward leakage of air which will result in excessive dilution of the oxygen delivered to your lungs. If you do your preflight and inflight mask checks you should have no worries.

There are indications that a number of inadvertent disconnects have occurred. The possibility that they may have been the cause of some fatal accidents cannot be discounted. You should make certain before takeoff that you are connected up properly—a detail which ought to be included as part of your inflight check, particularly after you have performed any manoeuvre that may have put a strain on your accordion tubing.

*

From the preceding paragraphs it is obvious that, if you carefully complete the recommended—and tested—oxygen checks, there is little risk of finding yourself upstairs with unserviceable equipment and suffering from anoxia. When you have inspected that equipment and found it shipshape, you can have every confidence in it. If, flying alone, you suddenly become aware that you are not feeling up to snuff for some reason, don't waste time musing about your condition. Rip down to 10,000 feet and think about it there—and then go through those checks to make sure that everything is OK.

Never tangle with anoxia. It's a fight no man can win, because oxygen lack is a tough customer. Give him one chance to throw you and you may stay down for the count. Oxygen trouble or no oxygen trouble—the choice is mainly up to you. Keep an eye on that equipment and you'll never have an anoxia "Near Miss"!

[Hyperventilation has not been discussed in this article because it was dealt with fully in "The Facts on Hyperventilation", by W/C J.C. Wickett, which appeared in the First Quarter issue of FLIGHT COMMENT for 1954.—ED.]

Static Phenomena

by
W/C H. Pearce

READERS will remember that an article entitled "Storage and Handling of Jet Fuels" appeared in the First Quarter issue of FLIGHT COMMENT for 1954. W/C D.D. Cunningham, Chief Technical Officer at 6 Repair Depot, Trenton, took a close look and decided he just couldn't "buy" it until he had asked a few questions first.

He asked those questions in a letter to the editor, and authoritative answers were supplied for us by W/C Pearce who is Director of Vehicle and Marine Engineering. First we'll quote from W/C Cunningham's letter and then turn the chair over to W/C Pearce.

W/C CUNNINGHAM:

The article on "Storage and Handling of Jet Fuels" has raised some queries about present aircraft refuelling practices which, to the best of my knowledge, are common at most RCAF units. In the footnote to the article the statement is made that "Chains dragged behind refuelling tenders for the purpose of dissipating static are useless.......The only safe way to handle tenders is to bond from tank to ground and aircraft to ground etc—procedures covered by the appropriate EOs............".

EO 00-25-6, 13 Mar 53, "Safety Precautions—Refuelling of Aircraft," is, I assume, the appropriate EO referred to. Under the heading "Static Electricity," it is stated in para 10 that, "Before refuelling or draining operations commence, both the tender and aircraft must be individually grounded and a bonding cable connected between the tender and aircraft before removing the filler cap". In practice it has always been accepted that the ground chain on the refuelling tender and the ground chain on the aircraft individually grounded the tender and the aircraft. The modern jet aircraft—Sabre, T-33 and Canuck, are equipped with grounding chains for this purpose. In the light of DMM's information about the uselessness of grounding chains, the accepted refuelling practice must be unsafe.

Para 13 of the article details the grounding sequence and reference is made to "an approved and identified ground". The implication is, therefore, that approved grounding points are available on the tarmacs or aprons where refuelling is normally carried out. I have never seen grounding points in the tarmacs or aprons at any unit where I have been—even those operating jet aircraft. How, then, can the tender and aircraft be safely grounded? Possibly your informant in DMM can enlighten me on this point and also as to what constitutes an "approved ground". Do the present RCAF specifications for tarmacs and aprons on jet units call for the installation of grounding points?

W/C PEARCE:

Your correspondent shows a healthy doubt regarding our findings so far on the effects of static on refuelling tender operations. This is a good thing if such a viewpoint leads eventually to widespread realization of the dangers involved and to demands that corrective action be taken. The dangers are real—not imaginary. Possibly then the editorial chair will allow a bit more space than usual to recount what little we do know about the subject.

Benjamin Franklin, whatever else he contributed to American history, is best remembered as the physicist who first proved that clouds somehow have the ability to generate an electrical current. His experiments with a kite, string and a door key are too well known to repeat. That this was not an isolated incident is adequately proved at the moment this is being written. A severe, early-evening electrical storm has plunged the writer's home into darkness and stimulated him to reflect further on the subject of static and its effect on RCAF operations.

The RCAF first encountered difficulty due to static phenomena during the mid-1920s. At that time, during early air survey work, many rolls of air survey film were ruined by "spiderlike" markings which, running throughout the film, obscured the photographic image so as to make the film unprintable. Our CAS can vouch for this; he reflew many otherwise excellent photo lines ruined by this bugaboo.

Many experiments were made over the years but the problem of static on air survey film was not overcome until wartime research into high altitude photo reconnaissance became a pressing matter. This research showed that you cannot prevent static discharge; you can only surround the object to be protected in such a manner as to guide the discharge away from it. Insofar as air cameras are concerned this consists in housing them in compartments, the temperature of which is regulated so that component parts are not subject to violent temperature changes but remain throughout in the "comfortable realm". There are more details to the action but this statement comprises the basic principle.

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A lot of people are under the false impression that static is generated on a cold, clear day but not at all on a warm, humid one. This is not so, as the phenomenon of the thunderstorm should show. The difference is only that when a charge is generated during humid weather it is more likely to bleed off than accumulate. That is why you seldom get a wallop from the door handle of your car in the summer but receive many a shock on touching it in winter. All of which brings us down to actual facts and the way in which they affect RCAF refuelling tender operations.

If the layman is to have a better understanding of static and refuelling tenders he must first recognize that when two dissimilar substances are either rubbed together or pass each other rapidly and in close proximity, an electrical current of high potential may be generated. Comb and hair, silk and glass, clouds and earth—and aircraft fuel and hose. These are examples of substances which react with each other in this way. Usually the magnitude of the charge is proportional to the area of the object. There are a good many square feet of surface area to a refuelling tender or an aircraft. If the potential of one is positive and of the other negative and these two bodies are brought together, an electrical discharge will take place; and if contact is between the refuelling hose nozzle and the aircraft's tank, a fire may be the result. May be? It has been—to the tune of one aircraft and one refuelling tender last year. "But", our correspondent says, "what of the grounding chains on the tender and the grounding chain on the tail wheel of the aircraft?" A fair question, but one for which the wrong answer has cost the RCAF heavily.

Some months ago, following no less than twelve separate refuelling tender fires in various parts of the country, an exhaustive investigation was held. (Indeed it still goes on.) Several of these fires originated apparently with defective mechanical design. The causes of others remained elusive. During investigation the RCAF turned over two tenders to the National Research Council for measurement of suspected electrical potential. Subsequent experiments revealed that these tenders were veritable electrical condensers on wheels. There were differences in potential in pumps, tank and chassis. Most important, however, was the discovery that the "static grounding chains" had an electrical resistance of 2×10^6 ohms. In other words, the chain is useless as a ground. It may interest our correspondent (W/C Cunningham) to know that highway traffic acts are being amended so that the static chain on fuel trucks will no longer be a compulsory fitting. On the writer's desk, as this article is being written, are several synthetic rubber straps which have been submitted by one of the rubber companies as a satisfactory grounding medium. They are going to be tested; but even if they are successful there will still be no room for relaxing vigilance.

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Now to other aspects of the subject. JP fuels were once thought to be "much safer to handle" than high octane gasoline. This is not so for two basic reasons. Firstly, there is some evidence that kerosene fuels flowing through refuelling hose generate static charges to a much greater degree than pure gasoline fuels. Besides, we refuel at higher speeds today and the rate of flow—two to four hundred gallons per minute—aggravates the situation. Secondly, because of the lower volatility of JP fuels, spillage will linger in odd pockets as an explosive vapor for prolonged periods. High octane, vaporizing quickly and rising, is carried away rapidly by even a slight breeze. During an investigation that followed a vapor fire, an airman identified a tender as the "one that always left a pool of fuel under it following refuelling operations".

What about confirmed static phenomena? Some have not only been uncovered by investigation but have also been duplicated successfully and repeatedly in laboratory experiments. For example, there was a tender being filled from bulk storage via one of the manholes. The cover had been removed and, though resting on the top of the vehicle, was insulated from it by a synthetic rubber gasket. Just at this time some "cu-nimb" clouds passed overhead. As he was replacing the cover, the operator actually saw a spark jump from it to the manhole edge. In the resulting "bang" he was fortunately blown clear. Investigators came to the conclusion that a passing cloud had differentially charged the cover while it rested insulated from the tank. They subsequently duplicated the situation in a laboratory using a small, scale-model tender.

On another occasion a fuel transport vehicle backed up to the steel deck of a platform at a bulk storage depot so that a discharge tap at the rear of the vehicle came in contact with the deck. There was a spark and the ensuing fire destroyed both vehicle and tank storage. Once again laboratory experiments confirmed that a static discharge, made possible by inadequate grounding, was the most likely cause. While this was not an RCAF accident, we have lost a bulk fuel storage compound and two tenders under conditions that are suspiciously similar. There are reports on record of differential static charges building up to such a potential on both vehicles and aircraft that a discharge took place between a wheel rim and the ground, exhibiting a force sufficient to perforate the tire casing. Such incidents are well documented.

*

Finally, an answer to your correspondent's query on grounding lugs. These were installed in several RCAF stations even before the last war. There are lugs inside hangars at Rockcliffe and Trenton and in many concrete aprons there are so-called "hold down rings" which resistance investigation may show to be capable of acting as ground lugs. The latest installation is at Torbay where new hardstand incorporates a metal mesh and lugs. TCA have asked the RCAF to install grounding lugs at units used by our civil airlines as stopping points. Greenwood, N.S., is one of these. CAA in the U.S. now makes grounding lugs a compulsory feature in airport design, and the possibility of using such fittings in RCAF installations where they do not now exist is being explored.

Until these are a reality, the best we can do is make certain that a good electrical bond exists between tender and aircraft. Only bonded wire or approved conducting hose should be used in tenders. (One of the burned tenders had been fitted with red steam hose). Bond to ground whenever and wherever possible. If a tire casing is mysteriously damaged don't rule out static. Finally, if we still do not know too much about static—and none of us do—let us at least recognize that static potential and modern aircraft fuels are a bad combination. Laboratory experiment has shown that the flow of one drinking glass full of static-charged water can ignite a fuel vapor of explosive mixture. A spark plug is not required.

near miss

CASE OF THE DIRTY INLET VALVE

An eight-plane Sabre formation was flying at 38,000 when one of the pilots experienced a sensation "as though he was pressure breathing." His aircraft suddenly slid out under the formation and fell into an uncontrolled dive. Repeated calls on the RT failed to elicit a response from the plunging plane. Down it went—until, at about 10,000, it suddenly levelled out and the pilot's voice came through to the formation leader to say that he was OK and returning to base.

After landing, the aircraft was examined by an instrument technician who blew into the hose leading from the regulator, succeeded in producing a hissing noise in it, and concluded that a leak had developed in the diaphragm. The regulator was removed and forwarded to IAM where it was tested—and found fully serviceable!

*

Later the pilot was interviewed in detail. During the exchange of questions and answers it became evident that the "pressure breathing" he referred to could have arisen because of a faulty inlet valve. With this possibility in mind, an experiment was performed on the pilot while he was sitting in a Sabre cockpit: Unknown to him, a scrap of paper was slipped beneath one inlet valve in his mask, making it unserviceable. While doing a preflight check of the oxygen equipment, he encountered the trouble and described the resulting sensation as "possibly similar" to what he had experienced at 38,000 just before he became partly unconscious. When the scrap of paper was removed, the mask functioned normally.

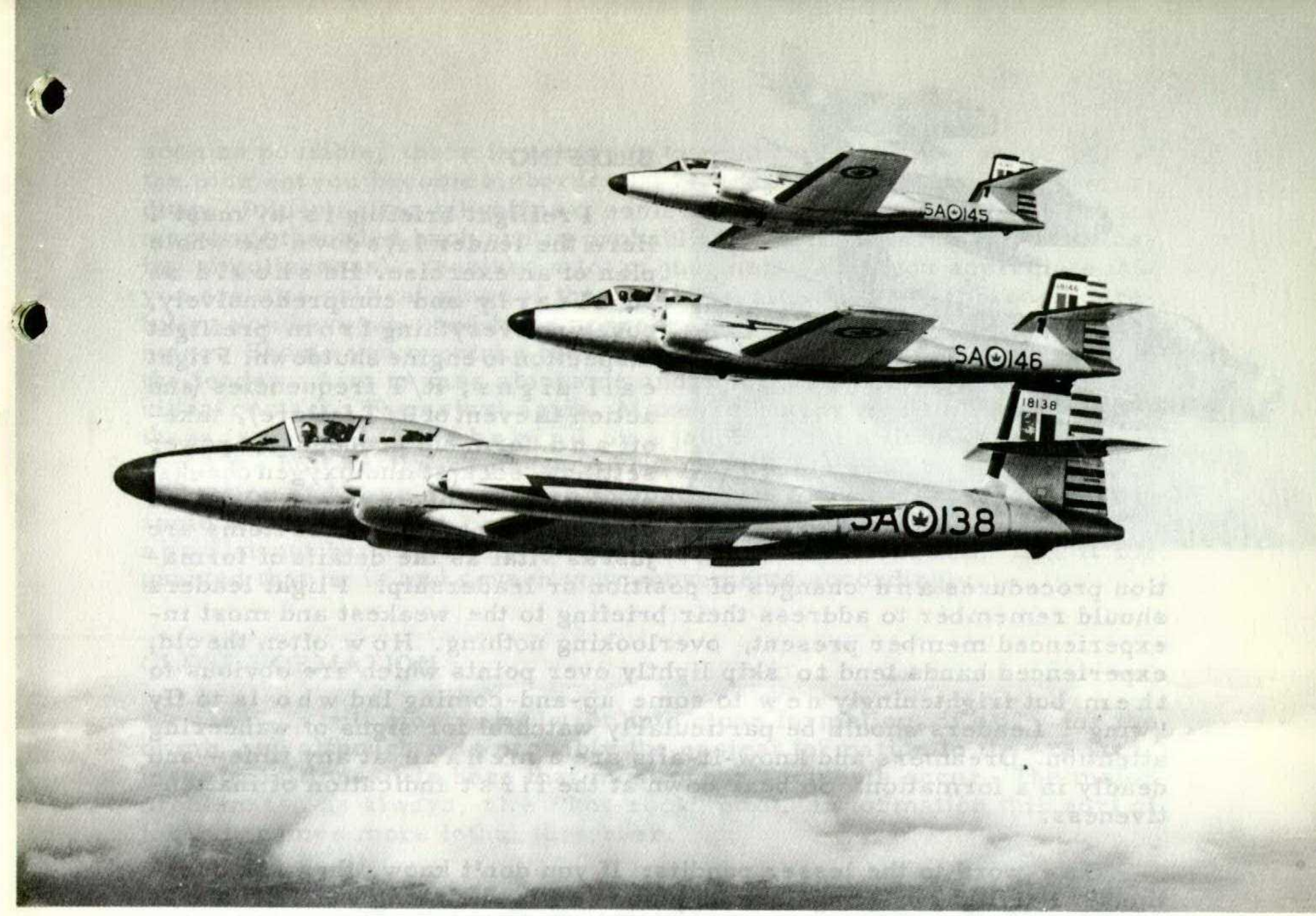
The conclusions reached were that the pilot experienced difficulty exhaling due to a dirty inlet valve; and that he became anxious, hyperventilated, and consequently made himself partially unconscious. Anxiety was likely stimulated by the fear that he was anoxic. Luckily, by the time his aircraft reached 10,000 feet, the hyperventilation had ceased, his anxiety had been allayed, and the pilot was capable of making a normal descent.

*

Two puzzling discoveries came of this particular "Near Miss". Interrogation of all pilots in the squadron disclosed that ONLY A FEW OF THEM really understood the operation of the A13A mask. Examination revealed that many of the inlet valves were so dirty that exhalation could have been rendered difficult—a state of affairs which existed despite lectures by the station medical officer covering the proper use and care of oxygen masks. The entry of small amounts of dust—particularly during the summer—can occur at any time and will prevent proper closure of the inlet valves in your mask.

What does all this tell us? What have we learned? Nothing new, really. It's the same old story. But in case you happen to be the "couldn't care less" type, here it is again. By re-printing it we might save your life.

- ▲ **CHECK THE OPERATION OF YOUR MASK BEFORE EVERY FLIGHT**
- ▲ **HAVE YOUR MASK CHECKED BY SAFETY EQUIPMENT SECTION IN ACCORDANCE WITH LOCAL REGULATIONS AND EO 20-115LB-2 (dated 29 Mar 54)**



FORMATION COLLISIONS

IN AN AIR FORCE like ours—dedicated primarily to fighter operations—the importance of skilled formation flying cannot be overrated. The "lone wolf" fighter pilot has little chance of survival in modern high speed air warfare. Day fighters have to work as a team, and to do so the pilots must be capable of maintaining a high degree of formation integrity, sometimes under the most exacting conditions. If a pilot becomes separated from his formation in a combat area, he courts disaster himself and denies his team-mates the cross-cover he afforded them.

The smallest effective combat unit is a pair of aircraft, and every function normally performed by a single aircraft is executed by the pair—from takeoff right through to a GCA approach. Obviously, to attain such a degree of proficiency, a pilot must practise often and practise hard, and have plenty of confidence in his own ability. He must be keen and aggressive—but also smooth, alert and SAFE! Carelessness or over-enthusiasm can—and often does—result in broken aeroplanes and pilots and ill-humour all round. Flight Safety in formation is really just plain commonsense and sound air discipline. Except in certain unforeseen circumstances, preflight briefings should be followed to the letter and the flight leader's orders and signals obeyed without fail. But enough of this preaching! Let us take a look at a typical four-plane formation exercise and see if we can uncover a few of the pitfalls common to this phase of flying.

BRIEFING

Preflight briefing is a "must". Here the leader lays down the whole plan of an exercise. He should do so clearly and comprehensively, covering everything from preflight inspection to engine shutdown. Flight call signs, R/T frequencies (and action in event of R/T failure), take-off and form-up procedure, power settings, cockpit and oxygen checks, proposed area of operation, expected clouds and weather—these items are just as vital as the details of formation procedures and changes of position or leadership. Flight leaders should remember to address their briefing to the weakest and most inexperienced member present, overlooking nothing. How often the old, experienced hands tend to skip lightly over points which are obvious to them but frighteningly new to some up-and-coming lad who is to fly "wing"! Leaders should be particularly watchful for signs of wandering attention. Dreamers and know-it-alls are a menace at any time—and deadly in a formation. So bear down at the first indication of inattentiveness.

One word to the lesser pundits: If you don't know, then ask questions! Preflight briefings are no place for a shrinking violet who is afraid he might ask a foolish question. The answer to the problem that is plaguing you may mean the difference between triumph and disaster during the flight. So don't swallow it! Spit it out! And be sure you understand the answer.

TAKEOFF AND FORM-UP

Takeoff in formation, when executed as taught, is a fairly straightforward operation with little real hazard involved. Perhaps the biggest problems are overtension and overcontrol in the pilot, two factors which usually go together.

Take it easy on those brakes. A tap of brake early in the roll may be required to keep straight; but remember that differential brake becomes more sensitive as speed builds up. The same applies to nose wheel steering which, while useful early in a takeoff roll, becomes a potential menace as speed increases. Right from the word "go", RELAX. Fly your aircraft smoothly—not with the ends of your frayed nerves.

Slipstream and jetwash can pose a problem when pairs are taking off at short intervals; but if your aim is to get out of the interference as soon as possible, there is not much to worry about. Stay on the ball at the moment you become airborne and be prepared to correct for a wing-drop. Join-up after takeoff is a somewhat sensitive period. The leader may have throttled back and is probably in a turn. Overtaking and closing simultaneously requires a lot of judgment; but if you appreciate that you are at a critical stage of the flight and attempt your approach carefully, you have no need to be apprehensive about an expensive grinding noise. Should you overtake too fast, forget about trying to go through the leader. Aim to pass alongside and below, so that you can maintain visual contact. Then start again. Make the "happy medium" your guide—there is no need to lag behind on a join-up, but a little care will also avoid the bull-in-the-china-shop routine. Should you be number 3 in a formation and have a wing man formating on you during this procedure, avoid harsh control or power movements. Although your wing man should not be "tucked in" at this stage of the formation, take it for granted that he is and govern your movements accordingly.

CLOSE FORMATION

Join-up will most likely be into close formation, if only for the climb, and although it is probably the easiest formation to fly—regardless of position—it is here that most of our accidents occur. The major problem is, as always, the "hot-rock" pilot. In formation this sort of joker becomes more lethal than ever.

During briefing, a set interval is customarily devoted to discussion of close formation flying as it applies to all members of the formation. All, that is, except the boy wonder who is determined to show that he can fly closer than anyone else in the air. (Sad to say, he often does.) Turbulence, downwash from the leader's wing, overcontrolling—all these factors can play a part in the downfall of the overconfident pilot who is forever trying to learn your fuel state from the instruments in YOUR cockpit.

Air discipline is one element of formation flying that must be enforced. If the briefing calls for a 20-foot separation, then that interval should be maintained throughout the exercise. Right there you have an excellent opportunity to demonstrate your prowess by holding station safely. When everyone else in the section attempts to emulate your skill,

you will have a clean, even formation. To overcome the habit of sitting tense in a close formation, make a point of reminding yourself periodically to relax, for nervousness and overcontrolling can be enemies. Alertness is one thing, overtension another. Leaders in particular have a heavy responsibility in this phase of the exercise. Signals must be clear and obvious, turns smooth, and instrument flying (if in cloud) accurate. If another aircraft looms into view take early action to avoid it, for later, harsh evasive action may well be impossible. "Right of way" means nothing if the other fellow fails to see you.

BATTLE FORMATION

Open or "battle" formation does not appear to be a very critical type of exercise, at least from a study of statistics. The aircraft are fairly well separated and in little danger of collision. When a turn comes up, however, the personalities of the drivers again exert their stern influence. The timorous lad will likely disappear from view. Our bombastic scourge of the skies will have the whole situation "taped". He'll throw on bank, roar belligerently across the formation toward his own slot, and woe to the man who gets in his way! In this character's bag of tricks, caution and lookout are for the other guy.

The crossover turn is not a dangerous manoeuvre. We are all taught how to perform it properly, and there are only two points to remember from the safety angle:

- ▲ Watch other aircraft in the formation—don't cross their paths;
- ▲ Do not lose sight of the leader.

Bearing this second point in mind, remember to keep up a rapid neck-swivelling motion whenever you are crossing under the leader. It is usually at this critical point in the manoeuvre, when your eyes are focused on where you judge he is headed, that the leader vanishes. Fight that urge to pull up. Nothing annoys a leader more than to have an aircraft pop suddenly in front of his nose. Take a good look around before changing attitude in any direction. If you are unable to see the other aircraft, give a call on the R/T, for not only is this a good safety measure—it might save a lot of time in getting the formation together again. "Breaks" and "turnabouts" call for an even greater degree of alertness but the same rules apply: Fly smoothly, keep your eyes open, and swivel that neck.

REJOINING

When the leader calls you back into close formation he naturally wants you there as quickly as possible. Should you give him instead a

rapidly-growing plan view of your aircraft's belly you might make him just a little annoyed. From a fair distance out you can afford to aileron in fairly smartly—not forgetting inertia and your rapid closing rate, of course. As you close up, slow your approach and make the last part of the manoeuvre a gentle edging-in. Few pilots can swoop straight through and stop precisely in their slot. Those who can and do employ this technique are—as our American cousins would say—"cruisin' for a bruisin'!" Whenever you misjudge your closure and find the aircraft bearing down on your unsuspecting leader, recognize the error at once and pass him on the underside. That way you can keep him in plain view and the danger of a prang will be vastly diminished. Just a commonsense rule—but so often forgotten.

This is the first instalment of a two-part article. The concluding half will appear in the next issue of FLIGHT COMMENT

JUST RELEASED!

The recently-unveiled Third Edition of CAP 100 (Vol.I, Flying Orders) represents a consolidation of basic flying orders governing the RCAF. When CAP 100 Vol.II Flight Procedure was introduced in 1953, many regulations and procedures were extracted from the 1951 edition. The orders remaining in the older version have been reviewed by the CAP 100 Committee and the necessary amendments and additions made. From these, CAP 100 Vol.I has been compiled.

The grouping of Flying Orders has been improved. For example, regulations pertaining to aircraft in flight have been grouped into a chapter designated "Flying Manoeuvres" and cover such topics as aerobatics, formation flying, forced landings and instrument flying. An attempt has been made to keep these basic flying orders to a minimum in the present volume since the majority of them are enlarged upon as procedures in CAP 100 Vol.II. To assist in making reference, an alphabetical index has been included.

LETTERS TO THE EDITOR

PYXing

SPRING OFFENSIVE

Like the proverbial burlesque queen, we've had cries of "More! More!" tossed in our direction. So, beginning in 1955, FLIGHT COMMENT will appear six times a year. This hopped-up production will put a fresh copy of the magazine into readers' hands every sixty days. Incidentally, there will be no Fourth Quarter issue for 1954. It will be moved up to become the Jan - Feb number for '55.

*

NEW FOR '55

Something different in RCAF accident prevention posters is scheduled to take its place alongside A.I.BRIEFS and FLIGHT COMMENT early in 1955.

The newcomer has been labelled "F.S.MEMO" and is as up-to-date as Wednesday of next week. A delta wing job scooting around cloud makes the poster a real eye-catcher, and its size—a hefty 12" x 16"—provides loads of space for subject matter. In addition, each issue of the memo will appear in one of four colors—green, orange, blue or red.

As indicated by the first two letters in the respective titles, A.I.BRIEFS are triggered by RCAF accident experience, whereas the F.S. Memos have been designed to widen the scope of flight safety education. The first subject selected to appear in this new series of posters is "Capable Captaincy".

WELCOME TIP

Dear Sir:

.......It would be helpful to the unit Flight Safety Officer if a list of the various A.I.BRIEFS published in each quarter was included in FLIGHT COMMENT.

W/C D.D. Cunningham
6 Repair Depot
Trenton, Ont.

(We don't waste any time adopting a good suggestion. The filler on page 10 lists the A.I.BRIEFS issued by DFS since January of 1954.—ED.)

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REFUELLING HAZARD

Dear Sir:

.......I have a comment to offer on the article called "Northern Ops" which appeared in the Third Quarter issue of FLIGHT COMMENT for 1954. Under the section dealing with cold weather servicing there is a paragraph on re-fuelling which states "...........for illumination, we carry a long extension cord and lamp which can be hooked up at the APU."

If this procedure is followed during refuelling, I venture to predict that operational problems will cease to exist for the aircraft being refuelled. Indeed there will probably be a very hot time for all concerned. Seriously, I do not believe that F/O McNeill intended to imply that refuelling was carried on with the APU running—but the implication is there. Such procedure is most unadvisable. Perhaps this point will be covered in W/C Cunningham's forthcoming article, "Static Phenomena".

S/L G.A. Heck
OC CEPE (NAE) Det.
Uplands, Ont.

REPORT IT

DEFICIENCIES IN AIRCRAFT design, errors in aircraft operation, and procedural blunders are often brought to light by means of a well-written, detailed accident report. Such a report, by its very presentation, will automatically stimulate corrective action. Information accumulated from isolated cases may be equally effective if integration of the evidence reveals a pattern of factors conducive to accidents. In both instances the correct preventive measures can be introduced to eliminate or at least reduce the accident potential. The two forms designed to execute these vital services when properly used are the D.14 (Aircraft Accident Report), and the D.6 (Aircraft Accident Investigation).

What about the potentially dangerous situation—the accident that is about to happen? These are the important cases because there is still time to prevent them. The fact that they have not yet occurred is the best possible reason for reporting them before they do. Unhappily, human complacency tends to let a situation develop beyond recall. But if we are to make a worthwhile frontal attack on those factors which contribute most to our accident rate in the RCAF, we must look for our weapons to those alert, responsible individuals who spot trouble before it goes off with a bang and make it their business to sound an adequate warning in time for corrective action to be taken. In circumstances like these, the initiative of technical officers, groundcrew and aircrew personnel in reporting hazards can be of tremendous value in accident prevention.

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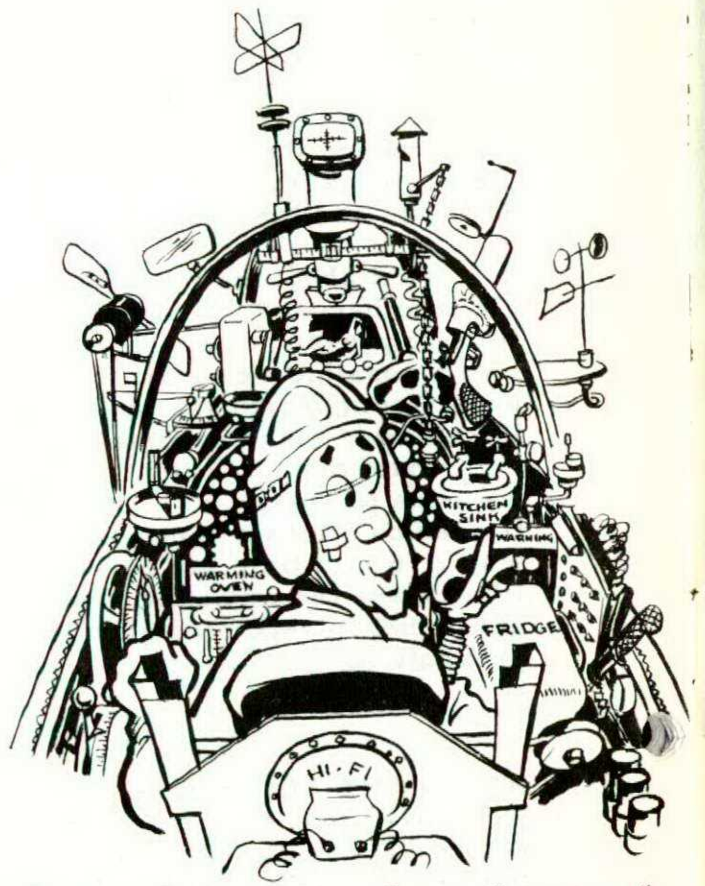
HOW MANY TIMES have you yourself said: "WHY DON'T THEY put a guard over that switch before someone trips it unintentionally?" "WHY DOESN'T SOMEONE change the position of that handle so it'll be easier to use?" "WHEN ARE THEY going to change the shape of that projection or pad it so that it won't catch my parachute harness every time I go to get out of the seat?" "WHY DOESN'T SOMEONE give a better explanation of this system in POIs?" "WHY ISN'T SOMETHING DONE to change this parachute harness so that it fits easier?"

How many times have you said these things? Probably a dozen times every day. Unfortunately, eleven out of twelve times your complaint ends there, the questions unanswered in your mind. What is worse, by neglecting to seek answers, you fail to bring those problems before those who can do something about them. Unanswered they remain—until one day someone (maybe even yourself) trips that switch, or finds that handle immovable, or catches his parachute on that projection while making a hurried exit. Then, and only then, does the answer turn up—as a contributing factor in an accident. There is a great flap, of course, and immediate action is taken to rectify the condition so that "it won't happen again". The same old story: locking the barn after the horse has bolted—except that the horse in this instance may be you. Life's ironies being what they are, that accident may have occurred because you said "why don't they?" to yourself instead of to the people who could have done something in time to prevent the accident. A lot of bodies in this man's air force have the job of keeping you alive and unharmed. As the night club owner said to the old lady who had just let go on the dance floor, "Why not use the facilities?"

*

LET'S FACE IT, men, an aircraft is a complex piece of equipment; and with the countless handles, knobs and switches required in today's cockpit it is quite possible that the odd one may have been placed in a position which makes it awkward to use or even potentially dangerous. If you see that this problem can be eliminated by a minor design change or by repositioning, then why not bring your idea to the attention of the right people? Can you think of one good reason why you shouldn't?

"How do I go about it?" is likely your next question. Simple. You merely submit an Unsatisfactory Condition Report—or UCR as it is commonly called.



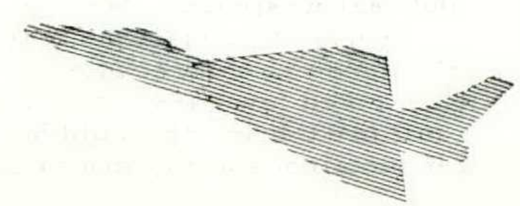
A complex piece of equipment

What is a UCR? Briefly, it is a standard RCAF form (Stats 318) which any individual may use to bring an unsatisfactory condition to the attention of the proper authorities. For complete details, look up Engineering Order 00-10-1 or ask the technical people who use it every day. The UCR is the fastest means in the RCAF of bringing an unsatisfactory condition to the attention of the authorities for review and possible rectification. It is the correct medium to use whether the object of your criticism is an aircraft, aircraft equipment, training aids, aerodromes, safety equipment, taxi strips, personal equipment and clothing, or miscellaneous items in any of these classifications.

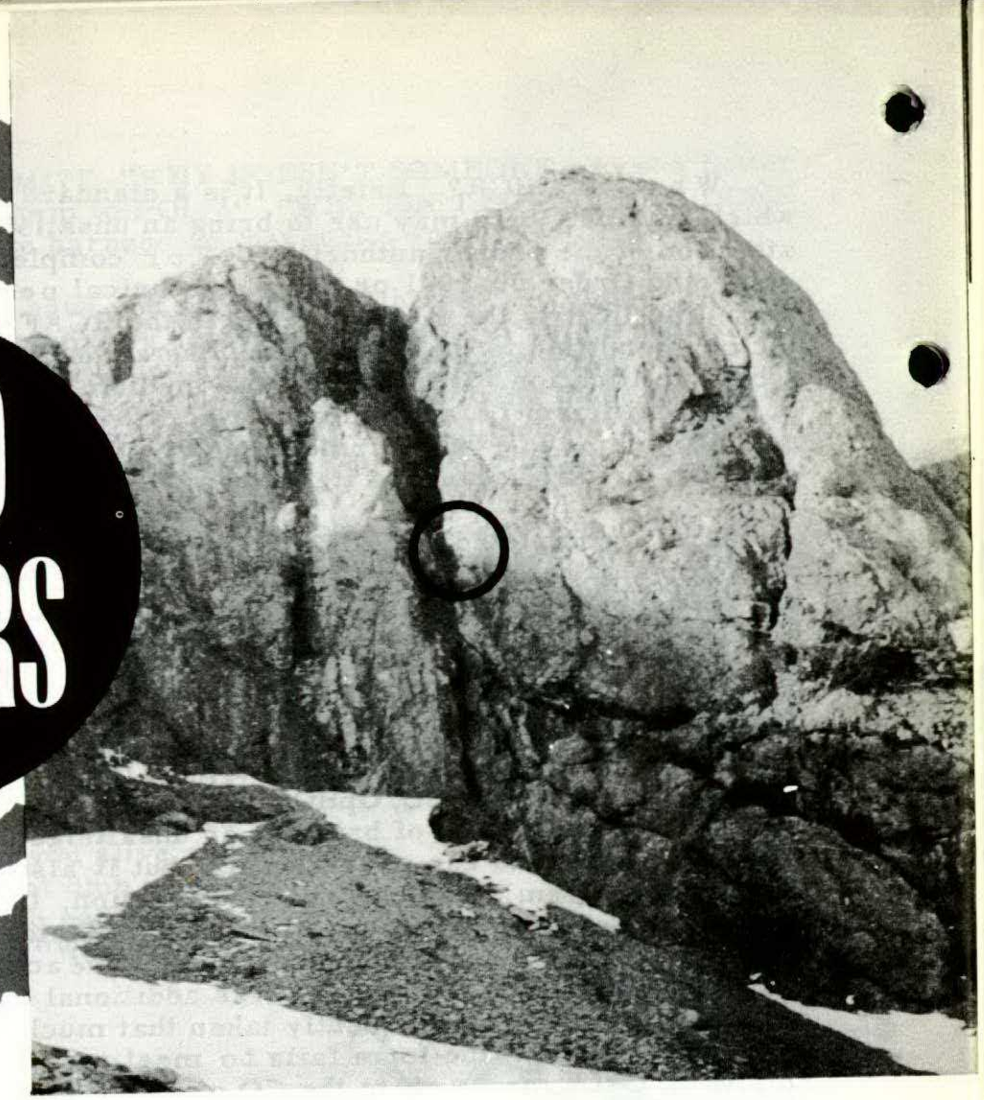
Once completed, the UCR passes from the initiator to specialist officers at his unit; from Unit to Command; from Command to AMC; and if necessary, from AMC to AFHQ. Corrective action may be and often is taken at any one of these stages but one copy of the UCR is passed on to higher authority for information. When corrective action cannot be completed by AMC within 30 days after receipt of the UCR, an interim reply is forwarded to the initiating unit. When final corrective action has been decided upon, one copy of the completed UCR is returned through the relevant CHQ/GpHQ. Obviously then, the UCR is not only the speediest method of bringing an unsatisfactory situation to the attention of those who can provide a fix, but it also ensures a quick solution for a problem. As for their preparation, UCRs are only effective if they are properly prepared, if the unsatisfactory part or condition is properly identified and if a logical, corrective action is suggested. Such a UCR is not only effective; it saves additional correspondence so that corrective action is consequently taken that much faster. If you feel for some reason that the form fails to meet requirements, don't let that stop you. Get a memo off to the CO or OC of the unit to start the ball rolling.

*

UCRs PROVIDE YOU with the means of playing an active role in Flight Safety. The prime intention is to bring to light situations which must be corrected before they kill a man and wreck an aircraft. Next time you start asking "Why doesn't someone.....?" sit down instead and fill out a UCR. If you have a piece of valid criticism floating around alone inside your head, we want it! Silence is anything but golden here. Climb a stump and holler. Get it on paper where it'll do some good.



SOLID CENTERS



THE WRECKAGE OF AN EXPEDITOR was found recently at the 5300-foot level of a 5960-foot mountain. Evidence has established that the pilot's failure to observe certain prime requirements for IFR flight set off a chain of incidents which culminated in the loss of an aircraft and the death of its occupants.

*

In planning his flight the pilot specified an altitude westbound of 6500 feet, IFR direct. The route lay over a designated mountainous region and two peaks of 5960 feet and 5280 feet stood along the line of flight. For these spot heights Article 207.30 of CAP 100 demands a MINIMUM altitude of 8000 feet westbound. Weather conditions prevailing should have prompted the pilot to visit the met office for a complete briefing. Instead he telephoned the forecaster, gave little information as to his proposed flight, asked few questions, and terminated the conversation abruptly. A full met briefing would have made him aware of a situation which, in a mountainous area, must always be treated with

the greatest respect: A strong flow of air from the west was causing subsidence in the lee of high terrain; and heavy cloud, precipitation and turbulence were present throughout the proposed route.

Accurate knowledge as to the degree of subsidence and turbulence in the area was supplied by the pilots of search aircraft sent to locate the wreckage. One of them flew his Otter at 5000 feet towards the mountain on the same track as that followed by the ill-fated Expeditor. By the time the Otter was five miles from the mountain it was losing 500 feet per minute despite the use of climbing power. Turbulence was so great that the aircraft was difficult to control. A like condition was encountered at 7500 feet, although height was maintained with climbing settings. Wind conditions during the search were much the same as at the time of the accident, but the cloud had lifted giving improved ceilings. A Harvard pilot on the search reported a similar experience with turbulence. Both pilots agreed that, had they been on instruments at the time, control of the aircraft would have been extremely difficult.

The investigation brought to light a further factor which may have had a serious bearing on the accident. Calculations disclosed that the C of G of the aircraft, loaded as it was for the flight, had been dangerously far aft. This condition resulted from stowage of safety equipment too far to the rear of the fuselage, coupled with the fact that the aircraft was being flown without fuel in the nose tank. Loading and centre of gravity checks are responsibilities of the aircraft captain—responsibilities which in this case were not properly discharged. The aft C of G (almost 2 inches aft of the rearward limit), coupled with the reported turbulence, may have resulted in control difficulties, especially during instrument flying. (A close check on aircraft loading and centre of gravity has since been instituted at the unit concerned in this story.)

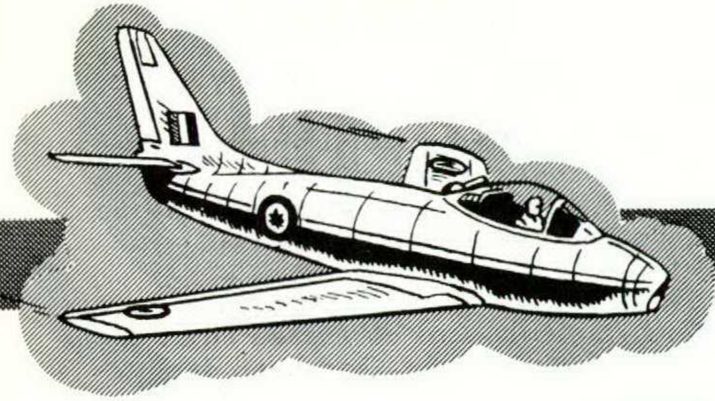
Much has been written on the subject of inadequate flight planning but more appears to be necessary. The rules and regulations governing the operation of aircraft, whether under VFR or IFR, have been devised with safety of flight as the prime requirement. They have developed out of many years of experience and careful study on the part of well qualified men. This reserve of "packaged" experience is yours in exchange for the application of reasonable care and forethought on your part. Remember, it is not enough to be able to take off, fly from A to B, and land. To fly well at all is to fly safely.

▲ KNOW THE RULES OF THE ROAD

▲ APPLY THOSE RULES DISCREETLY

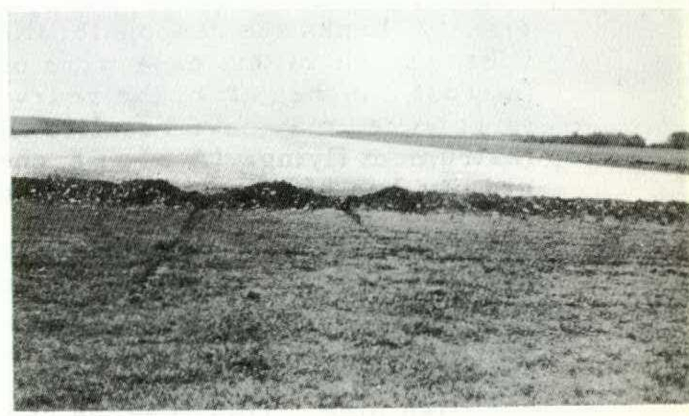
▲ MAKE COMMON SENSE YOUR GUIDE

Accident Resumé



SABRE

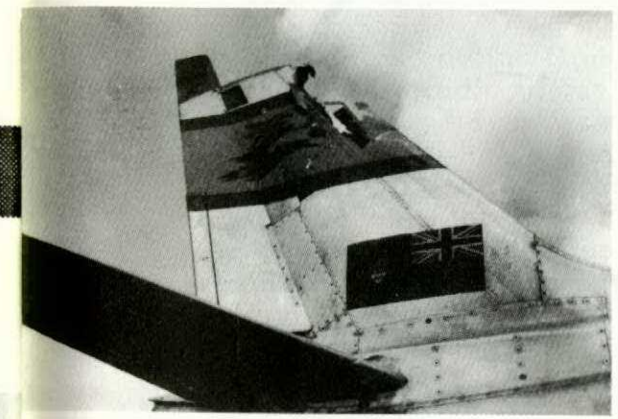
UNMARKED OBSTRUCTION



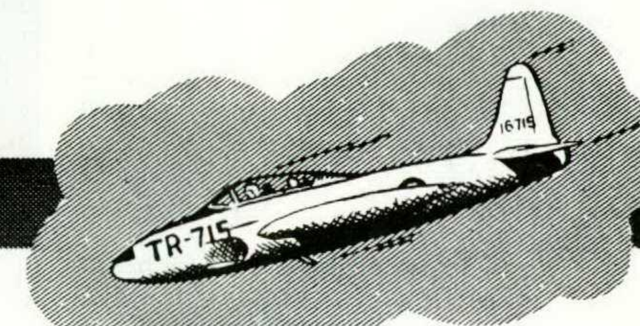
Rejoining the circuit after a half-hour's practice, the pilot noted the deteriorating weather. On his base leg and final approach he encountered heavy rain which interfered with forward vision. Just before touchdown he realized he was undershooting slightly—and at the same moment he saw an obstructing ridge of earth near the end of the runway. The Sabre touched down before the obstruction, the main wheels striking the ridge and folding backward. Extensive damage resulted as the aircraft slid forward on the drop tanks and nose wheel. The pilot was primarily responsible for the accident because there was no need to land short on a long runway; and in heavy rain and poor visibility he could have aimed for a landing farther down. However, despite the pilot's error in misjudging his touchdown point, the accident probably would not have occurred if there had been no ridge of earth at the end of the runway. It was approximately two feet high and only 12 feet from the start of the concrete. A ditch approximately two feet deep lay between the ridge and the runway. The ridge itself was not marked. For these reasons the secondary cause of the accident has been assessed against flying control.

FOLLOW THE LEADER

A Sabre section had completed a cine-gun exercise and the two pilots exchanged the lead for a practice QGH and GCA. Because the GCA run was unsuccessful, the pilot then in the lead switched to tower frequency for a vector and started to turn starboard at the same time as number two tried to resume the lead.



Confusion arose since final change of lead had not been covered during the briefing. This oversight, coupled with inadequate lookout, contributed to the ensuing collision. Fortunately both aircraft were landed without further damage. More care during briefings, constant lookout, and definite signals for assuming or resuming the lead are necessary if this type of accident is to be avoided.



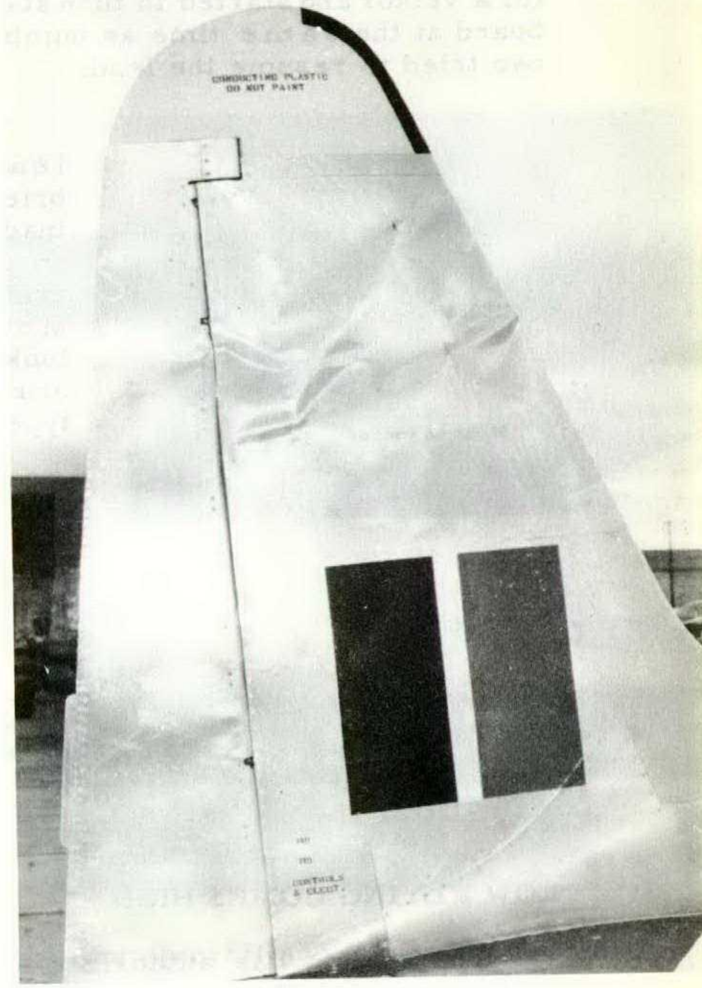
T·33

LOW FLYING COME$ HIGH

The student was authorized for a routine solo exercise. He had completed some of the prescribed sequences when he noticed that he was over a deserted area of bush land and "decided to carry out some low flying". He flew for several miles over treetops and large clearings. It was while climbing out of one such clearing that the aircraft struck the tops of some trees. The pilot was able to return to base safely, but after landing he found that his aircraft had suffered "C" category damage. The severe reprimand and $50.00 fine that were awarded should help this student remember low flying regulations. He is lucky to be alive.

OVERSTRESS ON FLAG

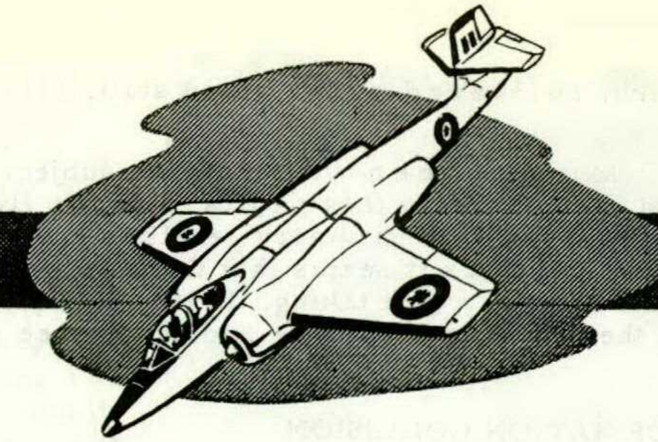
The pilot was flying as Number 4 in a four-plane section, carrying out an air-to-air firing mission at 13,000 feet. During the last attack he followed in too closely behind Number 3 and the leader instructed both aircraft to break off their attacks.



Number 4, with an airspeed of approximately 350 knots, pulled back on the control column and immediately induced a high-speed stall, over-stressing the aircraft to $10\frac{1}{2}$G and blacking himself out completely. He was seen to flick off into a spiral dive and lose several thousand feet before being able to recover. The airframe sustained considerable damage and required a complete overhaul. The pilot was lucky in that he had plenty of altitude at the time of the accident. Others have been less fortunate.

There is no excuse for violent overcontrol; a smooth pressure will assure a positive pullout whereas a sharp "hacking" motion will most likely result in at least a "mushing" tendency—and possibly an accelerated stall and an uncontrollable flick manoeuvre. One last word: Violent or jerky control habits picked up early in your flying career will be multiplied by hydraulically boosted controls in operational aircraft. So concentrate on smooth actions!

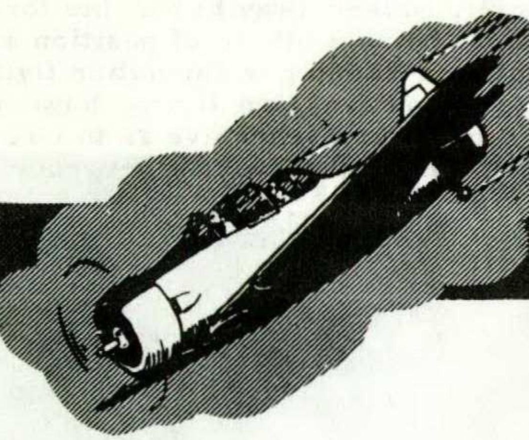
CANUCK



CALL FOR A TUG

During a routine flight the pilot reported hydraulic failure. He was instructed by radio to cancel his exercise, return to base and land. In the circuit it was necessary to lower the undercarriage by emergency means—after which a successful landing was made. Sufficient brake pressure remained to slow the Canuck and to turn it off the runway. At this point the pilot made his mistake. Instead of waiting for a tow, he elected to taxi to the parking area. The ensuing total brake failure resulted in a collision between the aircraft and two refuelling trucks!

HARVARD



LOW LEVEL DISASTER

The pilot was authorized to fly, in the solo area, an exercise which was to include aerobatics, stalls, climbing and descending turns, straight and level flying, and steep turns. His detail also required practice in forced and precautionary landings at the relief field. Shortly after takeoff the aircraft was seen at low level circling a farm—the home of the pilot's fiancee. Watchers on the ground saw the aircraft do a roll between two barns on the property. It was apparent that the pilot, on recovering from the roll to the left, noticed a tree directly in front of him. In trying to avoid it he pulled back too hard on the stick, initiated a high-speed stall, flicked in, and was killed.

Much has been written on the subject of wilful violation of orders and regulations as they pertain to low flying. In instances where the pilots lived, disciplinary penalties have been publicized. But despite these measures it seems that there is always some one left who feels the chance is worth taking. Is it? This pilot was to have been married on the following Saturday—and his fiancee saw him crash!

FORMATION COLLISION

Towards the end of an extended period of formation flying the pilot then in the lead experienced engine failure because of fuel starvation. He had earlier noticed the fuel warning light come on but did not change tanks as he believed there should be another 15-20 minutes' fuel remaining. Just as the engine cut out, the tank change was accomplished, the nose was raised to maintain altitude at the expense of forward speed, and the flight continued as the engine picked up on the new tank. This sequence of events precipitated a chain of evasive action by the remainder of the formation. Number 2 was able to reform but number 4, being slightly out of position, was unable to avoid a collision with number 3 which crashed out of control killing the two pilots. The pilot of number 4 luckily walked away from his forced landing. His close call arose from his being a bit out of position and surely emphasizes the vital need for station-keeping in formation flying. Probably the most important phase in formation flying, however, is the briefing. It should be so thoroughly comprehensive as to include a place for the discussion of actions to be taken in an emergency.

VFR VIOLATION

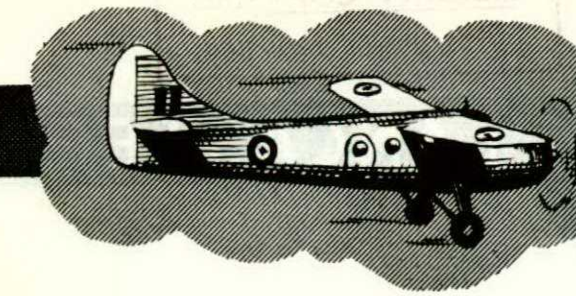
The pilot was enroute to his home base on a VFR flight plan when he encountered deteriorating weather. Shortly after passing an aerodrome where the weather was good, he ran into cloud and heavy rain. Instead of executing the well-known "180" he pressed on, hoping the condition was local, and eventually he established radio contact with destination, which was within a Control Zone. Finally contact failed and could not be regained. So the pilot flew on to his ETA at which time he let down, failed to break cloud, and returned to altitude. Next he tried an orientation using the radio compass—but without success; several letdowns were made before he broke cloud over water. Fuel was down to five gallons when the pilot put out a May Day and force landed in a field. CAP 100 Art. 204.01 has the word for all this: "When operating under VFR, aircraft are to be flown with continuous visual reference to the ground".

CLEANLINESS IS NEXT TO . . .

At an altitude of 7000 feet, during an IFR flight, the aircraft's port engine fire warning light came on, accompanied by a strong smell of smoke. The captain at once feathered the port propeller and selected the fire extinguisher for that engine. With the engine shut down the smoke dispersed so the captain did not operate the fire extinguisher but held it—as he thought, in reserve. The aircraft was landed without further incident and a technical examination revealed that both engines were excessively fouled with oil and that there was evidence of burned oil in the exhaust pipe recess in the port engine nacelle as well as on the bulkhead of the port engine. In the rear section of the port engine, behind the firewall and in the vicinity of the upper outboard engine mount, there was evidence of smoke and hot gas contamination. The fire extinguisher was found to be in a discharged condition. The fuselage indicator showed the bottle to be charged but the indicator on the head showed the bottle to be discharged. The extinguisher was not actuated by the pilot according to his statement. After cleaning, the engines operated satisfactorily, the fire having originated from the accumulation of oil in the exhaust recess in the port nacelle. With an unserviceable fire extinguisher aboard, it was fortunate that the fire died when the oil burned off. The assessment in this case is against maintenance.

...PREPARE FOR DITCHING

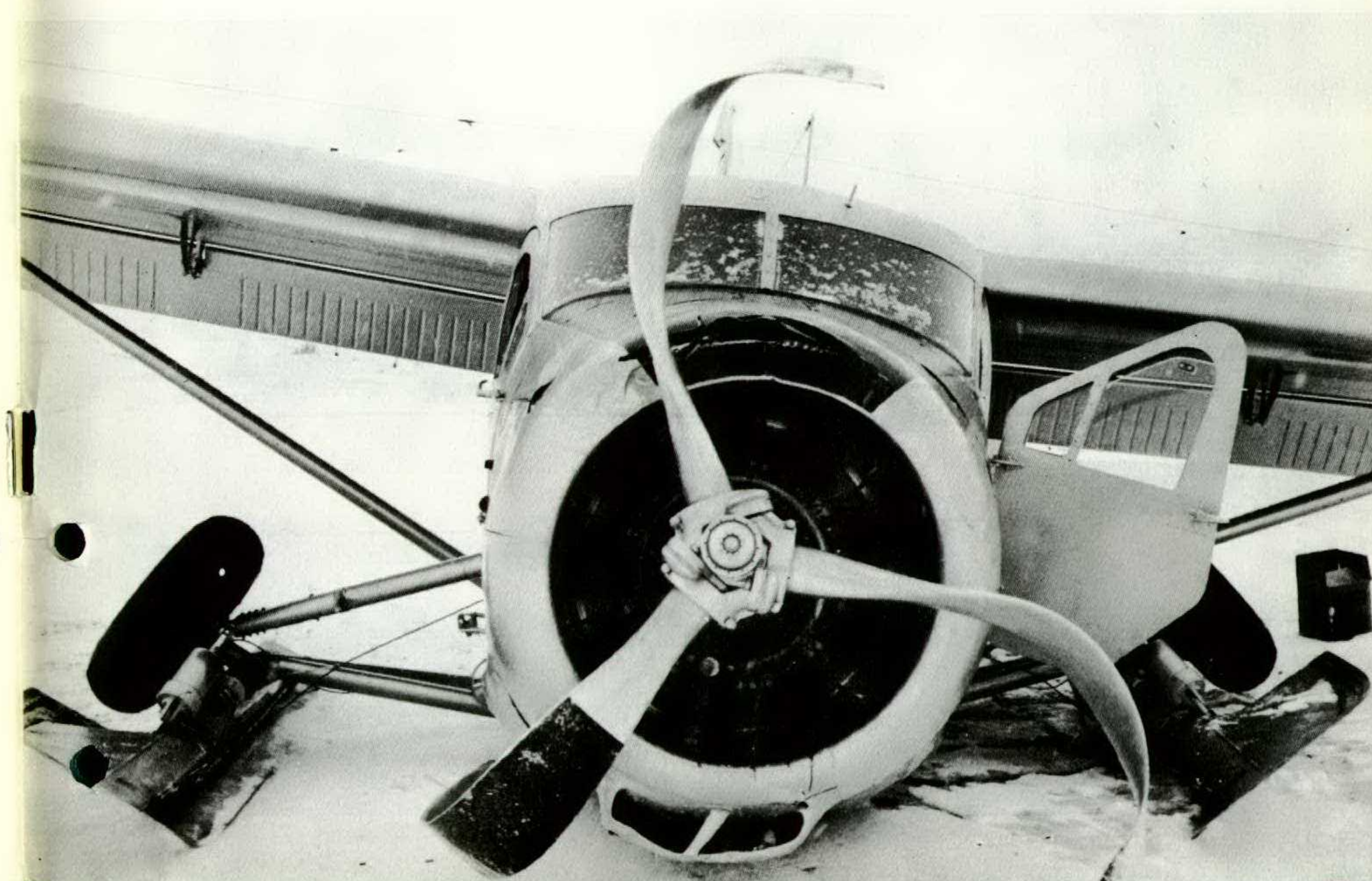
Unexpected bad weather on a long, over-water night flight caused radio reception difficulties and made bearings unreliable. A further problem faced by the pilot was inaccuracy in the gyrosyn compass. For his part, the pilot allowed a few mistakes to enter into his navigational work and he was unable to pinpoint his position on landfall after ETA. The flight was further handicapped by the fact that the copilot member of the two-man crew was not in current flying practice and so could not adequately assist the pilot. Finally the passengers were informed of the difficulties and the aircraft was ditched close to shore just before the fuel supply ran out. "Pilot Error" and "Briefing" were the assessments. The pilot's skilful ditching in high wind conditions permitted all personnel to evacuate the aircraft successfully.

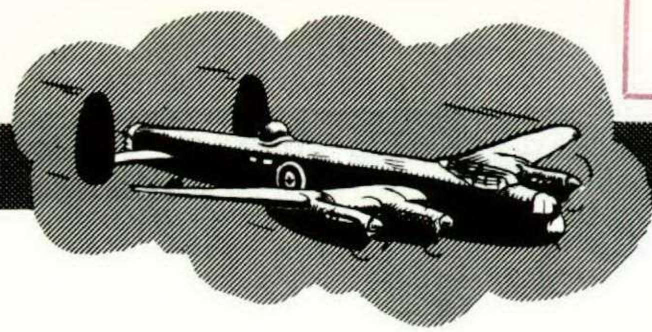


OTTER

OVERLOAD + AFT CG

As soon as the aircraft became airborne the tail began to drop. The pilot pushed forward on the control column and added more power but the nose continued to rise. At a height of 50 feet the aircraft stalled and crashed on the airfield. Investigation disclosed that it was overloaded by 1673 pounds and that the C of G was 6 inches aft of the rear limit. The captain was aware of the fact that his aircraft was overloaded to some extent but he was not aware of the aft C of G. Obviously, both are important and captains are again reminded of their responsibilities. Don't let it happen to you.

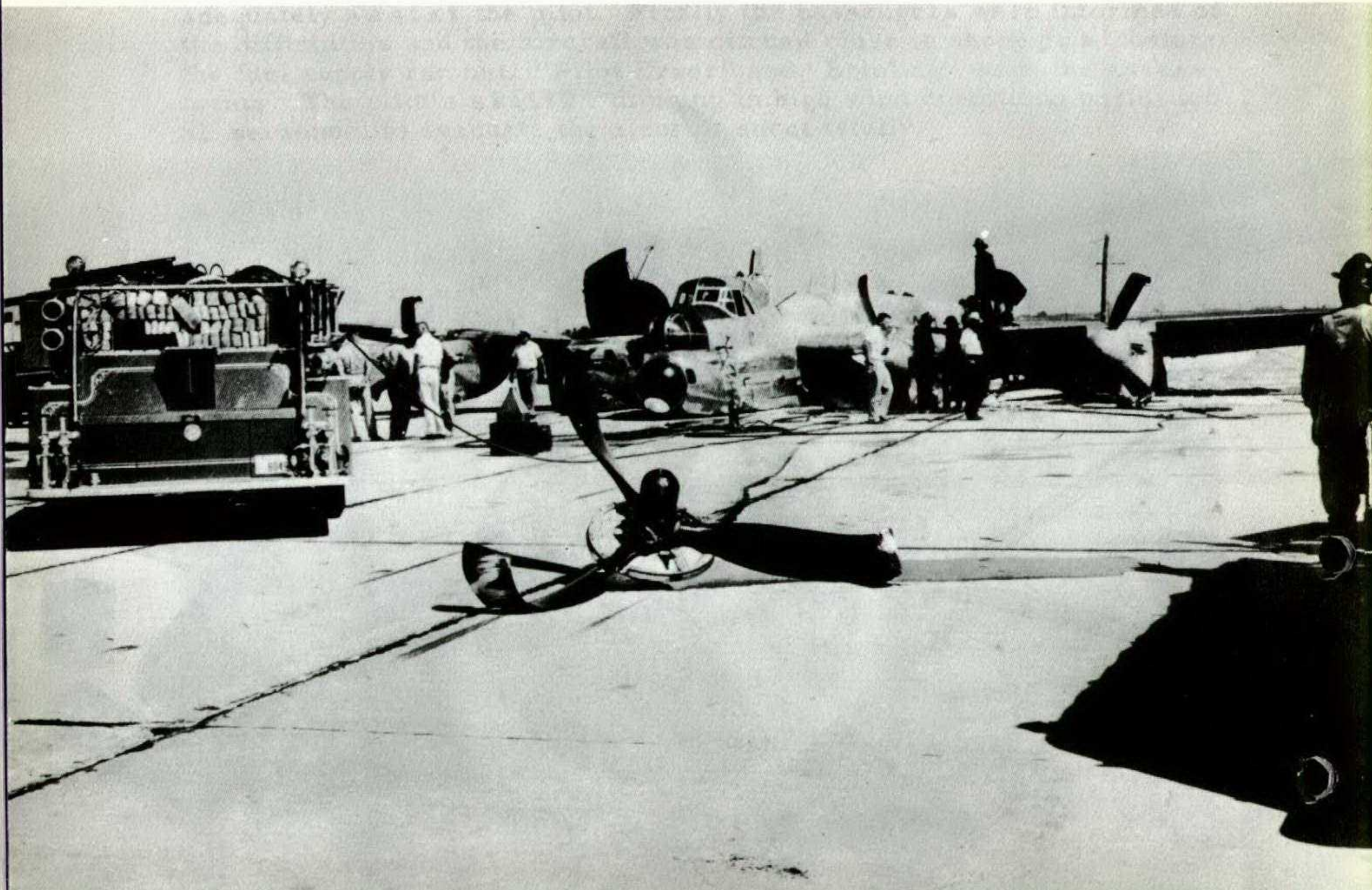




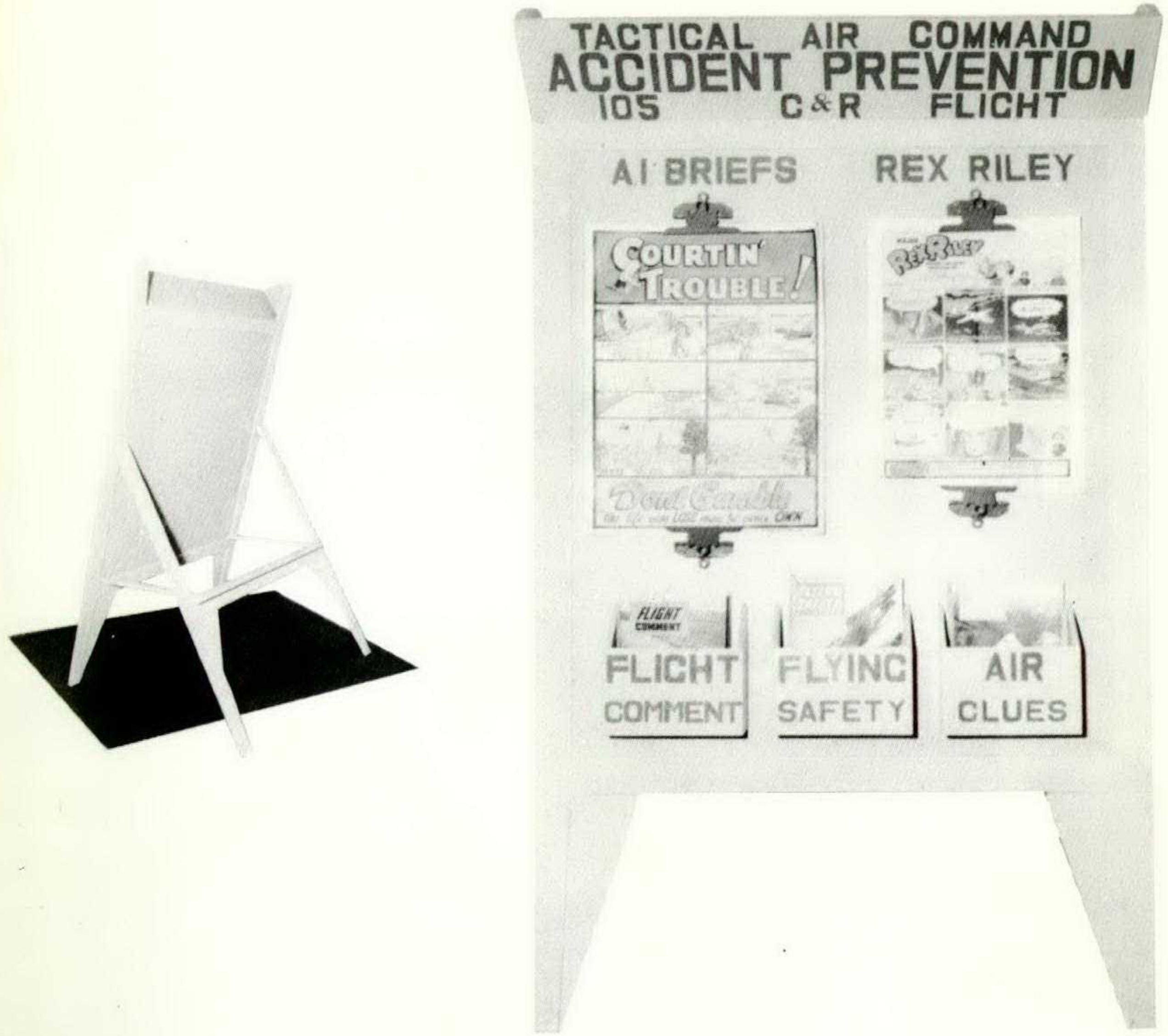
LANCASTER

DON'T STRETCH THE GLIDE!

While on final approach on a hot day the pilot suddenly realized he was undershooting. His corrective action consisted merely of easing back on the control column with no addition of power. The aircraft stalled short of the runway, its wheels striking an embankment in the undershoot area. Following a 50-foot bounce it came down on the runway. The port undercarriage collapsed on the first contact, the starboard on the second; and then fire broke out. The crew abandoned the aircraft successfully. How often has the warning been repeated about trying to stretch the glide? The addition of a little power would have prevented this accident.



The accompanying photograph shows an accident prevention bulletin board designed by 105 Communications & Rescue Flight, Edmonton, for its crew room. How is flight safety literature displayed at your unit?



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