FLIGHT COMMENT

ISSUED BY

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

RESTRICTED

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C O N T E N T S

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

EDITORIAL

FLIGHT SAFETY IN TRAINING COMMAND

by

A/V/M J.G. Kerr

Fundamentally the aim of Flight Safety in Training Command is identical to that of any other command in the RCAF: to reduce the number of unnecessary air accidents without jeopardizing the attainment of the objective of our flying operations.

There are three main reasons why we attempt to achieve this aim. Firstly, and most important, to avoid unnecessary loss of life, and injury to personnel. Secondly, to avoid waste of time and money required to investigate, replace, repair, or salvage damaged aircraft. Thirdly, to instil and maintain confidence in the aircraft we fly, in all personnel who fly or make it possible for these aircraft to fly.

And how do we attempt to achieve this aim? The answer is straightforward: by maintaining a continuous and active Flight Safety programme at each and every flying unit within the command.

It must be remembered, however, that Flight Safety is not the sole responsibility of any one person, or group of persons. On the contrary, everyone who flies or who directly or indirectly makes it possible for an aircraft to fly is involved in the Flight

Safety programme. Normally, air training accidents are attributed in one form or another to pilot error. But behind the scenes—did the people who trained that pilot do the job properly? Was the aircraft properly serviced? Were aerodrome obstructions properly lighted? And was there adequate weather briefing? These are a few of the questions that can be asked.

Although Flight Safety is everyone's job, a continuous and active programme requires supervision and co-ordination. This, of course, is the job of the Flight Safety Officer. In Training Command, FSOs are established at all major flying units, as well as at Group and Command Headquarters. It is important to remember that these officers have no executive authority, but are simply "bird-dogs", co-ordinators and salesmen of the Flight Safety Programme. The many and varied duties of a Flight Safety Officer cannot be discussed here, but suffice it to say that in order to carry out these duties, not only must he have an inquiring mind but also he must be an experienced pilot, and many times possess the combined qualities of a diplomat, a salesman and an educator.

Insofar as the problems peculiar to Training Command are concerned, the business of learning to fly involves certain risks which cannot be entirely eliminated. Accidents are bound to occur on a training station, and are expected to occur. Only through learning to correct his own errors can a student become really competent. A small aircraft damaged in learning the technique of a crosswind landing or in finding out a student's reaction is a good investment if it saves an expensive jet fighter at a later date. This is the type of accident which might be referred to as an acceptable training accident.

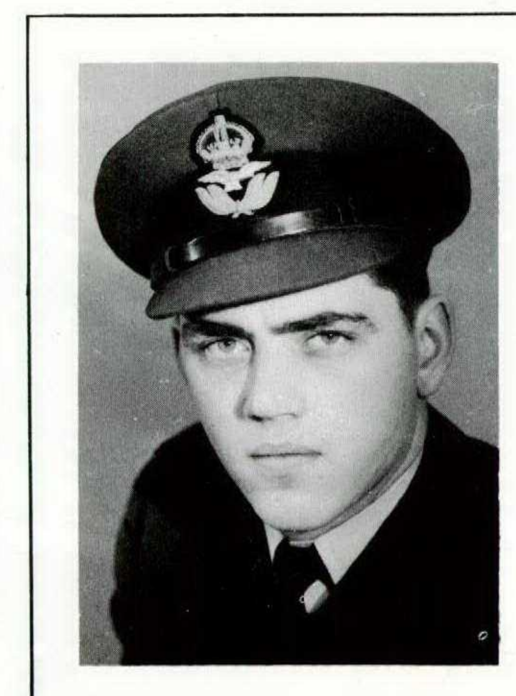
But in all training schools we still have the unacceptable accidents: they are the accidents which occur through negligence, carelessness, and disobedience or inadequate knowledge of existing rules and regulations. Too often the contributing factor in this type of accident is poor supervision of flying discipline. The elimination of these accidents is our primary objective.

In summary, all personnel concerned with the Training Command Flight Safety Programme endeavour to keep acceptable training accidents at a minimum, and at the same time strive by every effective measure to eliminate our unacceptable training accidents.

211156 F/O L.A. HARLEY

F/O HARLEY was instructing in night circuits and landings in a Harvard, and his student pilot had just completed a crosswind check on the first circuit. As they were about to turn onto final approach the student spotted flames behind the front cockpit instrument panel. F/O Harley took control, requested an emergency landing, and began his attempt to make the runway.

During the approach the front cockpit filled with smoke and the student's vision was almost obscured. However, the instructor continued the approach, calming his student with instructions to open his coupe top just prior to landing, turn off the fuel and switches on touchdown, and pull the fire extinguisher before leaving the aircraft.



The Harvard landed safely on the runway despite the smoke and flame reflection obstructing F/O Harley's vision. The student pulled the fire extinguisher as the Harvard stopped rolling and both pilots abandoned the aircraft uninjured. The fire was caused by a fuel line failure between the primer and firewall.

There is little to be added by way of praise. F/O Harley has been awarded a Pilot's Commendatory Endorsement for his courage and skill.

32325 F/O R.B. HAVERSTOCK

F/O HAVERSTOCK was on a test flight in a Sabre. Shortly after takeoff the engine resisted his attempts to reduce power, the rpm remaining at 100%. The pilot informed the tower that he had no control over his power output and then he flamed out the engine by cutting the master switch. A successful forced landing was made on the airfield.

Technical investigation revealed that the throttle control connecting bolt had dropped out in flight, leaving the pilot only the master switch as a means of power control.

For this display of flying ability F/O Haverstock has been awarded a Pilot's Commendatory Endorsement.

INTO THE CHAMBER

The following article was prepared for FLIGHT COMMENT by the Flying Personnel Medical Establishment of the Institute of Aviation Medicine.

THE QUAINT CUSTOM of artificial decompression was introduced into the RCAF about 15 years ago, bringing with it the instrument of this mysterious practice—the decompression chamber. Hitherto decompression had been experienced only by aviators, deep-sea divers and elevator operators. However, as aircraft attained greater and greater heights, the dangerous effects of decompression became more apparent and more puzzling.

The advent of the decompression chamber provided scientists with a convenient means of producing a controlled lowering of atmospheric pressure without the difficulties and limitations attendant upon having to conduct such experiments in flight. When the mysteries of human decompression were solved, the chambers became training aids in which aircrew could be safely introduced to the effects of low atmospheric pressure.

Why is decompression training necessary? Well, in today's air world, flying presents a strange environment of changing pressures, temperatures, accelerations, illuminations, noise levels and odours, and unexpected occupational hazards. Ground-dwelling creatures are not physiologically designed to adjust to all these physical changes and therefore adaptive, protective aids must be provided. With the exception of acceleration, the greatest single physical hazard facing the aviator is reduced atmospheric pressure at high altitudes with its resulting oxygen lack, bends, expanding body gases and water vaporizations. In the decompression training chamber, aircrew are able to expose themselves to the effects of low pressure and to rehearse preventive measures in an atmosphere where mistakes will not have serious consequences.

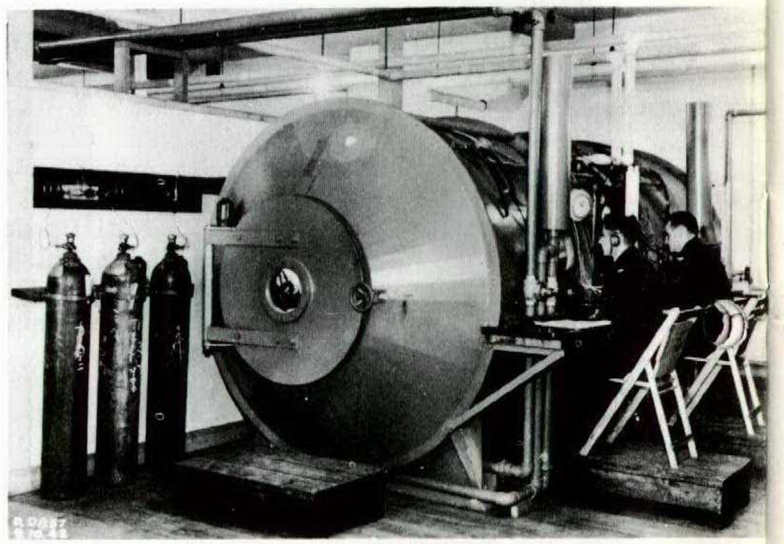
Where are the RCAF's decompression chambers located? There are seven altogether on air force stations situated at Chatham, Trenton, Toronto, London, Portage, Gimli and Saskatoon. Two others—at Dalhousie University in Halifax and the University of British Columbia in Vancouver—are available for use by the RCAF. Shortly two more will be installed at air force stations in Winnipeg and Cold Lake.

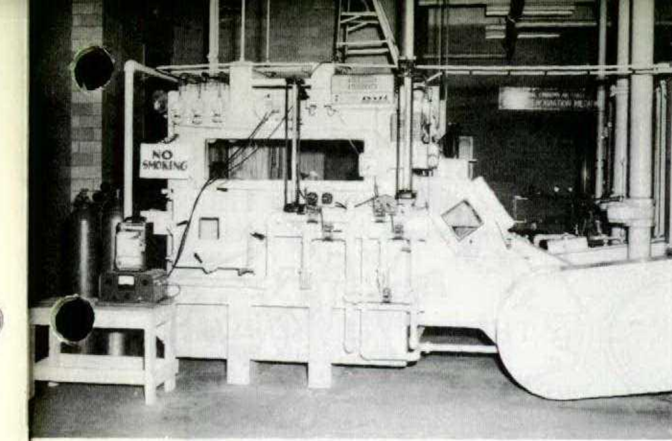
*

Training in the decompression chambers is supervised by medical officers, assisted by medical associates. The program is usually integrated into the aeromedical training scheme so that chamber indoctrination follows theory and equipment indoctrination. Chamber operation is provided by technical assistants, medical. In general, chamber "flights" include slow and rapid (explosive) decompressions to various pressure altitudes up to 43,000 feet, exposure to altitude effects including hypoxia (i.e. less than normal oxygen) and recompression descents including simulated free-falls. The procedure is varied depending on the experience and training requirement of each aircrew group.

What is all this make-believe intended to teach? The intention is to provide experience and knowledge in such aviation hazards and annoyances as:

- Hypoxia
- Over-breathing
- Decompression sickness (bends)
- Expansion of trapped gas (ears, sinuses, bowels)
- Oxygen equipment and its misuse
- Pressure suits
- Voice transmission at altitude



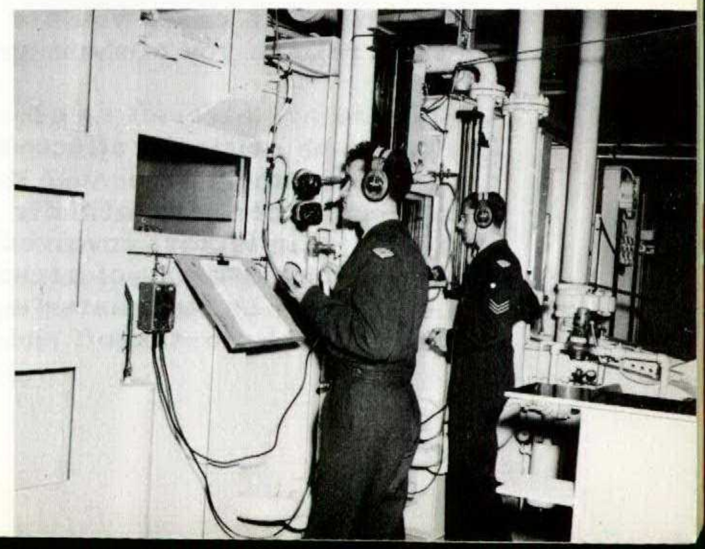


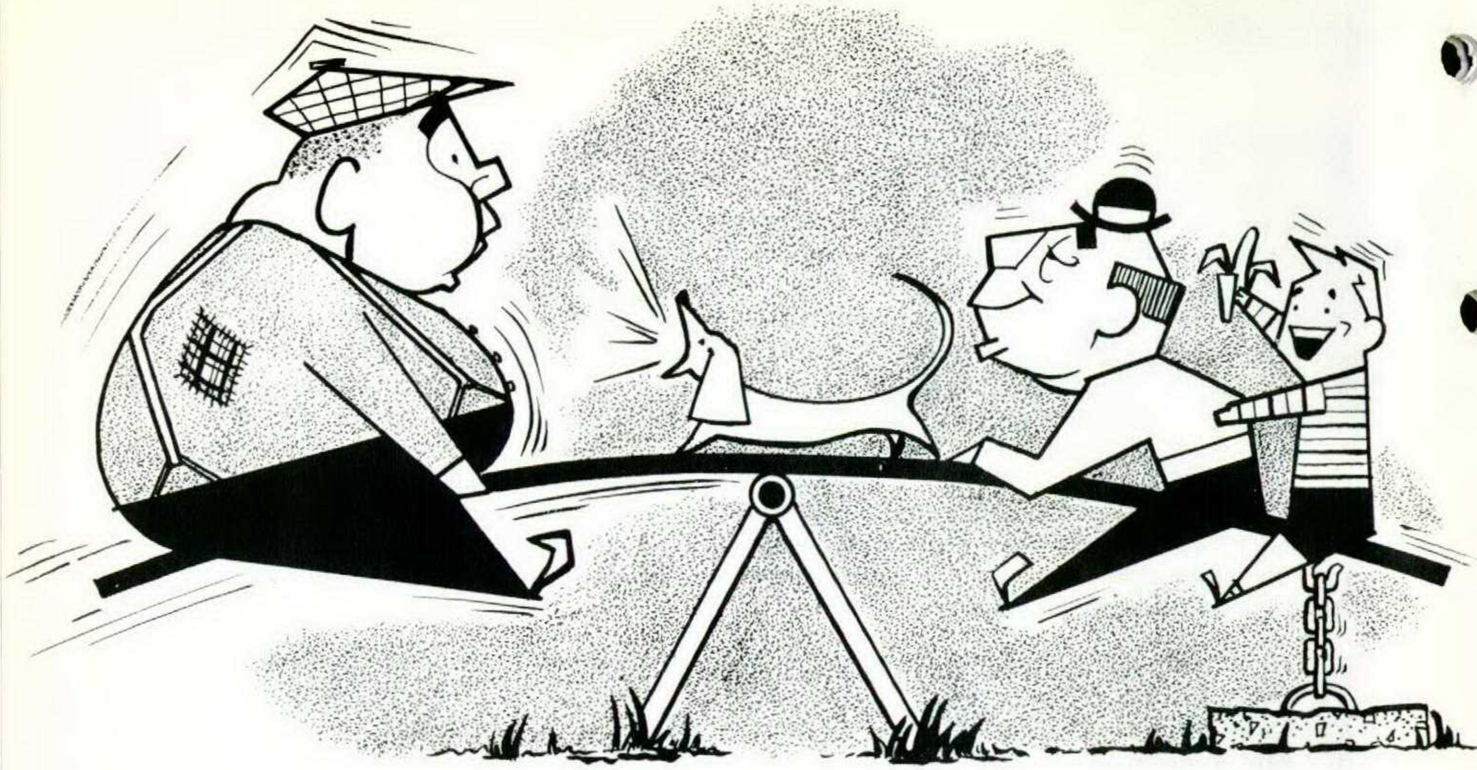
Explosive decompression merits a few extra remarks. The name itself is a bit terrifying. However, explosive decompression does not necessarily cause injury and destruction as do explosives. The expression refers merely to a rapid loss of pressure, such as might occur if the air in a pressurized cockpit were to escape suddenly. The action is accompanied by an explosive noise like the breaking of a rubber balloon. Violence of the decompression will depend on the pressure differential, the size of the escape aperture, and the volume of the pressure cockpit (or chamber). The greatest danger to pilots lies in a sudden expansion of body gases in lungs, bowels, or ears which may cause internal rupture.

Present-day pressure cockpits do not approach this danger point. The immediate effects of an explosive decompression are startling but harmless. Apart from the loud noise, there is a sensation of rushing air and a sudden cooling which, if the air is moist, may produce heavy mist in a large fuselage or a decompression chamber. The subsequent effects are those of high altitude exposure, hypoxia being the worst offender. Unless emergency pressurization is provided in the form of pressure breathing or a pressure suit, hypoxia may develop quickly above 40,000 feet. Demonstrating explosive decompression in the chambers provides aircrew with the opportunity of becoming familiar with its effects so that in an emergency the confusion and startle time will be minimal. In the chamber an explosion is accomplished by abruptly communicating two compartments at different pressures so that the subjects in the high pressure compartment will be decompressed as the air rushes into the low pressure compartment.

*

Is decompression training dangerous or costly? No. The risk of accident or injury in the chambers is far less than that taken by a careful, sober driver on a busy highway. Most people come closer to mishap tripping over the door sill of the chamber than they do sitting through a decompression. The cost of this training in time, personnel and equipment—when weighed against the advantages gained—is small compared to the expense of other training aids. Apropos of the money spent on such aids, it can be stated that the cost of safety in RCAF operations is much more easily sustained than the price paid for the lack of it.





A MATTER OF BALANCE

by

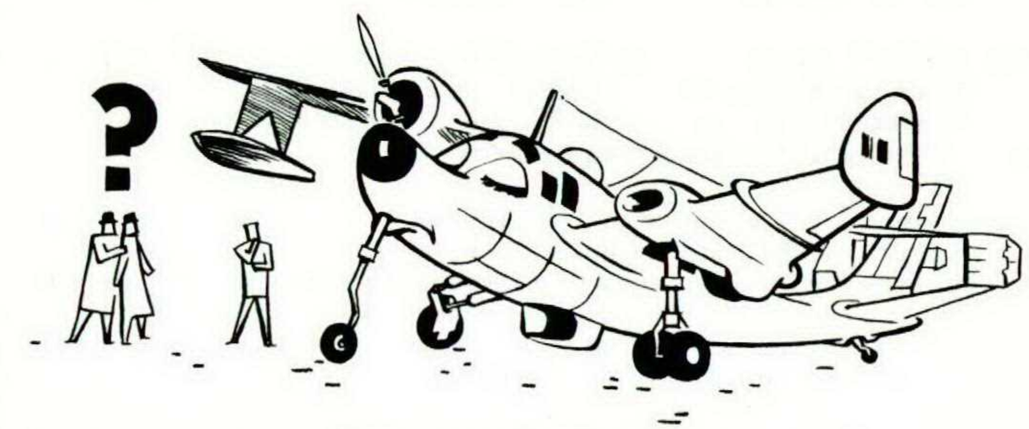
F/O H.E. Bryant

MOST SERVICE AEROPLANES functioning in their normal roles carry typical loads at standard positions in the aircraft. Since these loads are computed by the manufacturers so as to keep the centre of gravity within the prescribed limits, there is small necessity for the individual service aircraft captain to calculate his aircraft's C of G. Then why bother with this stuff? you may ask. The answer is that although in most cases you are not required to calculate a C of G, this does not relieve you of the responsibility of knowing how to calculate it.

There are aircraft such as the Harvard and T34A whose C of G limits can be critically affected by the addition of small loads in the baggage compartment. Because this is so—and since all captains are responsible for the safety of their aircraft—it is important that you understand fully the factors involved in aircraft weight and balance. If you aspire to the captaincy of a transport aircraft, be warned in advance that you will never be its master until you grasp the principles involved in loading it safely for takeoff and landing. The first step in your familiarization is to refer to the definitions and terms used in aircraft weight and balance calculations. You may already know that there are many in use and that some mean the same thing. For the sake of simplicity we will discuss only the standard RCAF definitions. (Ref. EO 05-1-8)

AIRCRAFT WEIGHT LIMITATIONS

Any successful aeroplane is a compromise in design. It has to meet performance requirements of various kinds such as speed, load, range, ceiling and rate of climb. Its weight limitations, for example, are dependent on its structural strength and the performance requirements which it was designed to meet. If we exceed these weight limitations we encroach on safety and performance. Hence the need for careful checking to ensure that weight limitations are not exceeded. An aeroplane may be authorized to operate in a case of emergency which subjects it to certain flight restrictions, at a design gross weight above the normal maximum. But only in an emergency.



A compromise in design.

EFFECTS OF OVERLOADING ON PERFORMANCE

If the design gross weight of an aircraft is exceeded, its performance will be adversely affected in a number of ways. Its stalling speed will be higher and longer runs will be required for takeoff and landing. Rate of climb, ceiling, range and endurance will be reduced. Performance on asymmetric power will be adversely affected. Finally, the safety factor of the structure will be reduced. (Here it is well to note that even normally loaded aircraft have experienced structural failure on encountering violent turbulence.)

BALANCE

So far we have dealt only with weight, why it is limited, and what happens if it is exceeded. Of greater importance is the way in which the weight of the aircraft and its load is disposed about the C of G. This is a matter of balance. To understand this matter of balance as we apply it to aircraft it is necessary to be conversant with a few terms.

(a) Centre of Pressure (C of P) - An arbitrary point through which the resultant of all the lifting forces on the wing is considered to act.

(b) Centre of Gravity (C of G) - The point in a body through which the resultant of the weights of all its parts passes. A body suspended from this point will be in static equilibrium.

(c) Arm - The distance along the longitudinal axis of the aeroplane between a reference point (usually the most forward point of the nose) and the C of G of the aircraft itself or the C of G of an item of freight or equipment.

(d) Moment - The moment of a force is the turning effect that exerts about a point. Its magnitude is the product of the force and the perpendicular distance from the line of action of the force to the point. Moments are commonly referred to as so many pound-feet, though they may be referred to in any units as found convenient. Further they are called "positive" when the line of force exerts a clockwise turning tendency, and "negative" when the line of force exerts a counterclockwise turning tendency.

Adequate control of an aircraft is made possible throughout its full range of speed and attitude by the correct relationship of the lines of action of four forces: lift, drag, thrust and weight. Variations of the angle of attack, from whatever cause, will change the line of action of lift (C of P) and the drag line, while the position of the C of G is dependent on the distribution of the weight. (Note that consumption of fuel constitutes a change of weight distribution.) The designer has provided for adequate control of the aircraft as occasioned by these movements of the C of P and C of G, within limits, by providing a tail plane, elevators and trim tabs. These limits are laid down in respect of the C of G in the relevant EO and form L36 for each type of aircraft.

EFFECTS ON PERFORMANCE WHEN C OF G LIMITS ARE EXCEEDED

When the aircraft is loaded in such a manner that the C of G is outside its fore and aft limits, the effects on performance are as follows:

(a) C of G too far forward—nose heavy

(i) With the CG at the forward limit, full up elevator is just sufficient to maintain longitudinal balance at the maximum lift condition, which occurs just at the stall. Therefore, with the CG ahead of the forward limit, it would not be possible to maintain proper control during the landing.

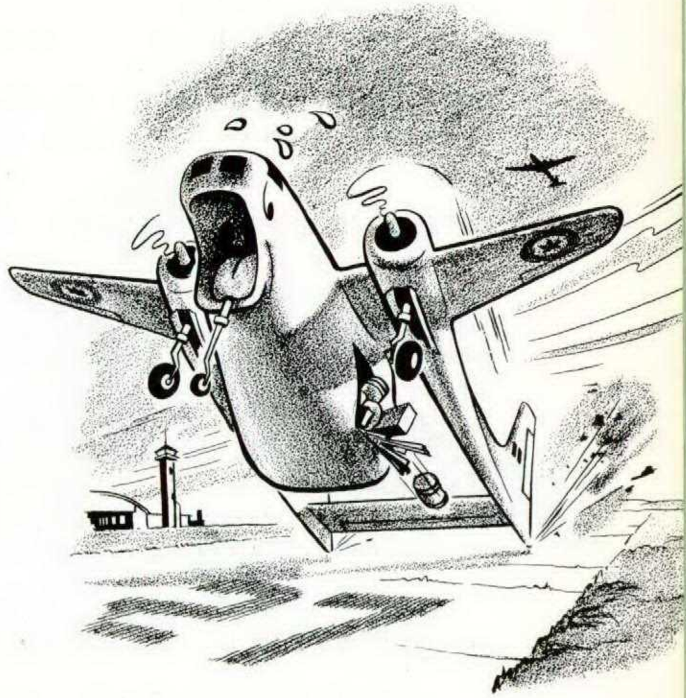
(ii) May alter handling characteristics to the extent that with the normal trim settings, etc, the normal stick-backward pressure would be insufficient during takeoff, particularly in a nose wheel type aircraft. This lack of response to normal pressures takes a little time to register, and the results, with a heavy transport aircraft on a night takeoff, are easy to imagine.

(iii) In flight the drag will be excessive due to the fact that in order to hold a certain attitude an ordinary amount of trim will not be sufficient. Thus an excessive amount of trim will result in increased drag, with possible increase in fuel consumption and decreased range depending on how the aircraft is operated.

(b) C of G too far aft—tail heavy

(i) During takeoff, using normal trim will not produce the desired takeoff attitude; and, though the aircraft may leave the ground, once deprived of runway-wing venturi effect, the aircraft may mush into the ground again. In extreme cases aircraft have crashed owing to a stalled condition of tailplane and elevator.

(ii) During flight - increased drag as explained in (a) (iii) above, with the following additions. If the CG is allowed to get slightly behind the aft limit, it approaches the neutral longitudinal stability point. In this region, a small stick force will result in a large G load, and over-



Not the desired takeoff attitude.

control to the point of overstressing the aircraft is the imminent danger. If the CG gets far enough back, the aircraft becomes longitudinally unstable and flight is impossible.

(iii) During landing - the possibility exists that normal pilot-imposed stick forces would produce an unduly nose-high landing with the aircraft "dropping out of the pilot's hands".

While we are on the subject of balance it might be interesting to note that although we have made a long story of the fore and aft positions of the C of G, we have not mentioned the athwartships position of the C of G, nor yet have we mentioned the position of the C of G along its vertical axis. This is because the changes of position of C of G in these planes of reference are usually so small that they can be ignored. However, in these days of such extra paraphernalia as wing tip tanks and outboard wing tanks, it is well to bear in mind that the C of G can have movement laterally.

DETERMINING THE C OF G POSITION

The position of the aircraft's C of G should be the concern of all pilots. Being within limits at takeoff and landing is not the only consideration. Under some conditions the inflight location of the C of G will have to be checked because of changes in (for example) the fuel load or bomb load. In order to do this properly the pilot must have a knowledge of the principle of moments, for it is upon this principle that the determination of the C of G position is based.

PRINCIPLE OF MOMENTS

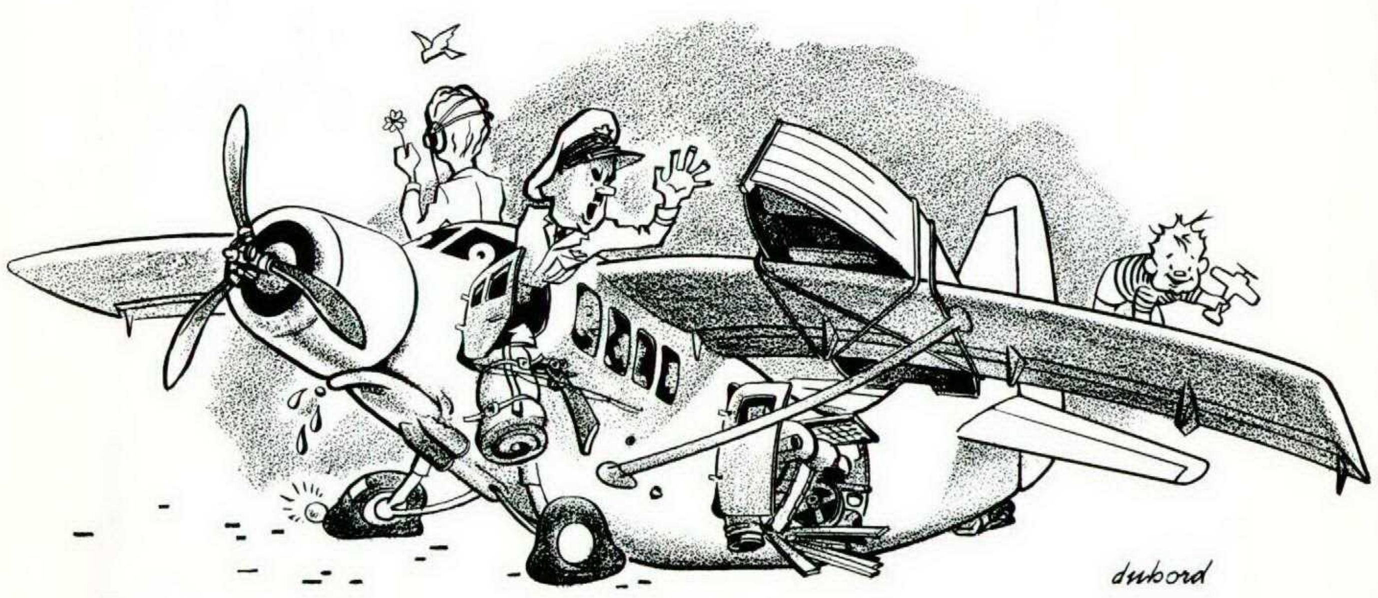
We see applications of this principle all around us in every day life. One such example is to be found in the schoolyard where a couple of children are playing on a see-saw. The turning effect (i.e. the moment) about a point produced by a weight is directionally proportional to the distance between the line of action of the weight and the point. The moment of a large weight near the point of balance can be equalled by the moment of a small weight at a proportionately greater distance from the point of balance. We shall in future refer to the distance mentioned as the arm, and the point of balance as the fulcrum.

APPLICATION OF THE PRINCIPLE TO AIRCRAFT

We have seen that weight x arm = moment. It follows that Arm = $\frac{\text{Moment}}{\text{Weight}}$. This latter form is the one which is used to give us

position of the C of G of any aeroplane. The only point to note is that, in referring to aircraft, it is usual to shift our fulcrum point to the nose, thus making all moments about that point positive, thereby saving a lot of possible confusion in weight and balance calculations. Using our formula then, $\frac{\text{Moment}}{\text{Weight}}$ = Arm, which is the distance we mentioned, it is possible to calculate the distance of the C of G from the fulcrum point—the nose or the nose reference datum, whichever we wish to call it. This position is calculated from the weights and arms of the various components of the aircraft. This data is then supplied to you as the basic weight, basic moment and CG of the aircraft—as found in the form L36. The additional weights and arms of fuel, crew, freight and passengers must still be accounted for. This additional weight is merely added to the basic weight and the product of the various weights and arms is added to the basic moment. The sum of the moments divided by the sum of the weights gives a resultant arm of distance which, when measured from nose reference datum (about which the individual moments were calculated) will give the position of the CG of the loaded aircraft.

This is basically all that is required to be understood with regard to the calculation of C of G. In practice the process is made considerably easier by the use of appropriate load stick or loading tables. It is not the intention to dwell further on the use of the load stick or loading tables, but merely to say that the work they do for you is simply as described above. Undoubtedly the need will arise for correcting a C of G position in order to bring it within limits. This statement will be self-evident once the principles involved are thoroughly understood.



A slight case of overload.

LOAD SECURITY

Obviously any freight loads carried in the aircraft are subject to the same acceleration and deceleration forces as the pilot. Therefore the security of the freight is dependent on:

- The strength of the lashing material
- The strength of the lashing points
- The strength of the aircraft floor.

For instance, in the C119F, lashing material should be strong enough to withstand: (a) A deceleration force (or tendency for the freight to move forward) of at least 4.5 times the weight of the freight; (b) an acceleration force (or tendency for the freight to move backward) of 1.5 times the weight of the freight; (c) an upward acceleration of the freight, 2.25 times the weight of it; (d) and a sideways acceleration of the freight, 1.5 times the weight of it.

Details of the floor intensity loading permissible are contained in the relevant EO, as are also all the other details relevant to compartment loading. Having, so to speak, put the EO in the hands of the reader, we hope that we have at least been of help in explaining some of the basic facts about aircraft weight and balance. From here on it is up to you to ensure that the conditions of loading are complied with.

NOTE: EO 05-1-8 contains general aircraft weight and balance data and specifies when aircraft must be weighed. AFRO 744, dated 31 Dec 54 covers the distribution of weighing scales.

Twenty-two years of the author's life have been tied up with aviation—half of that period devoted to aircraft maintenance engineering and half to flying. His engineering stint began in 1933 with Airwork Limited of England, and he learned to fly during the daily test flights of the firm's aeroplanes. In 1935 he qualified for his first pilot's license and acquired his British Aircraft Maintenance Engineer's license in 1937.

F/O Bryant joined the RAF in 1939 and from then until 1941 was engaged in maintenance. Posted to Canada in 1942 he qualified for his pilot's wings and became a flying instructor. Leaving this country in 1944, he joined No. 48 Sqn (Transport Command) and in 1945 moved to No. 24 Sqn from which he was detached in 1945 to become personal pilot to Lt. Gen Sir Charles Gairdner, the British equivalent of Gen MacArthur, in Tokyo. Throughout this appointment F/O Bryant's maintenance experience was put to good use, for a period of six months, during which he flew approximately 200 hours, he maintained his own Dakota in China, Korea and Japan.

Leaving the RAF in 1946 he took to airline work and flew for Scottish Airlines and Airwork Limited until 1952 when he joined the RCAF. Currently he is a member of the SOMaint Branch at TCHQ.

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LETTERS TO THE EDITOR

THE RUNWAY PROBLEM

Dear Sir:

In your article, "Winter Accidents", (third quarter, 1954) I discovered that you have no ideas on the subject of icy runways and taxi strips except to recommend going easy on the brakes and landing on the button. The ice is not likely to melt while your "intelligent pilot" is going around again—especially in a jet aircraft. You imply that one must put up with icy runways.

Aircrew at this station believe that sanding is desirable but should not be done because of technical difficulties: damage to jet engines, blocked drains and damaged under-carriage fittings.

W. Skelding, W/C
Chief Technical Officer
RCAF Station, Trenton

Dear Sir:

It is a fact that we have to "put up with icy runways"—for a time at least. However, the slippery conditions usually associated with icy runways need not be tolerated. Sanding runways has been accepted practice since 1952. The technical difficulties (referred to in W/C Skelding's letter) have not materialized up to January 1954. General Electric and Canadair technical representatives have indicated that sand does not constitute a danger to jet engines. It is also significant that jet bases are located in desert areas in both the USA and Overseas.

An experimental project is being carried out by Central Experimental and Proving Establishment to determine the most efficient and effective method of clearing snow and controlling ice on airfields to ensure sufficient traction for the safe operation of aircraft 24 hours a day. No conclusive decisions have been obtained to date but results indicate that present conditions can be successfully improved. These results will not be certain until late Spring, 1955.

R.R. Hilton, W/C
Director of Construction
Engineering & Design

As for blocked drains and sand-filled undercarriage fittings, such conditions are the result of neglect and can be adequately controlled. The important point about our winter article and the correspondence arising from it is that DCED has promised FLIGHT COMMENT an up-to-the-minute article on icy runways. It will appear in our pages before the winter of '55 sets in.—ED.

SAFETY POSTER CONTEST

A flight safety poster contest was held recently for the officers and airmen of 435(T) Sqn, Edmonton, and the unit sent along ten sample entries for the scrutiny of FLIGHT COMMENT's staff. Much as we would like to, we cannot possibly display them all because of space limitations, but we are reproducing one of the entries on this page. From time to time we may take advantage of the others, using them in cartoons and fillers in FLIGHT COMMENT, and giving credit to the originating unit. Thanks for thinking of us. Keep up the good work.

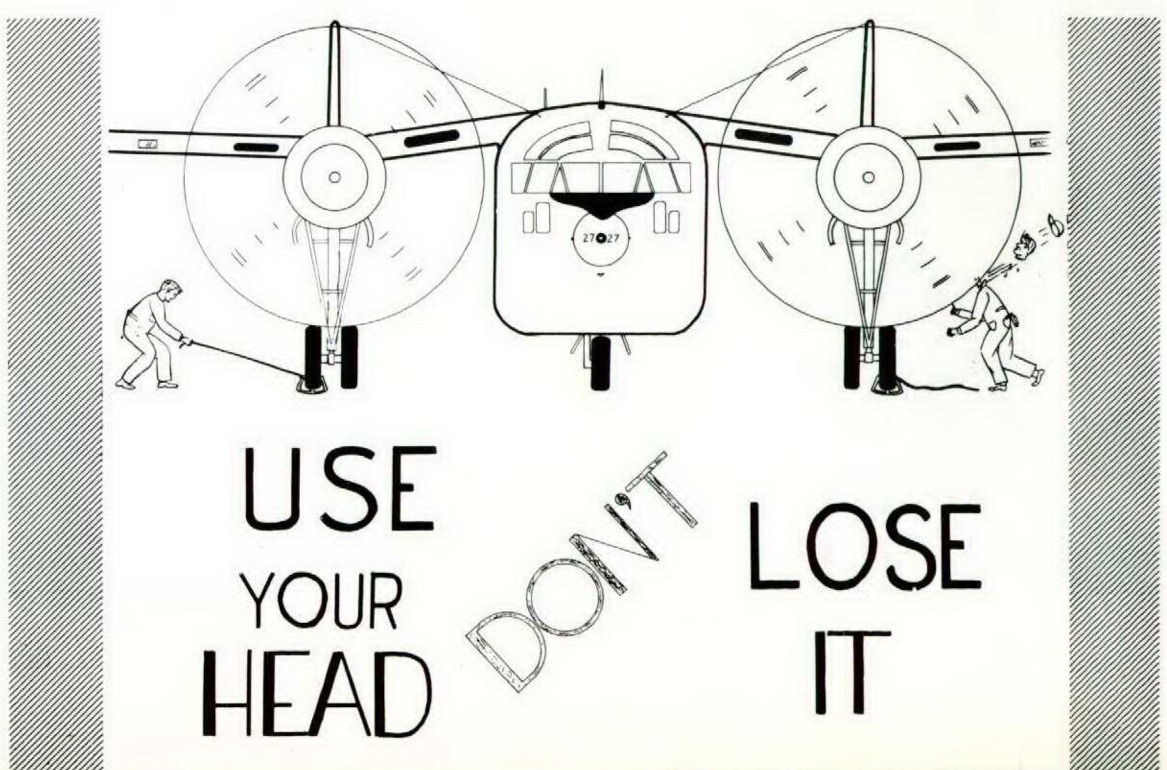
DITCHING IN THE MED

Dear Sir:

In the Second Quarter 1954 issue of "Flight Comment" there is an article entitled "Ditching in the Med". The wireless operator is cited for his major role both before and after the ditching. This officer was F/L (now S/L) D.R. Pearce, DFM, of the RCAF who was at that time on an exchange transfer with RAF Transport Command. I feel you should identify him for your readers.

A.C. Hull, G/C
CO, 3(F) Wing RCAF
Zweibrucken, Germany

Below is a photo of S/L Pearce.—ED.



Hi-level met

PART II

by
C.L. Johnstone
Meteorological Adviser
Air Defence Command

Part one of "Hi-Level Met" appeared in the Jan-Feb issue of FLIGHT COMMENT and dealt with the jet stream. In this, the concluding half of his article, Mr. Johnstone discusses clear air turbulence and condensation trails.

CLEAR AIR TURBULENCE

Operational experience at high altitudes soon disproved the concept that high level flight would be universally smooth. It was found that turbulent areas are a common occurrence in the upper atmosphere, that they may be encountered without warning and that, on occasion, the apparent severity of the turbulence is comparable with that associated with thunderstorms. Pioneers in the study of this phenomenon have been the Meteorological Services of Great Britain, United States and Canada—and much useful knowledge has been obtained. As an aid to further research, a technical paper entitled "A Review of Current Knowledge on High Level Turbulence" was prepared in August, 1953, by J. Clodman of the Canadian meteorological research team.

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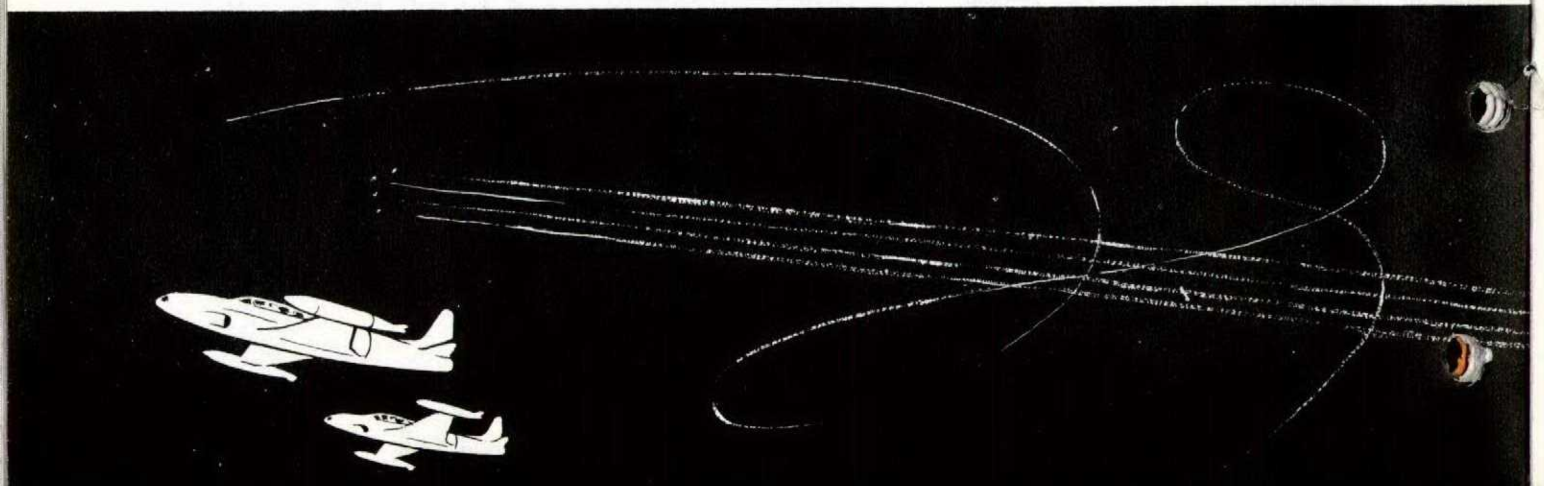
High level, clear air turbulence is usually associated with strong wind shear and occurs in patches 50 to 100 miles in diameter. The thickness of these patches is extremely variable but is generally less than 3,000 feet. However, thicknesses of over 7,000 feet have been reported.

Turbulent areas do not appear to have any clear cut pattern. A favoured location is in the vicinity of a jet stream—particularly on the cold side where the wind shear is most marked. There is also a tendency for turbulence to occur near the tropopause but the reasons for this are more obscure. It has been suggested that the small waves which are sometimes induced on the tropopause (and which travel along it) supply the necessary wind shear when they degenerate into small eddies. Another situation showing some correlation with turbulence is provided when a region of marked low pressure exists in the upper levels. Since an upper low is often of the "cold" type—consisting of a dome of cold air completely surrounded by warmer air at upper levels—the temperature discontinuity over relatively short distances could cause a significant wind shear and might even be responsible for waves on the tropopause.

Turbulent areas are neither widespread nor continuous and they do not appear to follow any fixed pattern. For these reasons no successful turbulence forecasting techniques have as yet been developed. Until they appear, the best that meteorologists can do is to indicate those areas in which turbulence is most likely to occur.

CONDENSATION TRAILS

The Rolls-Royce laboratories have found that for each gram of fuel burned by jet aircraft, 1.45 grams of water vapour are produced. A large quantity of heat, approximately 10,000 calories per gram of fuel, is also released. Both these products of combustion are ejected from the jet exhaust into a small portion of the atmosphere, and may cause it to become supersaturated and produce visible "trails". These condensation trails, or contrails, are composed of ice crystals—although under some conditions their initial composition may be water droplets which soon change to ice crystals.



Since the ability of air to hold water vapour is a function of its temperature, the heat added to it in the above manner reduces the relative humidity and inhibits the formation of contrails whereas the addition of moisture will increase the relative humidity and aid their formation. Furthermore, because the amount of heat and moisture released per unit volume of fuel burned is constant, temperature curves for fixed values of relative humidity can be computed to show the critical atmospheric temperatures necessary for the formation of contrails. Such curves, when used in conjunction with plotted, upper air soundings, will indicate in what areas and at what heights contrails will form. For the greatest accuracy in such computations, the environmental relative humidity ought to be known. Unfortunately there is no really suitable method of measuring that element at the very low temperatures associated with the high levels of the atmosphere.

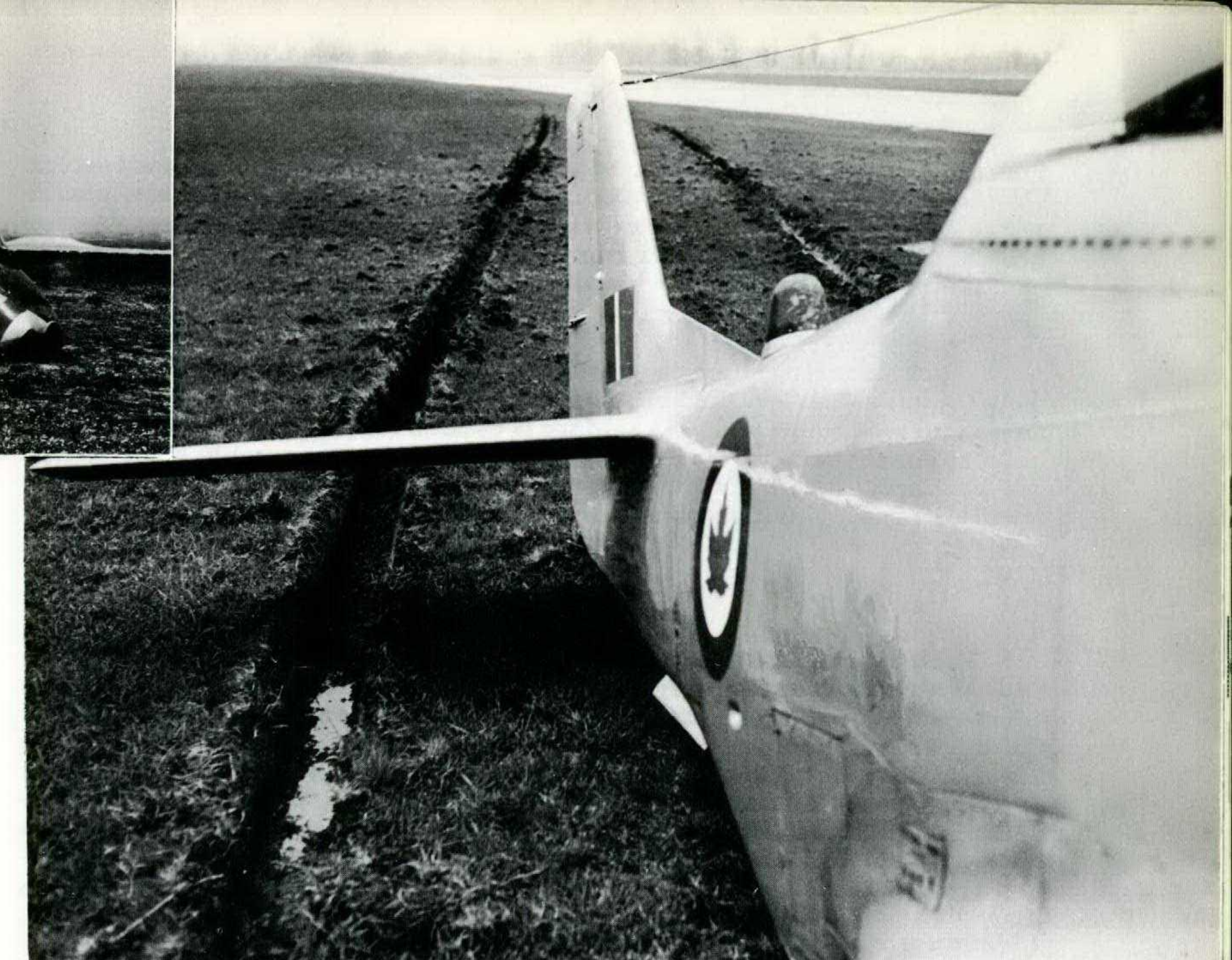
There is one other type of contrail—the so-called "aerodynamic trail", which is sometimes formed in very moist layers at lower levels. It results from the cooling associated with the sharp reduction of pressure in the air flowing past an aircraft. When conditions are favourable it is most commonly seen just behind the wing tips. The aerodynamic trail is rare and non-persistent and thus of minor importance.

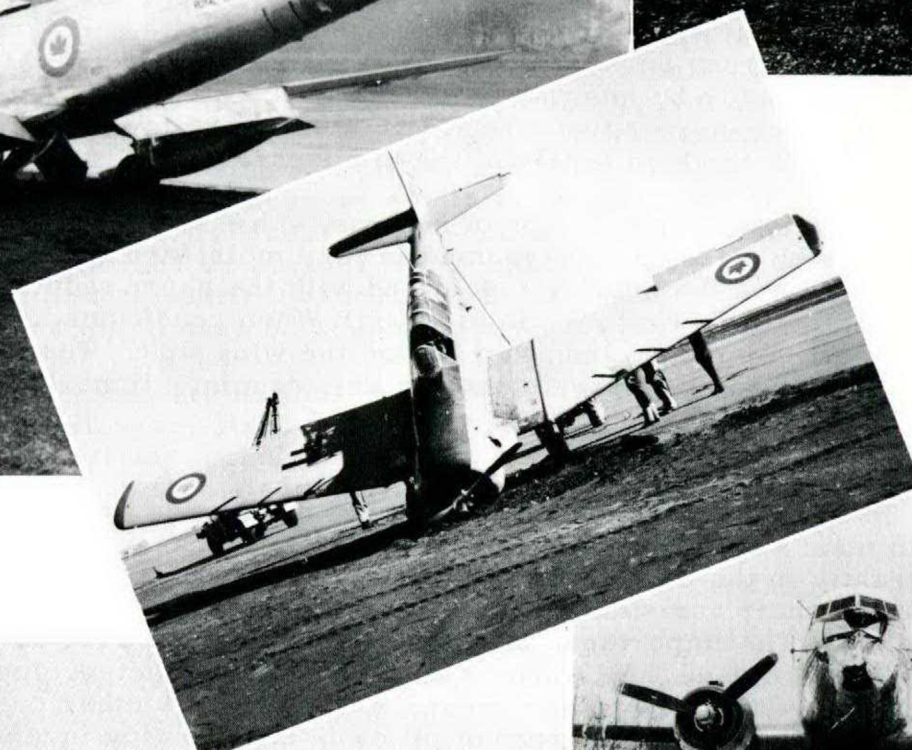
*

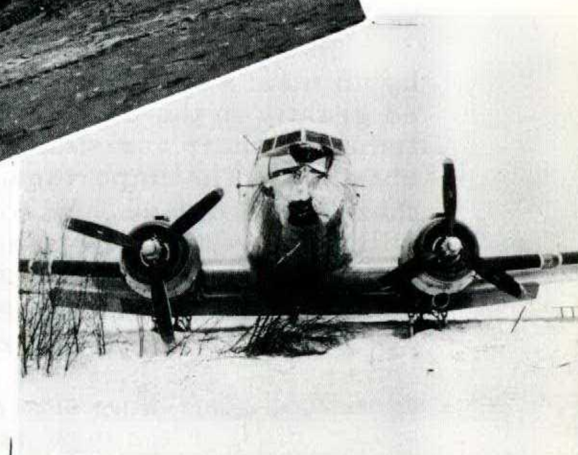
Studies of the jet stream, clear air turbulence and contrails have by no means been completed. Pilots of operational aircraft have assisted greatly in the compilation of statistical data relative to these problems and their assistance is still required if optimum results are to be obtained. The importance of complete and concise pilots' reports is therefore stressed. All such reports handed in to meteorological offices will be forwarded to weather research centers for further careful study. This co-operation on the part of pilots is contributing invaluably to one of the basic ingredients of safe flying—an efficient weather service.

'HERE COMES OUR HOT LUNCH ON A VFR FLIGHT PLAN'

U.S. Naval Aviation News







SPRING BREAKUP

Spring and a young man's fancy.... You hear a lot about them at this time of the year. Could preoccupations associated with the season be responsible for a tendency to let down a trifle in vigilance with the approach of milder weather? Maybe we should take a closer look.

Because the spring thaw for RCAF operations throughout the world varies geographically and yearly, we have taken a time span from 1 Mar - 31 May as representative of our experience during this period. Our survey covers the years 1953-54, and from it we have concluded that pilots should steer clear of undershoot areas, overshoot areas and the infield during spring breakup. Proof enough lies with the photographs we have on file, some of which have been included here. As for runway slush and water, you can at least be prepared to handle the sort of situation they present by knowing what to do ahead of time.

From 1 Mar - 31 May, 1953, there were 33 RCAF accidents caused by factors associated with spring flying. The majority of these accidents occurred in soft infield and overshoot areas. During the same period in 1954 there were 35 accidents caused either directly or indirectly by spring breakup factors. No one expects the impossible—but everyone respects the man who does the right thing BEFORE the crisis instead of remembering it suddenly afterward.

SPONGY GROUND

Factors responsible for or contributing to spring breakup accidents are a true "Rogues Gallery". They run the gamut from ricochet accidents caused by soft ground at the range to slush on the runway. But the major contributors to spring accidents are soft infield and overshoot areas. Obviously no one lands on them except in an emergency, so the original error is usually committed by the pilot. One wheel of an aircraft may run off the runway as the result of a swing. And one wheel sunk in a soft infield is enough to damage an aircraft. Here is a typical example, emphasizing the danger of soft infields during the spring thaw.

The pilot of a Mustang was making a landing in a crosswind. As the tail came down his aircraft swung to the right and ran off the runway onto the infield, the wheels sinking to a depth of approximately one foot. A swing off the runway during spring breakup could put YOU in this embarrasing situation.

There were 5 accidents during the spring breakups of '53 and '54 as a result of soft ground in the overshoot area. Did you notice the shot of that Sabre on its nose with its wheels in the mud? It was taking off as number three in a four-plane formation. Three-quarters of the way down the runway, the pilot aborted his takeoff because he couldn't unstick the nose wheel. The Sabre overran the runway, the wheels dug into the soft ground, the nose wheel sheared off, and the aircraft was a "writeoff." Soft shoulders can be just as dangerous. A wheel digs in and the mud flies—generally accompanied by parts of a disintegrating aircraft.

Tackling the problems associated with soft shoulders customarily begins and ends with a warning to pilots to steer clear. Granted that such a warning is justified, is there not a more realistic approach? Airfield maintenance must aim at even greater field serviceability.

Undershoot and overshoot areas must be free of obstacles, and the firmer their surface the greater their usefulness. Very likely improved drainage could be made to pay big dividends by ensuring the removal of unwanted moisture in a minimum of time, thereby making the infield and other areas of the 'drome capable of supporting aircraft should such a requirement arise. The planting of grass is another field maintenance aid, the grass serving to bind the soil. It should be kept short, however, to permit sunshine and air to get at the ground below following rain showers.

POOR VIS

Poor visibility accounted for another five accidents in the springs of '53 and '54. In many areas of Canada a snowstorm can brew up in a hurry. Visibility lowers in a matter of minutes so that, for those aircraft caught short by the snowstorm, reaching base is a big problem. For instance. A two-plane Sabre formation took off on a routine training flight. The weather was supposed to remain above VFR, occasionally lowering in snow showers. Arriving back at base the two pilots found their home field blanketed by a slow moving snow shower. After a series of attempts to land, the number two pilot was forced to bail out because of fuel starvation. The formation leader landed after making four low-level circuits to find the runway. Over the airfield the unforecast snowstorm had reduced forward visibility to practically nil. GCA could not maintain radar contact with the lost aircraft because of heavy snow "clutter" on their search radarscope. The pilot who bailed out escaped injury but his aircraft was destroyed.

RUNWAY OBSTACLES

Watch those runways! Canadian springs being what they are, aircrew may fly from a bare runway to a snow or slush covered runway within the boundaries of Canada—or even one province! So keep those winter precautions handy. Here's one good reason why. A Dakota pilot was landing on a short runway which was covered with rolled snow. The Dak bounced on touchdown and the pilot applied power for overshoot. Because it had been stalled onto the runway, the aircraft simply stalled again. The right wheel then dug into soft snow, swinging the aircraft off the runway. The Dakota went up on its nose, then fell back on the tail wheel, extensively damaged. Whiteout conditions may have been present, coupled with partially obscured vision from the alcohol spray used as a windscreen de-icer.

Wet and icy runways are always a headache during spring thaws and have a tendency to bring grief to the pilot who lets his winter caution slide off with his winter underwear. A Canuck pilot was recalled from a training exercise because adverse weather was approaching his base. While he was making a GCA approach a heavy rain shower so nearly obscured forward vision that he actually landed in gusty crosswind conditions with only side vision. Engines were shut off immediately after touchdown. As speed dropped off, the Canuck skidded from the runway, neither rudder nor brakes having any effect. The port undercarriage sank deep into soft mud and snapped off. The oozing ground was the accompanying spring breakup hazard. We have had three similar accidents resulting from wet runways.

Among novel cases on our accident files is the "water flameout" which occurred to a Canuck on the verge of takeoff. Travelling at about 50 knots it ran into a pool 100 feet long and 60 feet wide. Water shot up from the nose wheel into the engines causing them both to flame out. A slush-plugged runway drain was the culprit.

Runway ice forever presents the pilot with the need for extra caution. Here is the type of accident it helped to cause last spring. A pilot was making a three-point landing in a Mustang when its port wheel ran over a patch of ice, causing the aircraft to veer to starboard. Port brake and rudder were ineffective and the aircraft groundlooped off the right edge of the runway, sustaining "D" category damage.

(Reference is made to the runway ice problem on our PX-ing page. As we have noted there, arrangements have been made for an article embodying the latest thinking on the subject. It will be published in FLIGHT COMMENT before next winter closes in. Meanwhile, careful use of sand still appears to be the best answer to runway ice.—ED.)

Spring thaws give flying control and field maintenance sections a full time job preparing and ensuring adequate drainage facilities. Water—as one North Star pilot can tell you—can be a genuine menace The aircraft had just touched down and commenced its landing run when the passengers in the rear of the aircraft felt an impact on the port side. (The captain had not been notified of any runway hazards.) Investigation revealed that the port flap was severely damaged when the port wheels ran through a pool of water, funnelling it onto the flap with great force. And that's how low spots on a runway can collect sufficient water from thawing snow or damage an aircraft!

Vigilance on the part of Flying Control coupled with co-operation

from the Construction Engineering staff is the only way to cope with such a problem. As the melting of snow and ice progresses, slush must be bladed or brushed from runway surfaces if damage to fast moving aircraft is to be avoided.

ICING

Icing can be a factor in accidents at any time of year but this one came about in the spring of '53 - '54. Descending from 30,000 feet a T-33 pilot picked up moderate airframe icing. His windscreen iced over despite the use of defrosters and the pilot failed to allow enough extra approach speed to offset the increased stalling speed arising out of ice accretion. The T-33 stalled short of the runway, landing heavily and causing "C" category damage to the starboard undercarriage and tip tank.

Among the airframe icing accidents reported last year, here was one of the most unusual. A Harvard pilot selected undercarriage down on the downwind check. When the port green light failed to come on, he did all the prescribed emergency lowering procedures, but in vain. The port undercarriage collapsed near the end of the landing roll. Investigation revealed that the Harvard had been washed the previous evening by maintenance personnel who had failed to ensure that the lock pin mechanism was properly dry prior to parking the aircraft outside in subzero temperatures. The moisture had frozen in flight causing the lock to be inoperative. Clean aircraft are a credit and an asset—but they should be well dried before being exposed to freezing temperatures.

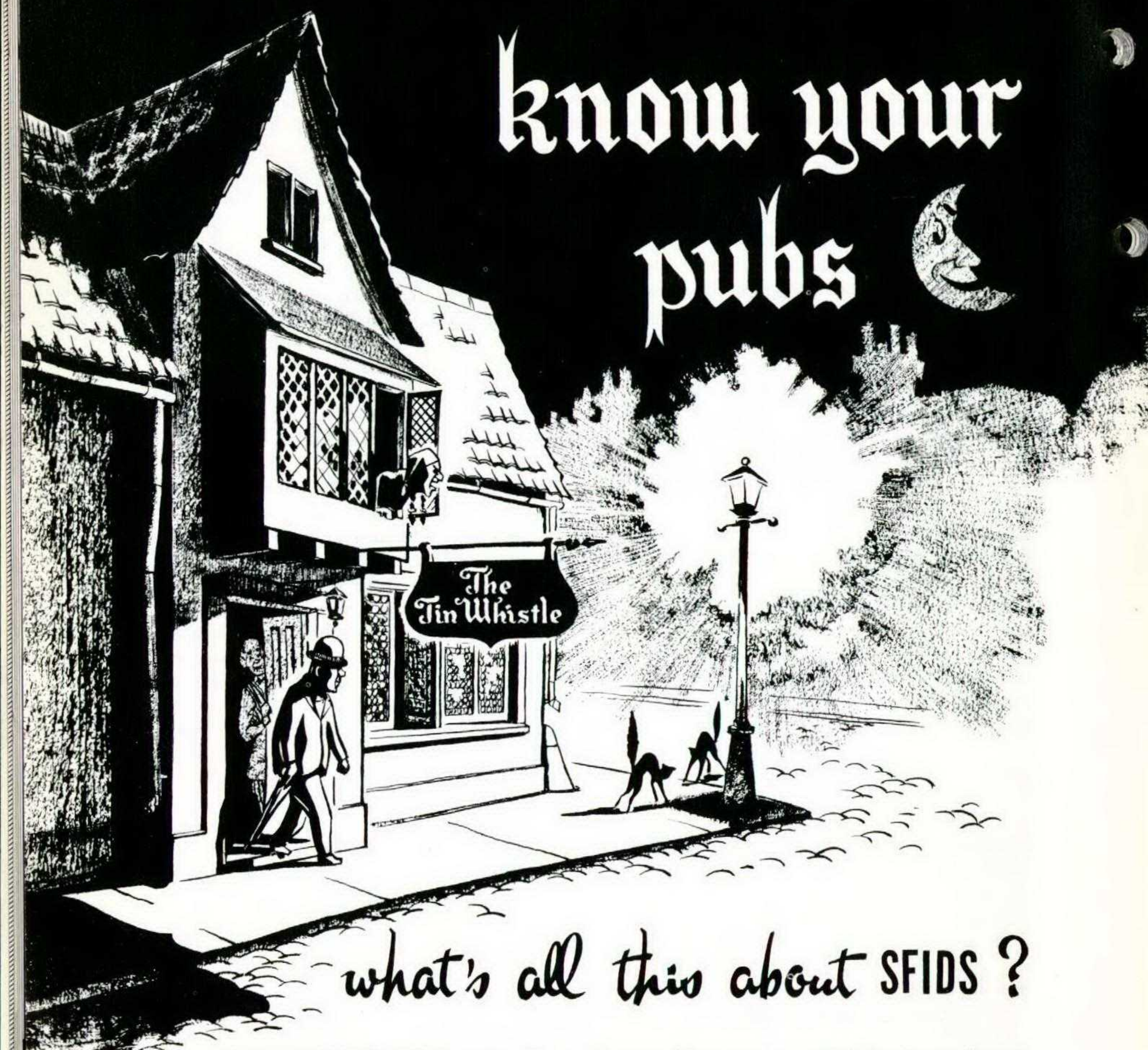
* *

This review of spring accidents should help to instil a sense of caution in all of our readers who are on active flying jobs. However, in closing, we submit for your consideration a few small tips which should help to see you through the spring months unscathed and uncensured.

- Know runway conditions—at base AND destination
- Stick to the runway—the infield is slow going
- Keep an hourly eye on the weather
- Report runway conditions after landing
- Cycle your undercarriage after a slushy takeoff

WINTER VIGILANCE WILL SEE YOU THROUGH SPRING

know your pubs



what's all this about SFIDS?

AT WHAT TIMES does a Canadian radio range station broadcast weather reports? How does one convert centigrade to fahrenheit? Could you read the message if you saw Paulin Signals? The answers to these questions are laid down somewhere. And you can count on it that equally vital information on a host of topics can be picked up from the same source. So where do we look?

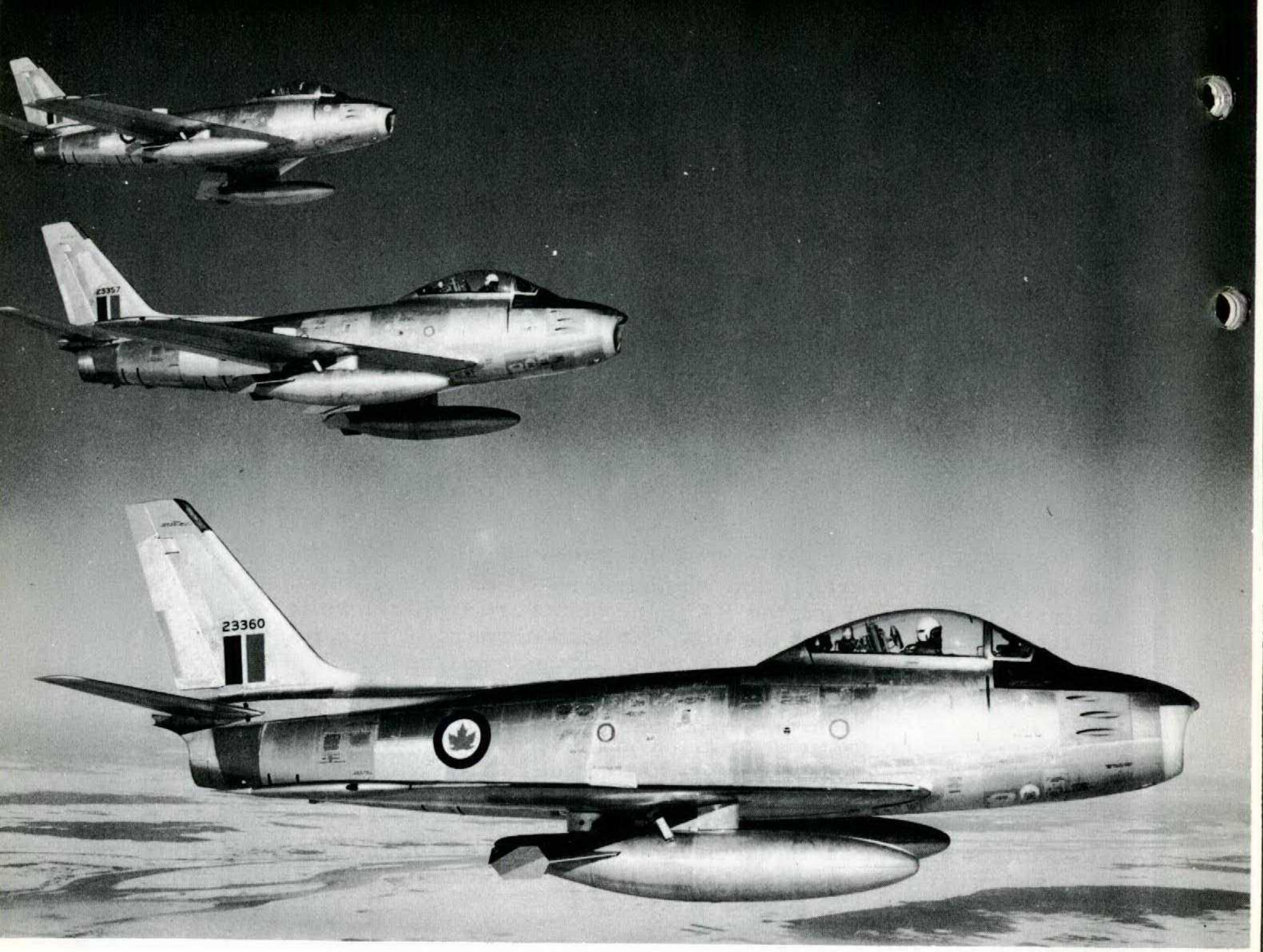
S-F-I-D. Recognize it? The SFID or Supplementary Flight Information Document (also called CAP 482) is a vital source of information not just for pilots but for all aircrew. It consists principally of rules, regulations and flight information obtained from governmental publications, intelligence offices and civil agencies. The SFID is invaluable for preflight planning, emergency procedures and inflight data concerning operating procedures such as ADIZ and ICAO International Distress. SFIDs also carry informative knowledge on commercial broadcasting stations: locations, call letters, frequencies and hours of operation. (At present the actual radio programs are not listed, so for "Our Miss Brooks" consult your local newspaper.) Incidentally, if at present you are not using your SFID to your own advantage, remember that we are obliged to carry them in all aircraft when operating under IFR. (See CAP 100 Vol I art 102.68.)

*

The SFID is actually part of the Radio Facility Chart series. There is world wide coverage; and whether the SFID for a particular area is printed by the USAF or the RAF, the books are similar: white with three diagonal black lines in the top, left hand corner. There is an active working group—comprising representatives from the RCAF, RCN, RAF, RN, USAF, USN and US Army—which co-ordinates with the respective Services to formulate the information to be printed. If you have any comments or suggestions to make on these SFIDs, ship them right along to RCAF Headquarters, Ottawa, Attention: Flight Information Centre. They will receive full consideration. But don't wait with bated breath until they appear in print. SFIDs are published only every six months. You might also like to check AFRO 421/54 and 606/54 to ensure that you are receiving the correct allocation of Supplementary Flight Information Documents.

Because your interest may now be sufficiently aroused that you are wondering what other valuable "gen" is within your reach, we have listed here the contents of CAP 482. See anything you'd like to check on?

Accidents and Forced Landing Instructions
Air Defense Identification Zone Chart
Air Traffic and Signals
Air Traffic Control Clearance
Air Traffic Control Procedures
Approach Clearance
CIRVIS
Commercial Broadcast Stations
Conversion Tables
Designated Mountainous Area Chart
Direction Finding Service
EMERGENCY RESCUE COMMUNICATIONS PROCEDURES
Emergency Visual and Radio Signals
Flight Plans
Flight Service (US)
Flying Regulations (US and RCAF)
General Information (Distribution, Procurement, etc)
General Procedures (International)
Ground Control Approach (GCA)
ICAO Place-Name Abbreviations
ICAO Procedure Chart
Instrument Landing System (ILS)
Loran Chart
Meteorological Station, Broadcasts
Metro Station Index
NOTAM Code
Ocean Station Vessels
Position and Weather Reports
Q and Z Operating Signals
Radio Range Orientation (USAF & RCAF)
Regular Foreign Clearing - Terminal Aerodromes
Rescue, Search and Rescue
Servicing (US)
Standard Holding Procedures
Sunrise and Sunset Tables
Time Signals
Two Way Radio Failure
Units of Measurement
Weather Recording Forms



FORMATION COLLISIONS

PART II

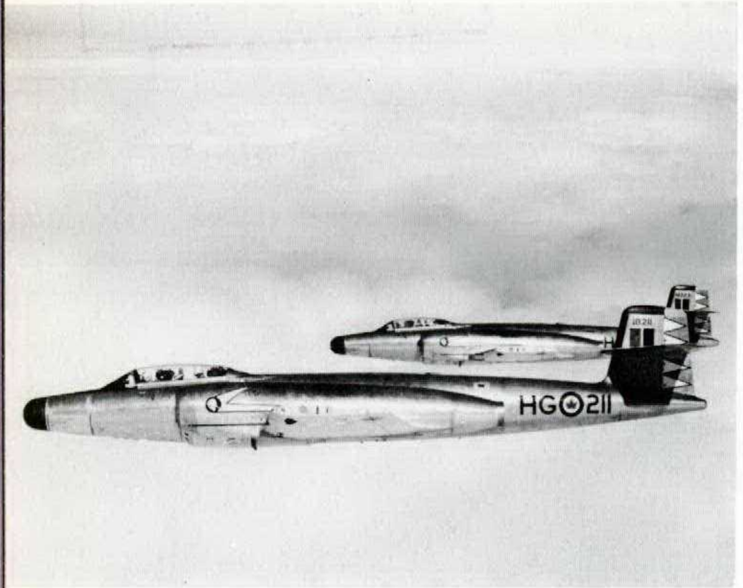
This is the concluding portion of a two-part article, the first half of which appeared in the Jan - Feb issue of FLIGHT COMMENT.

FORMATION APPROACH

The approach to a landing field demands the utmost skill and caution on the part of the leader. In jet formations particularly, concentration and good judgment are required for manoeuvring to ensure a straight

run-in on the dead side of the runway in use without overbanking an echelon, and in order to provide a good straight stretch for the formation to "settle down".

The leader has further responsibilities however—more directly concerned with safety. Once again he becomes the sole "lookout"; but his problem is now more acute because the aircraft are entering a congested flying area. Prior to making his initial approach, he should contact flying control for the details on local traffic; and a further wise pre-



caution is to take a good long look in the direction opposite the intended turn BEFORE entering the turn. This recommended procedure applies especially to airfields employing the "funnel" or "3-mile-initial" approach system in which other aircraft are very likely funnelling in from the opposite side—each one blind to the other's approach.

Watch your signals and give ample warning if you intend to use airbrakes or make a rapid power cut. While the latter would not be dangerous if every aircraft maintained its required spacing, some eager beaver may be tucked right in close—in which case hasty action could have serious consequences. Any erratic move on the leader's part is magnified considerably by the time it reaches number 4 in the echelon, and this applies, to a lesser extent, to each member of the formation. Numbers 2 and 3 should remember that they are sandwiched (as if they could forget it!); and so, should they be sliding in a little too close for comfort, they ought to check the movement and then ease back out to position, giving the outer pilots time to adjust their position. Tight formation at this stage of the flight is not only unnecessary but an invitation to disaster, particularly in turbulent conditions. A safe, even spacing looks just as impressive to the ground observer!

(Speaking of these observers, formation flying was never developed to impress anyone on the ground. It is aimed solely at cultivating good judgment and precision—its ultimate value lies in its tactical application—and it is for this reason that the more difficult exercises are not attempted until the simple ones have been thoroughly mastered.)

CIRCUIT AND LANDING

Whether you call it the "landing pitch" or "landing break", this is the manoeuvre that was designed to set the members of a formation up at safe and regular intervals for landing. Maintain the interval and all is well; neither prop nor jet wash presents a problem, and the risk of collision is at zero. Should you be closing fast with the aircraft ahead when turning final, don't be shy—overshoot! If you have to apply full power for the go-around its much better to do it at a safe altitude than on roundout. Apart from your own discomfort, picture the alarm and consternation in the aircraft behind you when he gets your full-power blast at the point of stall!

Briefing usually covers which side of the runway each member of the formation will land on. When you roll out onto final, line up with your side of the runway and hold it; this will cut confusion to a minimum. Should you for any reason have to change sides at any stage of the approach, a brief call on the R/T should be sufficient to warn your teammates. Again, after touchdown don't collapse in a relieved heap. You're not through yet! Watch your relative overtaking speed carefully and keep to your own side of the runway. On the other hand don't decelerate too harshly and make life difficult for the pilot behind. A steady, straight stream up to the end of the runway is good insurance. There should be no turnoff at an early intersection unless the briefing calls for it, for not only does this indicate poor discipline and ragged behaviour; it is also an unsafe practice.

TAILCHASES

This chat would not be complete unless we covered tailchasing, which is a fruitful source of accidents. Spacing again is important. A 200-yard interval has stood the author's formations in such good stead for several years that he can see no reason to suggest an alternative. The leader can do plenty in the interests of safety if he makes a few mental notes.

- Why go barreling up into the sun for no reason? If, when you glance ahead, the sky is too bright for comfort, then its too bright for your tailchasers.
- Make your manoeuvres smooth and avoid erratic changes of direction.
- If you must loop, ensure that you have plenty of excess speed. If you have lots, then your number 4 may just stagger over.
- Keep your head over your shoulder and your eyes open for unsafe practices.

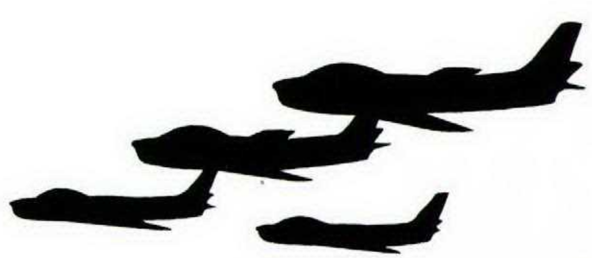
If you are a follower in the formation, your job is to follow the joker in front. Follow him and maintain your interval without cutting corners (unless you're losing ground!). If he pulls up into a vertical manoeuvre and you "cut a corner" before pulling up, then almost invariably your air speed will be less. Should you stall off the top of a loop, that's bad. But if you stall off and collide with the"bod" behind you......Perhaps you are overtaking rapidly and almost climbing up the jet pipe of the aircraft ahead. This is not the signal to dump air brakes, chop power and fishtail madly back into the gaping intake of the aircraft behind! Slip out to one side and get on the R/T before you do anything rash. The old basic rule applies: Use your head—don't panic.

GCA

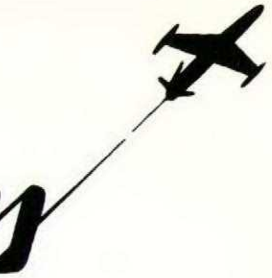
In fighter operations, as mentioned earlier, the letdown and GCA are also carried out in formation. Of the letdown little need be said as the rules for close formation apply there as well. Power settings and air speeds are laid down and no undue difficulties are anticipated. GCA will probably go smoothly, too—right up to the time the little wizard in his dark room says "perform your initial landing check", or words to that effect. Here is where the pre-flight briefing pays off. If you have pre-arranged signals for air brake operation and gear and flap lowering, then you are "home free". But a word to the wary: make sure you have visual signals up your sleeve as well as R/T transmissions, just in case the airwaves are busy and you can't get a word in edgewise.

CONCLUSION

Well, there wasn't very much to that after all, was there? Mostly just plain good airmanship and common sense. Chances are that you were well aware of most points before you started reading. However, the writer has no apologies to make. If he has succeeded in convincing one pilot that a flying habit of his is a menace to himself and a threat to the formation—and if that pilot vows to eliminate the habit—then the effort has been repaid. Pilots training toward fighters are bound to develop formation habits. It is a man's duty to see to it that the ones he develops are safe habits. If you are fortunate enough to be serving with a fighter squadron already, Good Luck to you. And one last tip; REMEMBER THAT FORMATION FLYING IS PURE TEAM WORK—AND THAT THERE ARE OTHERS ON THE TEAM BESIDES YOURSELF!



near miss



"SWIVEL NECKS LIVE LONGER"

When I started flying, my instructor at FTS used to pound home his message on the importance of avoiding a mid-air collision by rapidly banging the stick against my knees and shouting, "Keep your head on a swivel!!" He further emphasized the need for absorbing a few fundamental safety rules by remarking sadly, "You get only one chance to make a fatal mistake."

*

One bright day a couple of months later I almost proved him right. I was up solo, practising aerobatics on the day before my final check flight. I was feeling pretty well satisfied with myself. The slow rolls and cloverleafs were going fine and it was hard to remember that the lumbering trainer wasn't a Mustang or a jet, and that the cloud over there wasn't an enemy bomber. I made another pass at it just in case it was and then decided to go home. It was a little late, and as I approached the field I saw the last of my group heading in toward the landing pattern.

Perhaps it was my recent combat experience with the cloud that made me think a diving U-turn from a couple of thousand feet up would be a suitable way to get down to circuit pattern altitude. I picked a landmark to indicate the spot at which I should come out of the dive before entering the pattern. Then I searched the sky for other planes. There wasn't a thing around except one trainer about half a mile off to the right, flying in the same direction and at about the same altitude. By this time I was lined up with the approach to the pattern so that a steep, diving U-turn would bring me out at traffic altitude, headed in the right direction to enter the pattern without having to make a single correction. Again I checked for other planes. Still nothing but that trainer keeping his distance. I pulled up a little and whipped over in a dive to the right and watched the altimeter unwind while the airspeed climbed to the red line. I checked my landmark, tightened my turn a bit, and then pulled up hard at traffic altitude. I levelled off, chopped power, lowered undercarriage, and was waiting for the airspeed to fall off before sinking the flaps when a wild whining buzz penetrated my headset.

I looked around to see what could be the trouble and there it was! Another plane was beside and slightly above me, with the propeller not three feet from my head. In the flash it took me to slip down and away I saw the wing of the other plane overlapping the fuselage of mine and the landing gear almost meshed with my antenna.

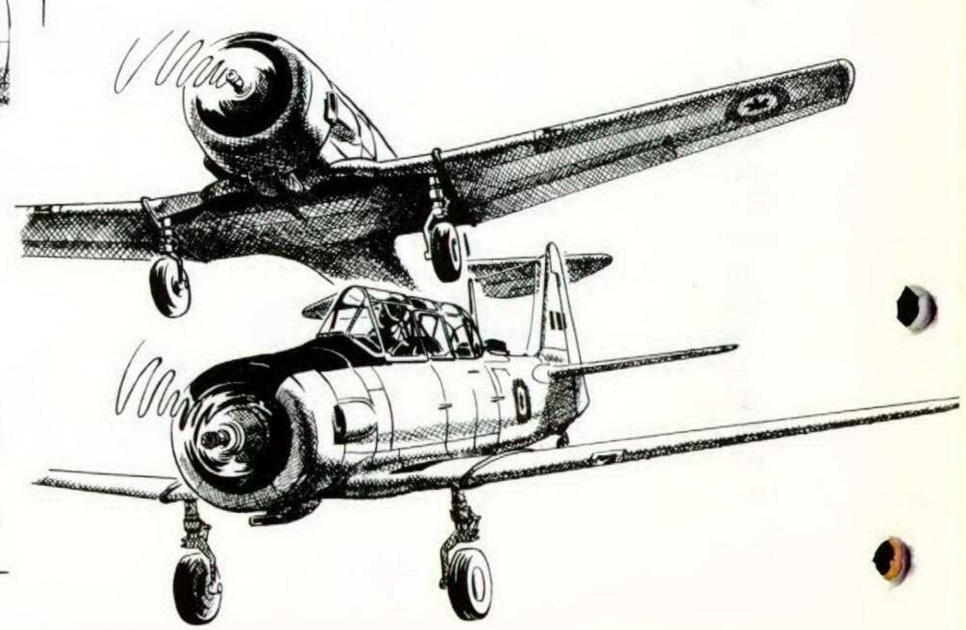
For the next few minutes I was content to fly along straight and level while I tried to figure out where the other plane had come from. I looked back over my shoulder and sure enough the trainer was gone and I knew what had happened. He had peeled off to the left as I did the same thing to the right—and we had almost met in the middle. The low-winged trainers had blocked vision for both of us. The result could have been another unexplained mid-air collision.

*

If my whole life didn't flash before me in that instant of almost certain disaster, the sobering words of my FTS instructor did. I had ignored his warning to be constantly on the lookout for other planes and I'd been careless in putting myself in a position where, in a potentially congested area, the low wing of the trainer blocked my vision. The other fellow had been wrong too; but that didn't change the fact that I had come within hailing distance of making my first "fatal mistake".

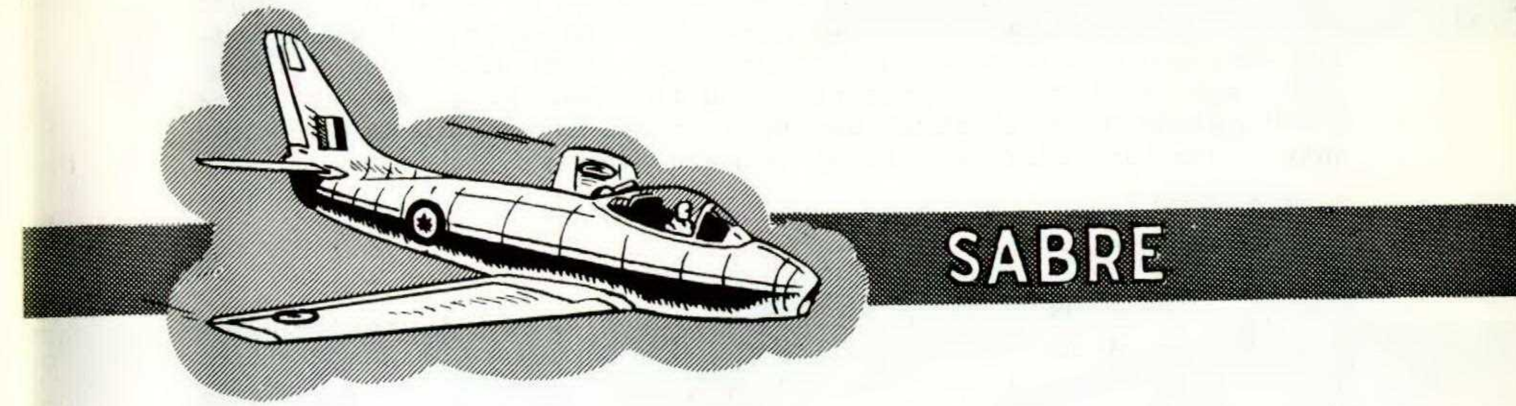
From: Accident Prevention Bulletin
RCAF Station Claresholm, Alta.

Not three feet from my head!



His wing overlapped my fuselage.

Accident Resumé



ILLEGAL BOUNCE

While on a routine cine exercise the pilot "attacked" an aircraft of another squadron engaged in a practice letdown. Attacking from above and astern, he passed beneath his target and then pulled up in front, striking the other Sabre's nose section with his own fin and rudder. The following criticisms are levelled at the attacking pilot:

- ▲ He attacked without prior briefing and mutual arrangement
- ▲ He employed an unsafe technique to break away after the attack
- ▲ He pulled up sharply in front of his victim and failed to maintain safe clearance.

This has been referred to as criminally poor airmanship and a "shock" tactic to point out to another pilot that he has just been "bounced".

STALL ON APPROACH

The pilot had completed his circuit and was rounding out for landing. He throttled back to idle and thought he "had it made" when suddenly the aircraft flicked violently to the right and the wing tip, aileron, and drop tank fin struck the ground. So the story goes, and another Sabre is damaged as the result of an attempted full stall landing.

The Sabre V is a first class fighting aeroplane, and represents a considerable advance over the MK II; but as pointed out in the October 1953 A.I. Brief entitled "Extended Leading Edge", it has one quality that requires special attention and that is the low speed stall characteristic. No doubt most of you Sabre specialists have reefed into a high speed stall condition many times, and the heavy buffet encountered was a good warning of the approaching stall. At that time you were elated to find that the "waffling" characteristic of the old slatted Sabre was gone forever. However, we never get anything for nothing, and in this case we've lost some of our tremendous low speed control. To be more specific, in a low speed stall—as in a high roundout or a full stall landing—one is likely to encounter a wingdrop with little or no warning. This same stall could be encountered on the final turn with even more lasting effects! Check on the approach speeds in your Pilots Operating Instructions and FLY the aircraft onto the runway.

MINIMUM RANGE

During an air-to-air flag firing exercise the pilot pressed home his attack so closely that he had insufficient airspace remaining in which to effect a safe breakaway. The port wing struck the tow cable, cutting it in half. The remainder was jettisoned after it whipped and damaged the elevator of the tow aircraft. Rarely is an accident photographed while it happens. In this instance the attacker's cine camera recorded the entire sequence and clearly showed the late breakaway which precipitated the accident.

ENDURANCE AND EMERGENCY PROCEDURES

Having completed an exercise the pilot remained at altitude "putting in time". Unfortunately he overstayed his safe fuel supply before commencing descent; and as he had also turned down his VHF volume to facilitate reception of commercial radio programs on the radio compass, the tower was unable to communicate with him. During descent, failure of the normal hydraulic system occurred—a situation which was not made known to the tower operator. In the circuit, low on fuel, the pilot then found that his gear would not extend. His first emergency procedure attempt was incomplete, his second incorrect, and during the second try the engine flamed out because of fuel starvation. The subsequent forced landing resulted in category "B" damage to the aircraft but the pilot was unhurt.

▲ Return to base with sufficient fuel to complete the landing and allow a margin for error.

▲ Maintain a continuous listening watch on the correct R/T frequency, and inform someone if you get into difficulties.

▲ Know your emergency procedures thoroughly.

Had these precautions been observed, this accident might not have happened.

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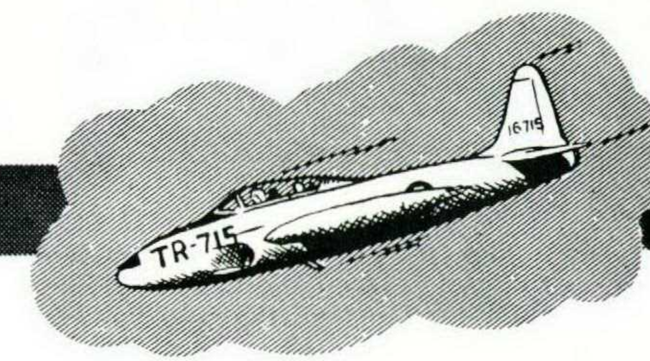
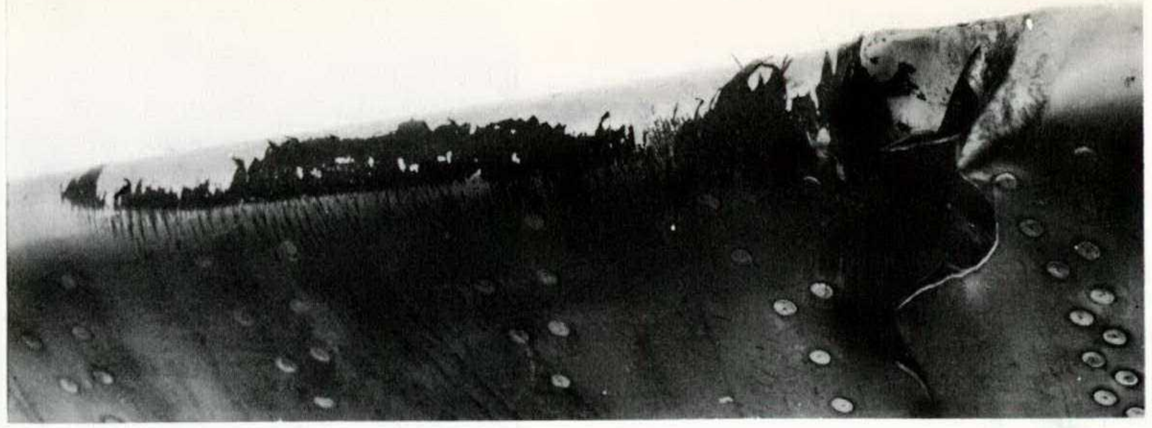


UNBRIEFED MANOEUVRE

Four pilots were briefed for formation practice at 30,000 feet. As the exercise progressed the student pilot in the lead aircraft with the instructor ordered a formation mach run, a manoeuvre for which the section had not been briefed. Diving to 25,000 feet, the leader ordered "dive brakes out, throttle back." The three other aircraft encountered control difficulties. Number three pitched up and its pilot lost sight of the leader. Striving to resume normal flight and trying to maintain close formation despite control difficulties he collided with the lead aircraft, lopping off its tail. The pilot of number three bailed out successfully but the two in the lead aircraft were killed. The formation mach run was beyond the capabilities of the students and, as stated, had not been covered in the briefing.

LUCKY THIS TIME

The pilot was engaged in a live air-to-air firing exercise. On his sixth attack he closed to less than authorized minimum range and angle-off. As he broke from the target his starboard wing struck the tow bar. The aircraft was landed without further damage.

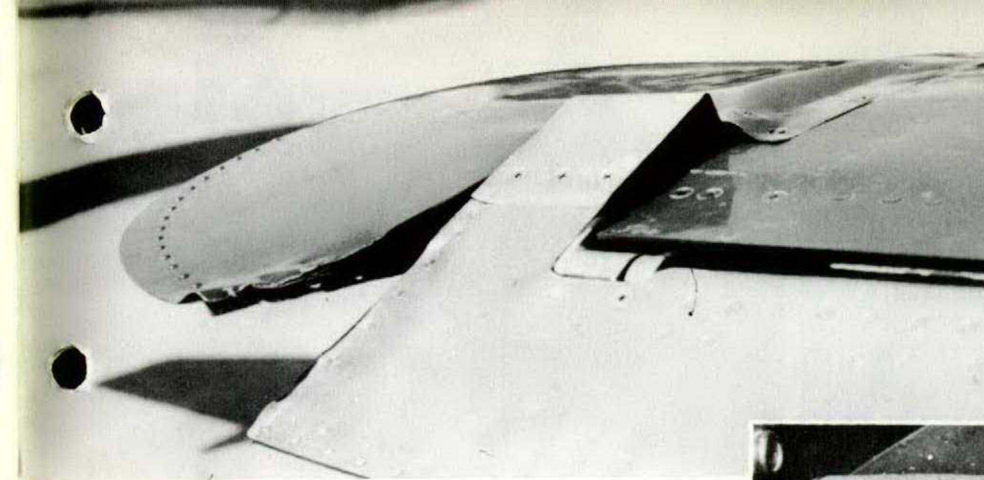


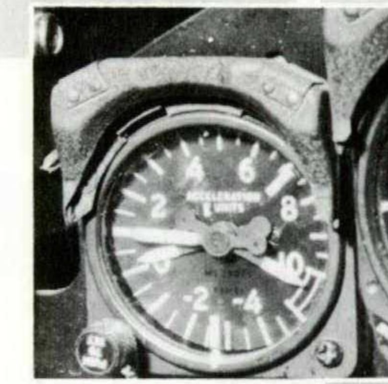
Serious accidents have resulted from circumstances similar to these. Reasons listed and discussed in these pages have ranged all the way from target fixation to over-keenness or anxiety to turn in a good score. Keep in mind, though, that the only hits you can count are those with ammunition. Using your aircraft as a missile is not only "not countable" as a score; in many cases it is lethal.

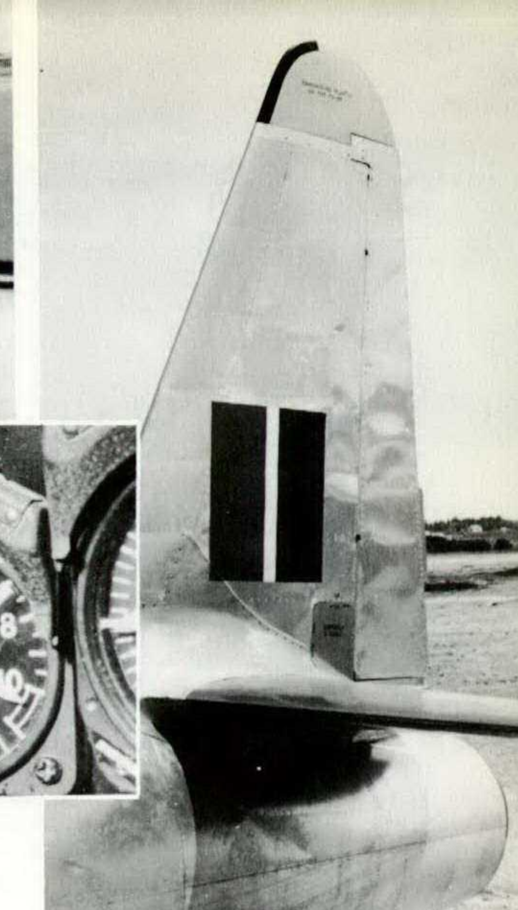
UNWANTED CURTSY

During their preflight both pilots checked that the gear lever was down; then external power was applied, lights push-tested and the starter button pressed. The undercarriage warning horn sounded and both pilots suddenly noticed that the gear handle was in the "up" position. The gear handle was at once returned to the "down" position but it was too late; the nose gear retracted and the aircraft settled onto its nose.

Technical investigation revealed a maladjusted ground safety latch which permitted an inadvertent "up" selection to be made. The pilot should have ensured that the handle was fully down in the locked position before power was applied.







MACH RUN RECOVERY

Flying on almost full power at 8,000 feet the pilot inadvertently reached the aircraft's mach limit and encountered right wing heaviness. Failing to recognize the onset of compressibility, he attempted to turn starboard. The nose dropped and the aircraft rolled into a spiral dive. In his recovery, the pilot pulled full opposite controls and extended the dive brakes without reducing power. The violent recovery caused severe airframe damage under a 10-1/2G loading.

Several lessons come to mind in connection with this accident. Any pilot operating high speed aircraft should expect to encounter compressibility effects when flying at high power settings. In T-33 aircraft the approach to the limiting mach may be recognized by aileron "buzz", control buffeting, wing heaviness or combinations of these. Continued operation in this buffet region is poor practice as control of the aircraft becomes marginal and airframe fatigue problems set in. Any turn towards the "heavy" wing is asking for trouble, particularly in the lower levels where compressibility problems are more acute.

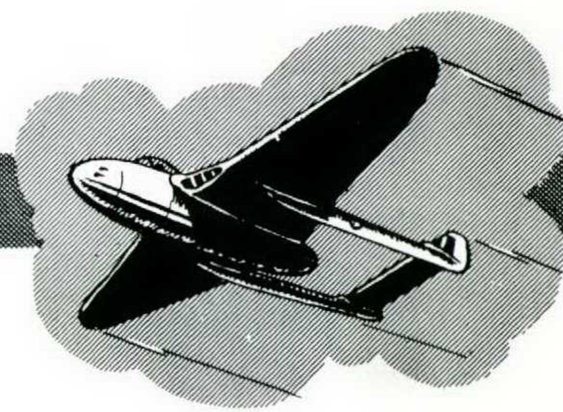
Recovery from a mach run, a spiral dive or any other high speed manoeuvre normally starts with reduction of power. Then, with the wings level, pullout can be effected by either a steady backpressure on the controls or selection of dive brakes "out". Remember the heavy nose up pitch when dive brakes are selected, however, and govern their use accordingly. A hard pullout plus a dive brake selection will result in overstress.

LOWER THE WHEELS

The aircraft was on an acceptance check and the pilot had returned to the circuit to prepare for landing. Having noticed a discrepancy in the fuel counter reading, the pilot was preoccupied with a check of this component at the time of his request for landing clearance. He selected wheels down but did not check the indicators or notice the red, gear unsafe warning light; and he could not remember hearing the warning horn when the throttle was closed. In the subsequent wheels up landing the aircraft suffered category "D" damage.

It is evident that the landing of an aircraft and the associated cockpit checks require the undivided attention of the pilot. All other checks and tests must be completed before joining the circuit for landing.

VAMPIRE



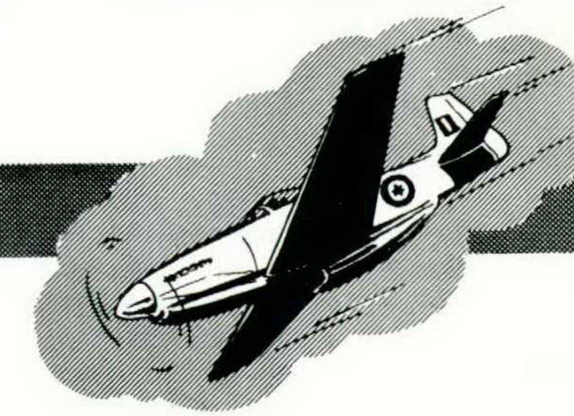
ABORTED TAKEOFF

The pilot reported that, since the nose wheel did not lift from the runway when it should have, he aborted his takeoff in accordance with instructions in force at his unit at that time. A technical investigation revealed that the engine was serviceable and was functioning normally during takeoff. Therefore, unless the pilot was riding the brakes, the aircraft should have become airborne after a normal takeoff run.

It is considered that the pilot aborted too soon. The takeoff

distance required by a jet aircraft depends upon its all up weight, the height above sea level, wind speed and direction—and the ambient air temperature on the runway. All of these factors must be taken into consideration when calculating the takeoff run of a jet aircraft because that run can vary widely from day to day—or even from hour to hour.

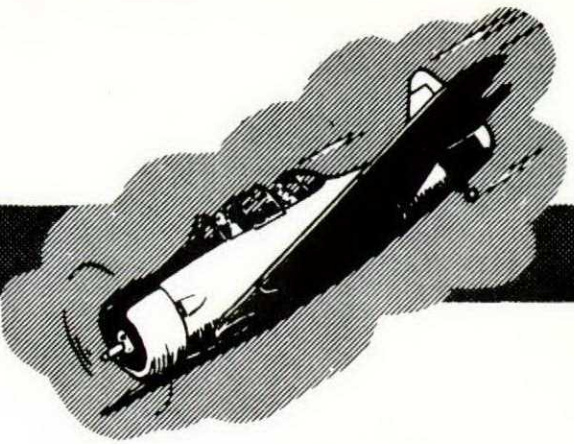
MUSTANG



SLIPSTREAM

During a formation landing the Mustang in number two position was too close to the leader and flew into his slipstream. The pilot was unable to prevent the port wing of his aircraft from striking the runway. Following the bounce he at once elected to overshoot and applied full power. The aircraft gradually took on bank and commenced a slipping turn to port, probably the result of torque from high power and low air speed. When 180 degrees of turn had been completed the pilot, realizing he was not going to get back to the field, selected undercarriage up and crashed into the river. He was helped out of the water by a civilian pilot who had witnessed the crash and taxied his own float plane to the scene to be of assitance.

HARVARD



GMS--THEN WHAT?

Following a dual, instrument flight of one hour the student proceeded onto solo aerobatic sequences. During the aerobatic period he changed to reserve tank and continued with practice stalls, spins and steep, gliding turns. On levelling off from one of these turns the student applied power; but "the engine merely stopped". Then, he states, "I did my checks and on checking the fuel I checked the reserve tank and it was empty. I then carried out a normal forced landing". The aircraft was subsequently found to have about ten gallons of fuel remaining in the starboard tank. Close attention to one's fuel consumption and amounts remaining should be elementary. And, for the future, keep in mind the fact that jets use it up even faster than do conventionals.

ON BORROWED TIME

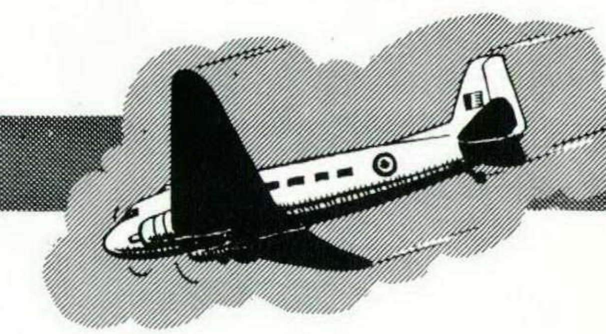
During a low level navigation exercise the pilot, so he reported, "pulled up over the town" and fell behind the accompanying aircraft. In the process of catching up he flew between two clumps of trees. The pilot then stated that his "first sight of the power line was when it hit the propeller and bounced off the coupe top". The rear section of the coupe top and the rudder were sheared off and the aircraft forced landed in a grain field. Frequent reminders of the consequences of disregard for orders published in CAP 100 appear in FLIGHT COMMENT and A.I. BRIEFS. Low level navigation exercises are an important part of training but the requirement for clearance above all obstacles is still the essence of the order. In this instance the pilot was unhurt—but he is no longer in the Service.

POWER LINES AND AERODYNES

Once again a low flying aircraft has become involved with high tension wires resulting in damage to both. Significant also is damage to the instructor's reputation. The exercise consisted of a dual, low level crosscountry, during which the student had trouble recognizing turning points. He lost not only his way but some altitude as well. When the instructor took over, he flew a course to return them to track in a way that would assist the student in recognizing a required pinpoint. Meanwhile he maintained the altitude at which the student had been flying. Before the desired check point was reached a power line got in the way. Despite damage to the aircraft, a safe landing was made at base.

Low flying is recognized to be necessary and valuable training, and orders—if obeyed—specify minimum altitudes which are clear of all obstacles. Too often the end result of an accident such as this one is a crashed, burning aircraft and fatal consequences for the crew. The pilot of this Harvard was lucky, and disciplinary action will doubtless have a deterring effect in future. Is it worth it?

DAKOTA



BIG BLOW

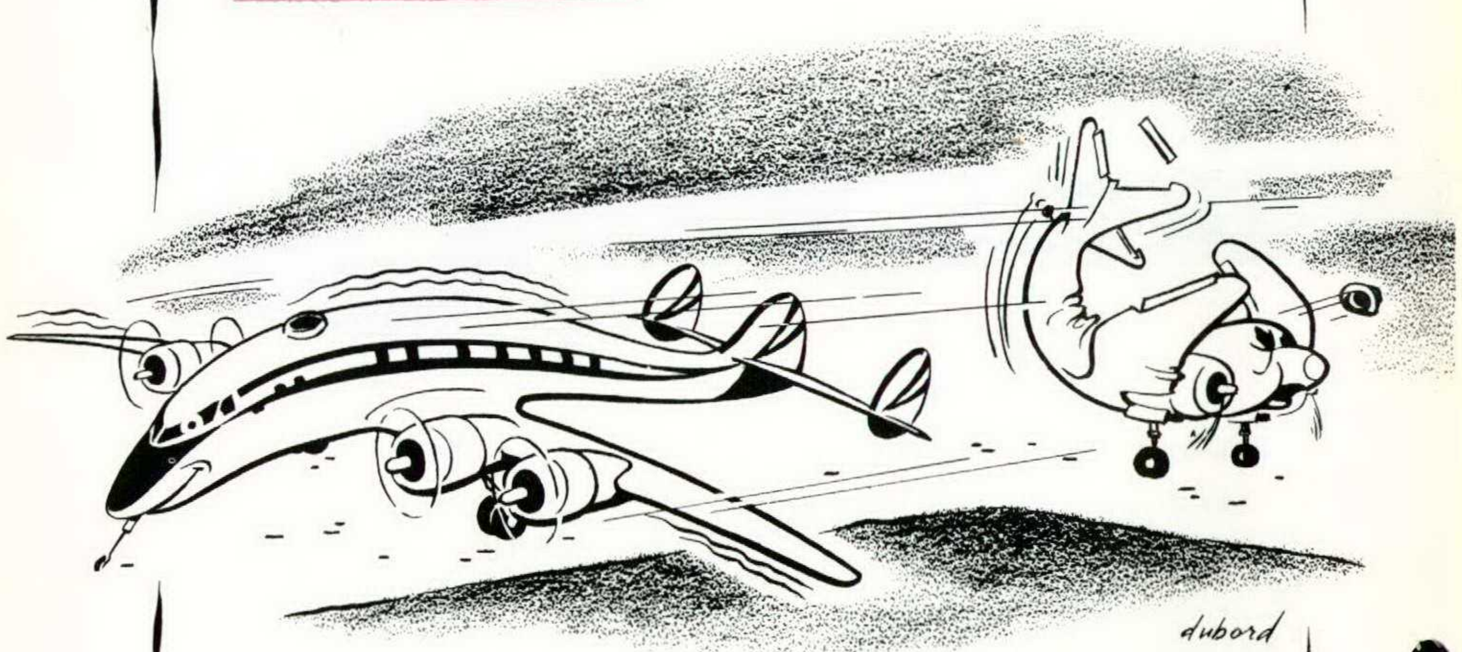
The pilot had landed and was taxiing to the parking area under the guidance of a "Follow Me" vehicle. He permitted the vehicle to lead him past the rear of a Constellation on which the engines were running. While the Dakota was moving towards the designated spot a runup was started on the Constellation and the blast was sufficient to damage brackets and hinges in the rudder and tail assembly of the Dakota.

Probably many pilots have taken a similar chance but were in luck in that runup power was not applied while they were taxiing in the vulnerable area. An A.I. Brief (Volume 3, Number 11, dated June 1954) has been issued to spell out jet blast dangers. Similar hazards are associated with propeller blast.

"The Cockpit", a United Air Lines publication, was quoted in a Flight Safety Foundation Accident Prevention Bulletin as follows:

"FACTS AND FIGURES

Big winds are generated by modern aircraft when their engines are run up on the ground. Recently a crew of United Air Lines' engineers undertook a measurement of wind velocity at various points astern of a DC-6. With all four engines turning at take-off power (dry), at 300 feet beyond the tail the meter indicated a velocity of 88 mph. At 200 feet, 95. At 150 feet, 110. At 100 feet, no reading—couldn't move the equipment that close—but interpolation pegged the velocity in the neighbourhood of 130 mph."



FROIN

Did you know what was meant by the term "FROIN", the title word on the A.I. BRIEF for November 1954? If you did not recognize the word, what did you do about it? Some people we know did nothing until a discussion developed—at which time one individual produced the answer from page two of "Weather Work", a text published by the Meteorological Division of the Department of Transport.

FROIN means "frost on indicator", the indicator consisting of an aluminum rod mounted on the side of the Met instrument shelter known as a Stevenson Screen. If frost has formed on this indicator (FR-O-IN), there is every likelihood that it is forming on nearby parked aircraft. The term is not a misspelling—as one accuser suggested—of "FROID", the French word for "cold".

Part of this controversial Brief consists of the reproduction of a weather sequence with the key term shown in its accustomed place—at the end.

DFS