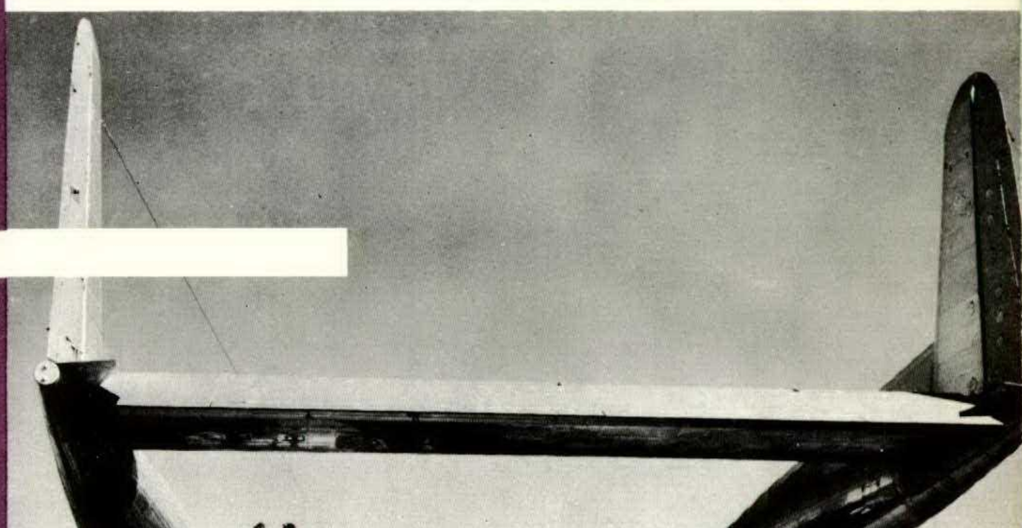
FLIGHT COMMENT



ISSUED BY

DIRECTORATE OF FLIGHT SAFETY
R.C.A.F. HEADQUARTERS • OTTAWA, ONT.
SEPTEMBER · OCTOBER · 1956

RESTRICTED

FLIGHT COMMENT

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

SEPTEMBER · OCTOBER 1956

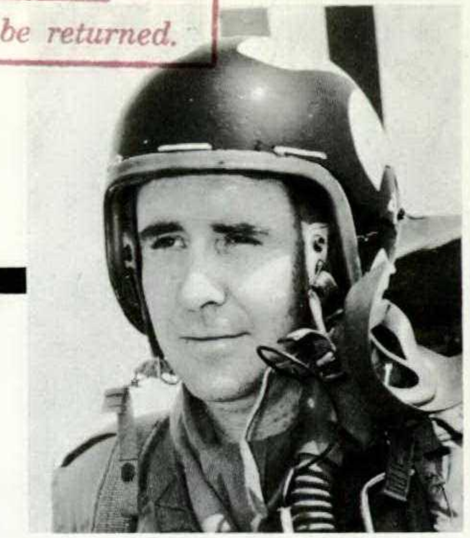
C O N T E N T S

**Articles, comment and criticism welcome.
Address all correspondence to:**

**THE EDITOR, FLIGHT COMMENT
DIRECTORATE OF FLIGHT SAFETY
AFHQ, OTTAWA**

•

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



F/L I.N. MACDONALD

Leading a formation of Sabres in echelon starboard, F/L MacDonald initiated a break to the left at approximately 1,200 feet and at an IAS of 300 knots. Just after entering the break, the aircraft rolled violently to the right in a nose-high attitude. In his attempt to level the wings and get the nose down, the pilot had to use considerable force in moving the control column toward the left corner of the cockpit.

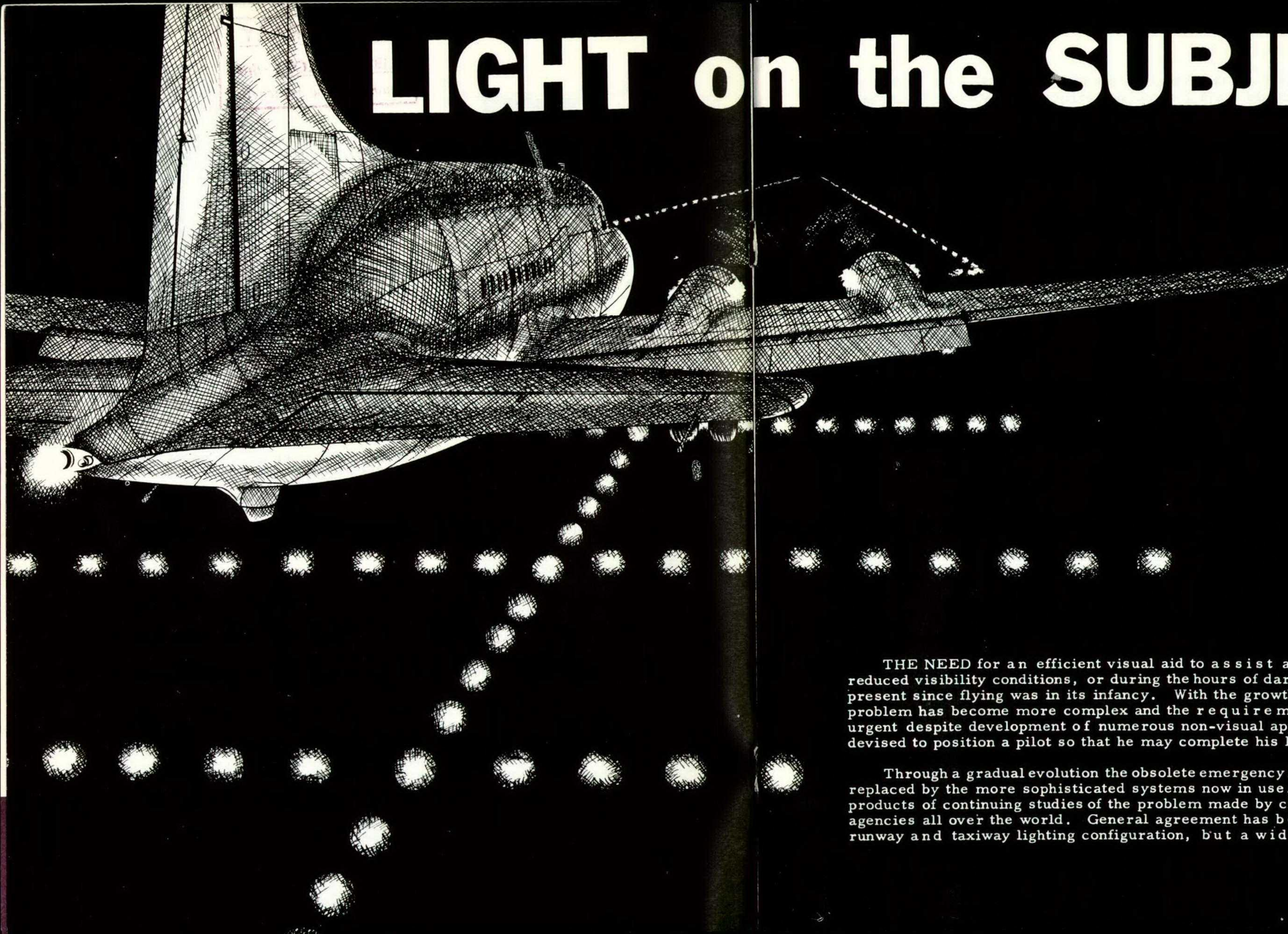
Number two had just started to roll into his break, so he had a hectic few moments trying to bunt his aircraft low enough to avoid collision. The nose of the lead Sabre continued to rise despite full nose-down trim. Even though hydraulic pressure read normal the alternate system was tried, but to no effect. When the nose-high attitude persisted until airspeed had reduced below 150 knots, F/L MacDonald decided to eject. At this point, however, a village at the edge of the airfield appeared under the Sabre's nose. The pilot judged that the aircraft would stall just above it, so he opened the throttle, hoping to gain sufficient altitude to clear the built-up area.

Airspeed started to increase and the Sabre made a slow, climbing turn to the left. As the speed picked up, longitudinal control improved; but more force was required to hold the left wing down in the turn. During the climb the pilot noticed that both ailerons were in the "up" position—the cause of the nose-high attitude. When 11,000 feet was reached, F/L MacDonald retarded the throttle, re-opened the dive brakes and lowered the undercarriage for control checks. The Sabre was controllable down to 120 knots but at this speed stick forces became extremely heavy and control uncertain. Cleaning up his aircraft, the pilot commenced a slow descent. Final approach for a flapless landing was made at 160 knots with dive brakes out and gear down. Just over the button the right wing dropped sharply—but the landing was completed safely.

Preliminary examination revealed that only the port aileron worked; the starboard aileron was stuck in the full-up position. On further investigation the hydraulic jack was found to have broken at the point where the piston was attached to the aileron; the latter, jamming in the up position, had caused the aircraft to roll violently out of a left break. To counteract the roll tendency, full left aileron had to be used; when both ailerons were up, they acted like elevators in forcing the Sabre's nose up.

F/L MacDonald is to be congratulated on the coolness and resourcefulness which permitted him to complete a safe landing under difficult conditions. He saved not only an aircraft, but possibly the lives of people in the village.

LIGHT on the SUBJECT



THE NEED for an efficient visual aid to assist a pilot landing in reduced visibility conditions, or during the hours of darkness, has been present since flying was in its infancy. With the growth of aviation the problem has become more complex and the requirement even more urgent despite development of numerous non-visual approach systems devised to position a pilot so that he may complete his landing visually.

Through a gradual evolution the obsolete emergency flares have been replaced by the more sophisticated systems now in use. These are the products of continuing studies of the problem made by civil and military agencies all over the world. General agreement has been reached on runway and taxiway lighting configuration, but a wide divergence of opinion still exists on the subject of approach lighting. This inability to establish standards which are universally acceptable has resulted in multifarious designs—and potential confusion for aircrew. The latter condition is further aggravated by the continued use of obsolescent systems for reasons of economy. There are at least twelve different types of approach lighting in the U.S. and at least five in Canada. At present a committee comprising the Department of Transport and RCAF specialists is studying the problem in an attempt to agree on a system acceptable to all groups in Canada. A NATO committee, of which Canada is a member, is also endeavouring to reach the same goal on an international basis.

Approach Lighting

Several excellent navigational aids are now available to assist a pilot in making a safe descent from altitude to the minimums established for an airfield—sometimes as low as "200-foot ceiling and half-mile visibility". It is at the instant a pilot breaks through the overcast and becomes visual that a clear indication of the final approach to the runway is needed. At an altitude of 200 feet the pilot is approximately 4000 feet from the beginning of the runway. If he is flying at a normal approach speed in minimum weather conditions, he has only 20 seconds to change from airborne instruments to visual guidance in order to land his aircraft safely. Approach lighting systems are designed to provide maximum guidance to pilots under these circumstances.

Many factors enter into the design of any approach lighting system. Recognition must be instantaneous and unmistakable; brilliance must be sufficient, yet not so intense as to dazzle and confuse; and direction of landing and distance to the runway must be immediately clear. The system must also supply continuous guidance, including height and roll guidance, throughout the entire approach. Modern individual approach lights are designed to provide a beam which can be directed into the approach path to give the pilot maximum indication. All systems manufactured today incorporate these features to some extent—but none to the complete satisfaction of everyone.

If it were necessary to satisfy only one type of operation and one type of pilot, common agreement might be reached without too much difficulty. Unfortunately the system must suit many types of operations and many types of pilots. As an example, the majority of civil pilots prefer the centre line-crossbar configuration in one design or another, while pilots of some types of fighter aircraft consider the split, parallel row system preferable, or even mandatory. Some contend that the supports for the approach lighting unit constitute an unacceptable obstruction to landing aircraft, while others say they do not. The question of what color of lights to use contributes its share to the disagreement. These are only a few of the obstacles that must be hurdled before the ideal system can be evolved.

Canadian groups, both civil and military, have accepted the basic concept of the centre line-crossbar configuration. The RCAF has adopted a modified Calvert design (shown as fig.1), while DOT is installing a modified ALPA (Airline Pilots Association) design (fig.2). All new construction follows these patterns. Present RCAF and DOT policy is to install such a system on the designated instrument runway only. Additional systems may be installed at a later date if a true need is determined.

Three further systems are still in use, notably the Bartow double line-high intensity (fig.3), single row-left hand-low intensity (fig.4), and centre line-low intensity (fig.5). At some DOT stations the latter is superimposed on the ALPA system for use at night in good visibility conditions.

There is one notable exception to this standard configuration. At several RCAF training stations the final 1000 feet of the approach system has been split into two lines to provide a double row on the left side and a single on the right, placed in line with the runway lights. The entire system is red instead of clear in colour. It is contended that this arrangement removes dangerous obstructions from the path of an inexperienced pilot who may be making too low an approach or landing short of the runway. The difference in colour, of course, is to prevent pilots from confusing the approach system with the runway lighting. This configuration is shown in figure 6.

Some factions of the USAF also prefer a split design similar to the above, for additional reasons: First, the nose-high landing attitude of some types of fighter aircraft prevents the pilot from seeing the centre line configuration at a very crucial time on his approach. Second, military aircraft—and in particular jets—have a narrow range between optimum approach speed and stalling speed and, because a slight error could result in an undershoot, a safe area must be provided. Third, a clear overrun area is required regardless of the length of the runway. The design presently favoured by the USAF is shown in figure 7. (The USAF and USN are now conducting extensive trails on a new type of approach lighting configuration which they consider will be superior to present systems. Full details are not available at this time.)

Threshold Lighting

A third element of the aerodrome lighting system, and one which is also a subject of controversy, is threshold lighting. This lighting is devised to indicate to a pilot the beginning of the runway surface on approach or the end when taking off. The original RCAF configuration provided for omni-directional green lights, spaced equally across both ends of all usable runways. In newer designs (see fig.8) a 100-foot break was made in the lights over the centre portion of the runway. Thresholds associated with the high-intensity approach system are provided with

(see page 8)

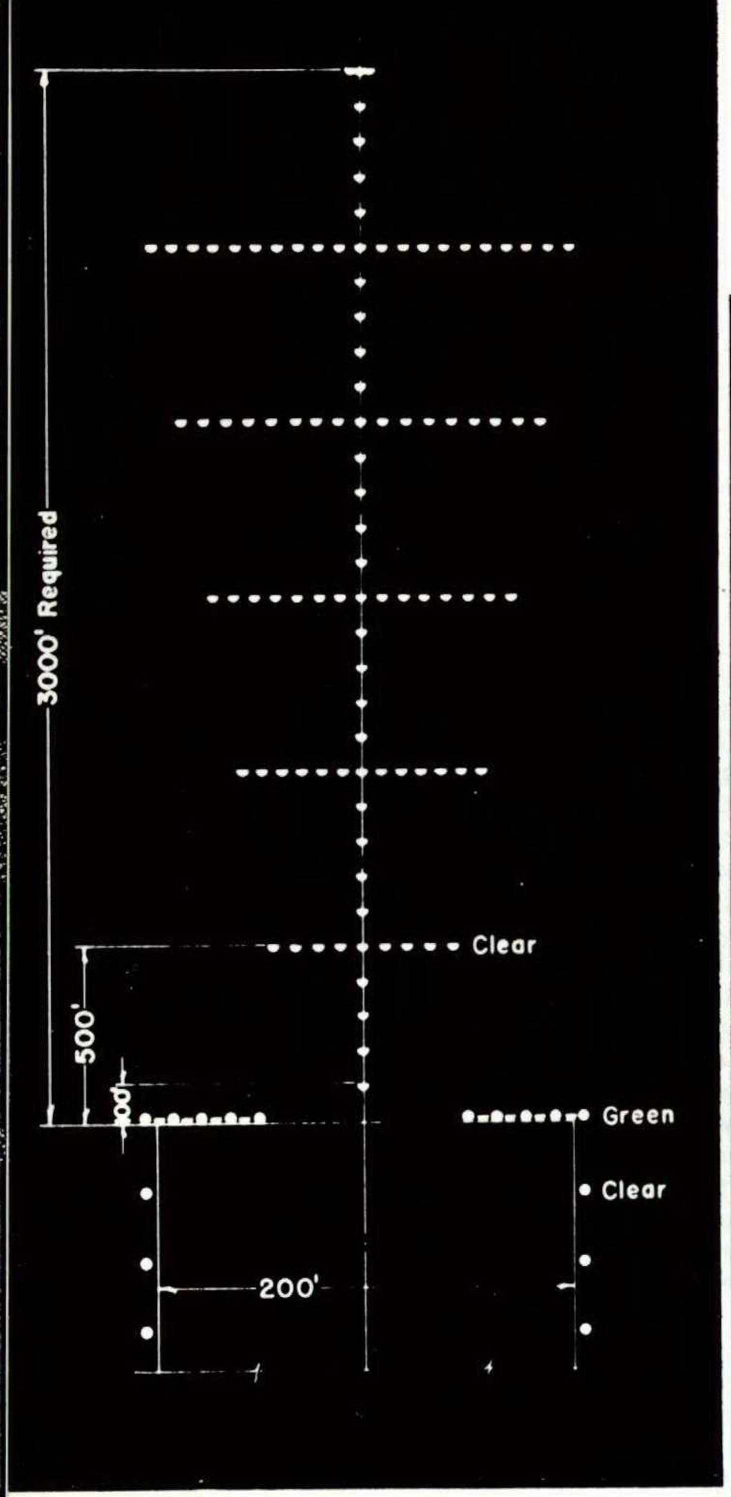


Fig 1. R.C.A.F. Standard High Intensity Centre Line and Crossbar System

Fig 2. D.O.T. Standard High Intensity Centre Line and Crossbar System

● -indicates both omni-directional and bi-directional lights

◒ -indicates a uni-directional light

(Centre and crossbar lights are "clear".)

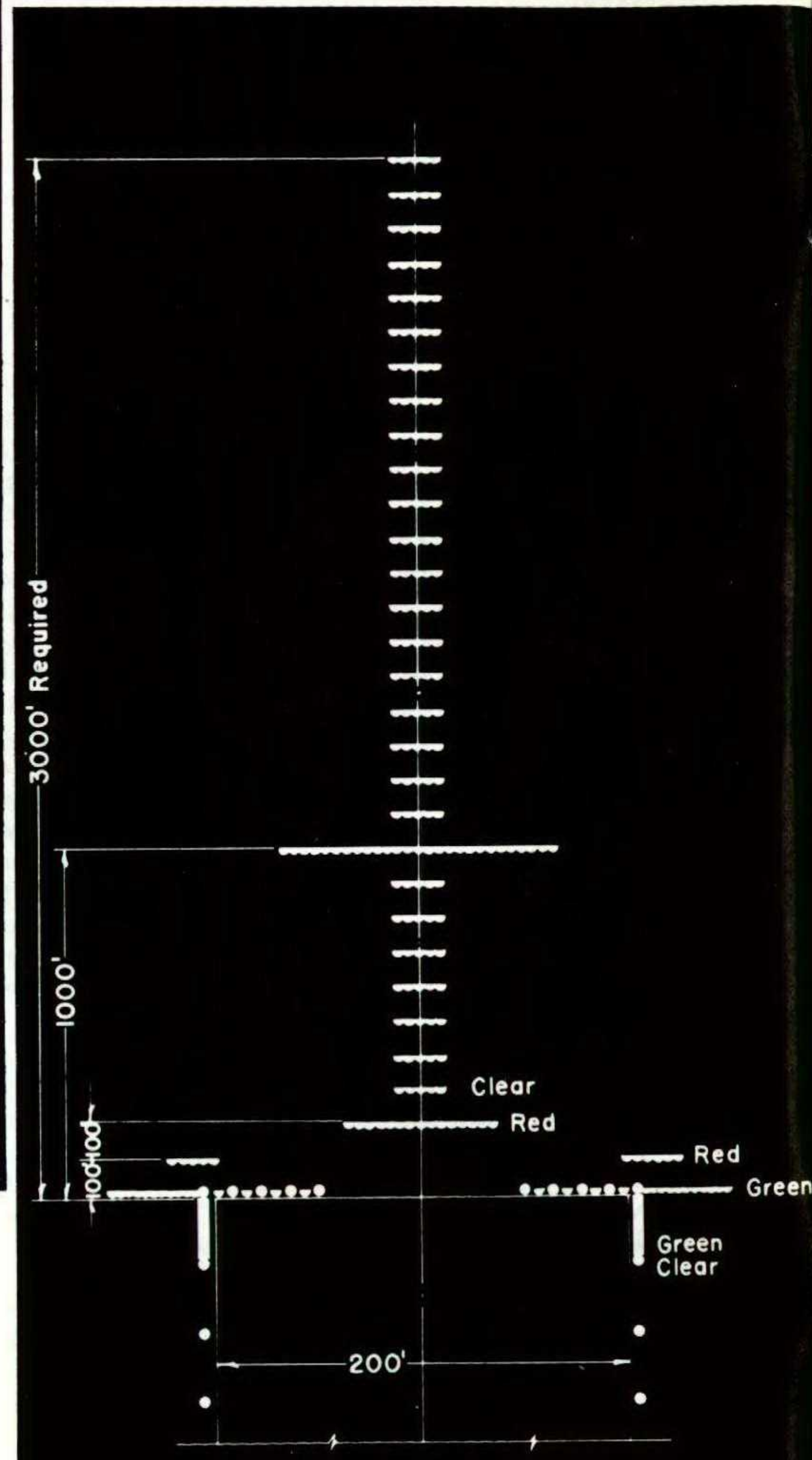
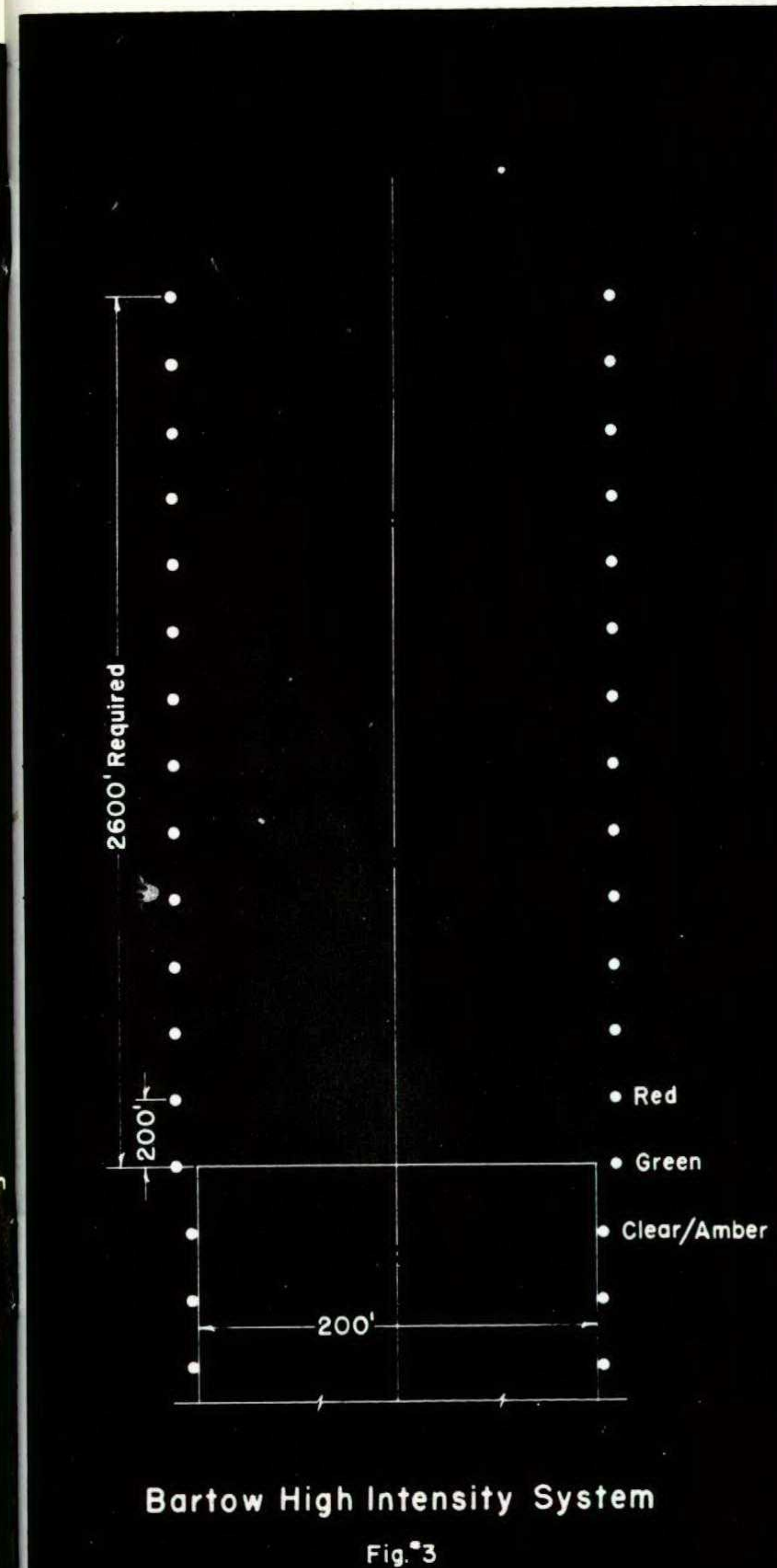


Fig 3. Bartow High Intensity System



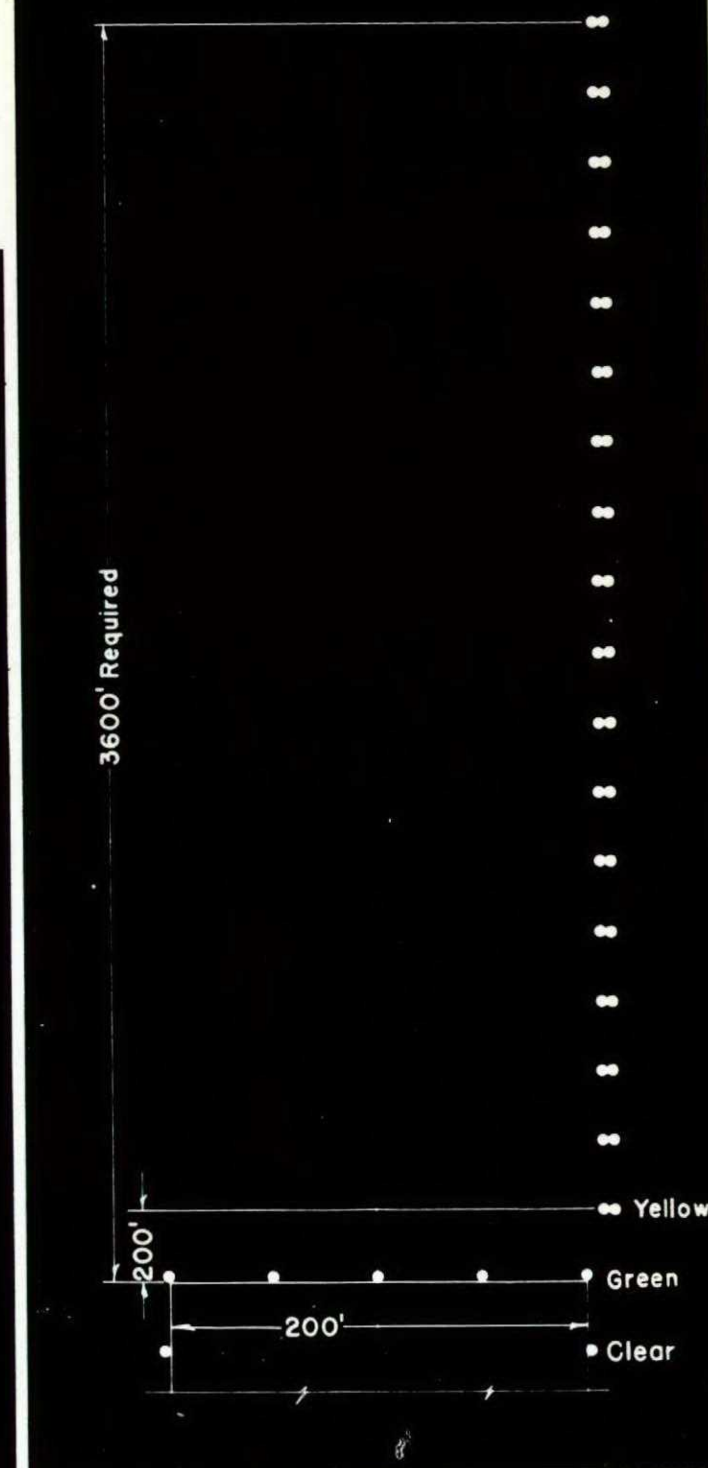


Fig 4. D.O.T. Low Intensity Left Hand Single Row System

ten bi-directional green lights—five on each side of the centre break, tied into the runway lighting system—and interspaced uni-directional green lights facing into and connected with the approach lighting system. On all other approaches not provided with approach lighting, eight bi-directional green lights are installed, equally spaced four on each side of the 100-foot centre gap. The intensity—high, medium or low—of the threshold lighting is always the same as the runway lighting it complements.

Threshold lights are mounted on frangible fittings, have an overall height of 18 inches and are designed to break off on an impact of no less than four and no more than six pounds. Observations have been raised (based on several recent accidents) to the effect that these lights present a hazard to landing aircraft, particularly when flown by inexperienced pilots, because they could cause severe damage to hydraulic lines and aircraft surfaces. For this reason the threshold lighting at certain training stations has been repositioned outside the runway surface (see fig. 9), thus leaving the runway entrance clear. The order of lights has not been changed except that an additional uni-directional light has been placed at each extremity where it is associated with an approach system, and an additional bi-directional light has been located on each side where no approach system is provided. Although the number of lights has been increased to provide better indication, there is still a feeling in certain quarters that some of the value of the threshold lighting has been lost. This possibility is now being investigated by specialist officers.

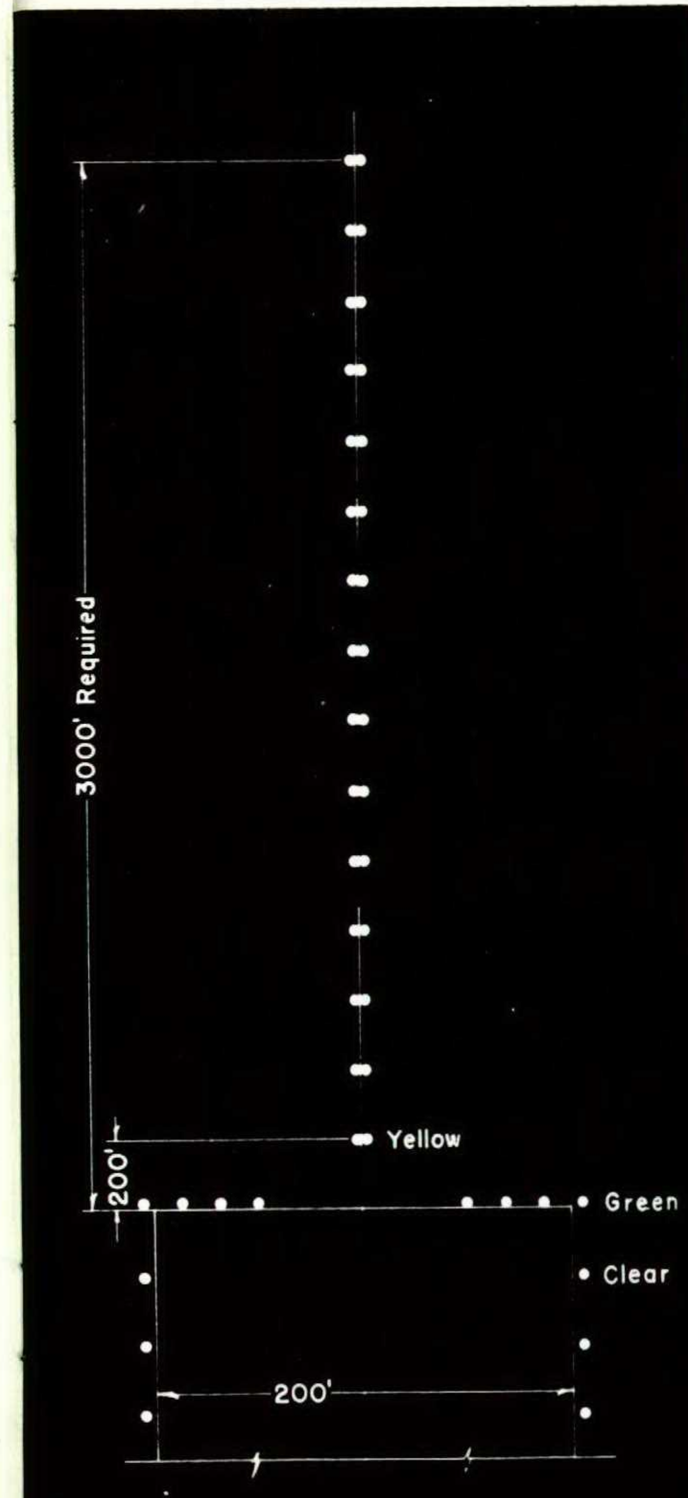
DOT has adopted a somewhat different configuration which appears to have considerable merit (see fig. 10). The standard bi-directional lights across the end of the runway are supplemented on each side by lights in an L-shaped pattern. This design is preferred by most civil pilots and is receiving increasing favour from the military.

The point to be remembered in the design of any type of threshold lighting is that it must clearly and unmistakably mark the beginning of the runway. Military aircraft of today, with their higher approach speeds, must make use of all the available runway. To ensure this they must land as near as possible to the beginning of the hard surface. The pilot does not have time to decipher a confused or indistinct threshold pattern. With only 20 seconds or less to change to visual aids and prepare to land, any indecision on his part could result in an undershoot, an overrun or a dangerous landing. Current study is aimed at creating positive threshold lighting to provide the indication desired without imposing additional risk of damage to aircraft.

Colour

A NATO agreement, to which Canada has signified approval, sets forth a standard colour configuration: (see page 10)

Fig 5. D.O.T. Low Intensity Centre Line System



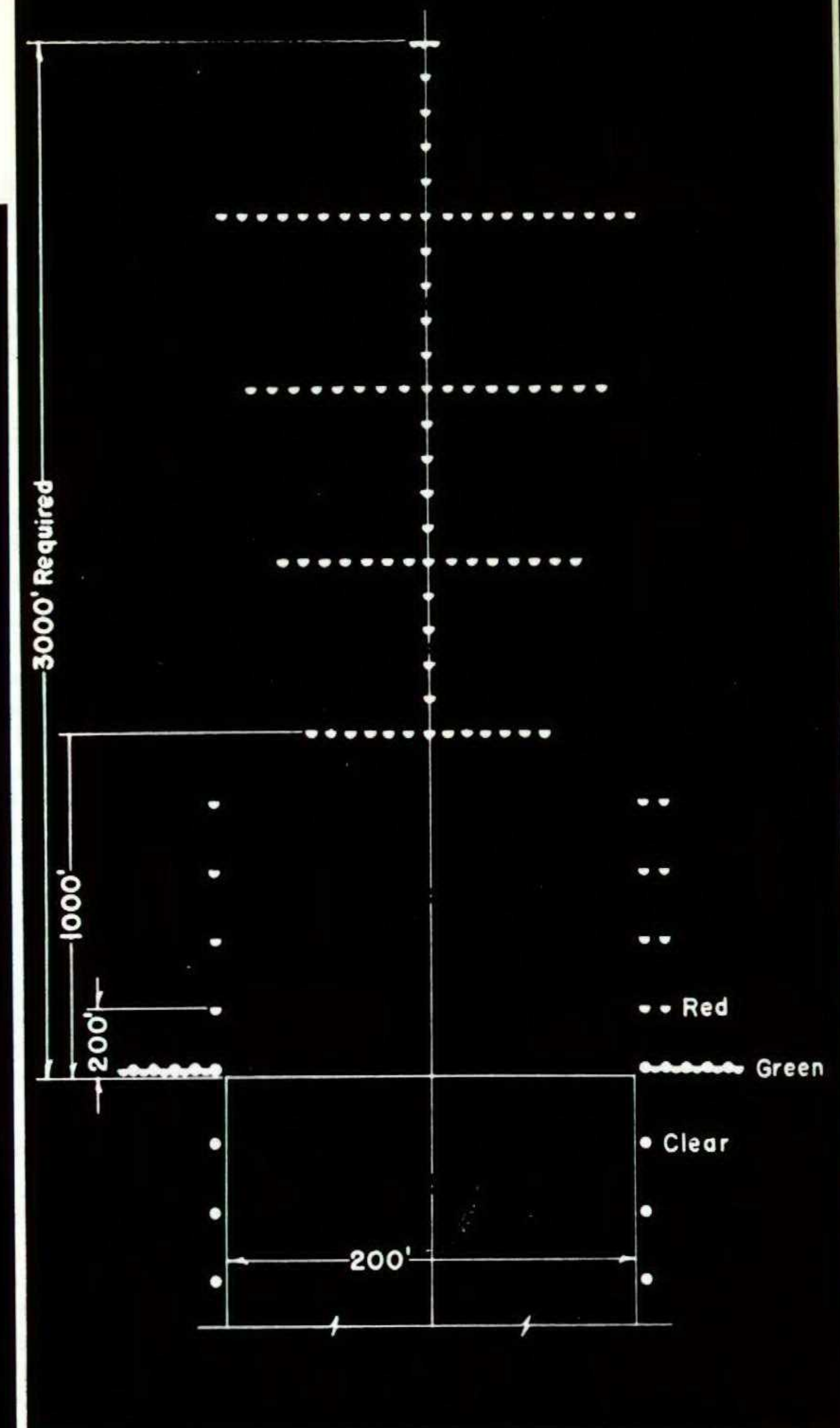


Fig 6. R.C.A.F. Experimental High Intensity System

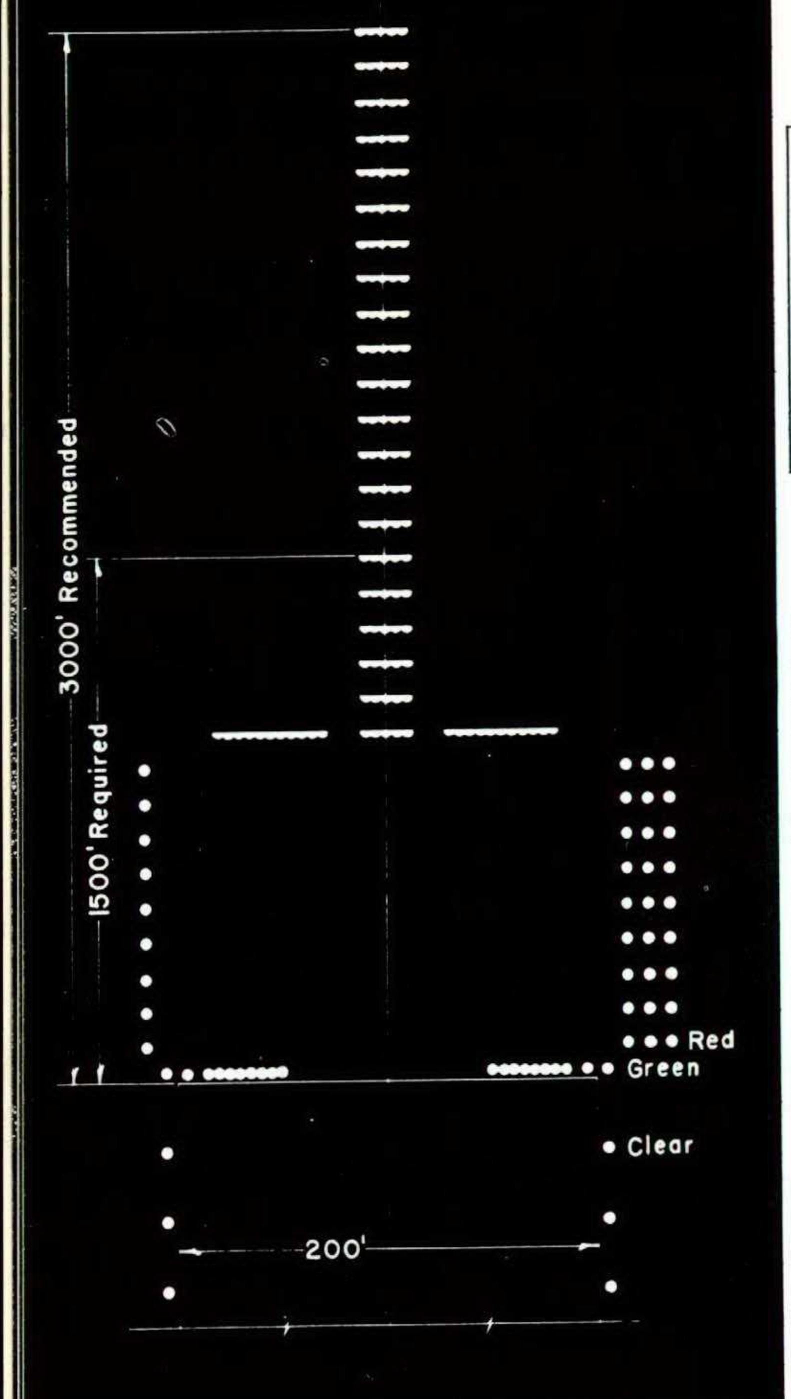


Fig 7. U.S. Standard High Intensity System

RUNWAY	**Clear**
TAXIWAY	**Amber and blue, with amber on side nearer landing surface**
THRESHOLD	**Green**
APPROACH	**Clear**

Generally, all Canadian airfields conform to this colour scheme, but there are exceptions. Gimli and Portage, with their split-approach systems, use a red colour to avoid confusion with the runway lighting. This, in effect, reduces the system to a medium-intensity system at best. The DOT ALPA system includes a red crossbar at the 200-foot mark, as indicated in figure 2. Further, most stations are still using a complete blue taxi system. While not in themselves necessarily dangerous, these departures from the standard can be confusing—and may cause accidents.

While discussing colour it might be well to note that a lamp of a given wattage, when used with a clear lens, emits approximately 100% of its normal candle output. By comparison, a similar lamp with a yellow lens gives 43.5%; red, 31%; green, 21%; and blue, 8.6%. Therefore it is obvious that a clear light source should be used where the maximum indication is required, principally in the approach system. The main objection to a clear filter has been noted previously—i.e., to avoid confusion where a parallel row configuration is being used. Experiments now in progress with flush type lighting might, if successful, remove the main objection to centre line lighting and permit more general agreement; but many difficulties must be overcome before this is possible.

Lighting Intensity Controls

All high-intensity systems are equipped with brilliance controls. These controls will shortly be expanded to include taxiway lighting on RCAF stations in Canada. Each system (aerodrome and approach) is independent of the other and has five stages of brilliance: 100%, 25%, 5%, 1% and 0.2%. No firm RCAF criteria have as yet been laid down to define the brilliancy stage to be used for a particular condition. However, the criteria drawn up by DOT can be used as a guide by the Air Force, as follows:

RELATIVE SETTING	BRIGHTNESS PERCENT	VISIBILITY CONDITIONS DAY	NIGHT
1	.2	—	2 miles or better
2	1%	—	1 to 2 miles
3	5%	2 miles or	¼ to 1 mile more
4	25%	1 to 2 miles	on pilot's request
5	100%	½ to 1 mile	on pilot's request

Brightness settings may vary in daylight depending on whether the day is light or dark, and at night according to extraneous lighting of buildings and highways. While flying control will endeavour to use the optimum setting, it remains the prerogative of the pilot to request a change if he so desires.

Some criticism received from the field claims that the lowest stage of brilliance is still too bright on a clear night. This matter is now under study and three possible solutions have been suggested: First, redesign the regulator to provide a lower stage of brilliance; second, adopt the DOT solution and superimpose a low intensity-centre line system, minus crossbars, on the high intensity system; and third, turn off all approach lights on clear nights. While all three suggestions have merit, every aspect should be considered before a decision can be reached.

Joint Use of Aerodromes

Joint use of certain aerodromes by RCAF and USAF or DOT has resulted in the installation of either a modified system or more than one type of approach lighting. At Goose Bay, for example, there are three different types of approach lighting, and none of the three is of completely standard design. Endeavours have been made to effect standardization but circumstances have dictated otherwise. Similar situations emphasize the need to brief a pilot efficiently before he makes a flight to aerodromes with which he is unfamiliar or which he has not visited for some time.

(see page 13)

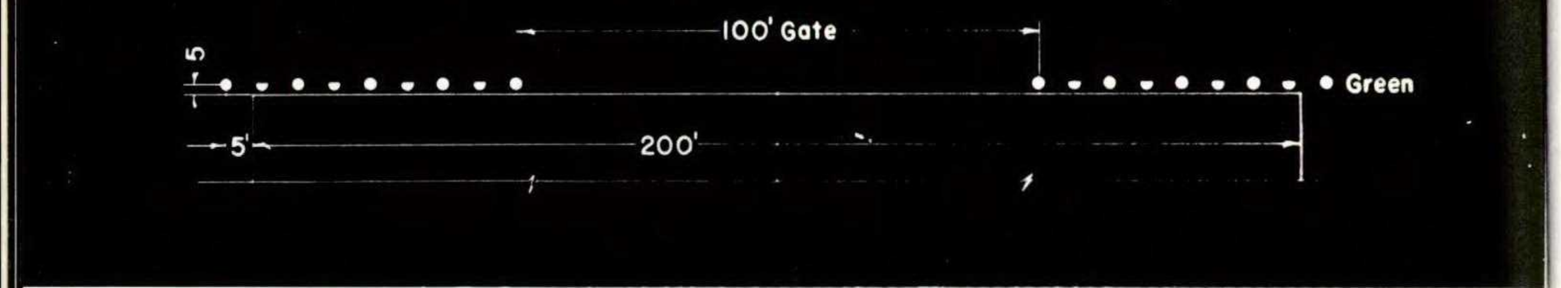


Fig 8. R.C.A.F. Standard High Intensity Threshold System

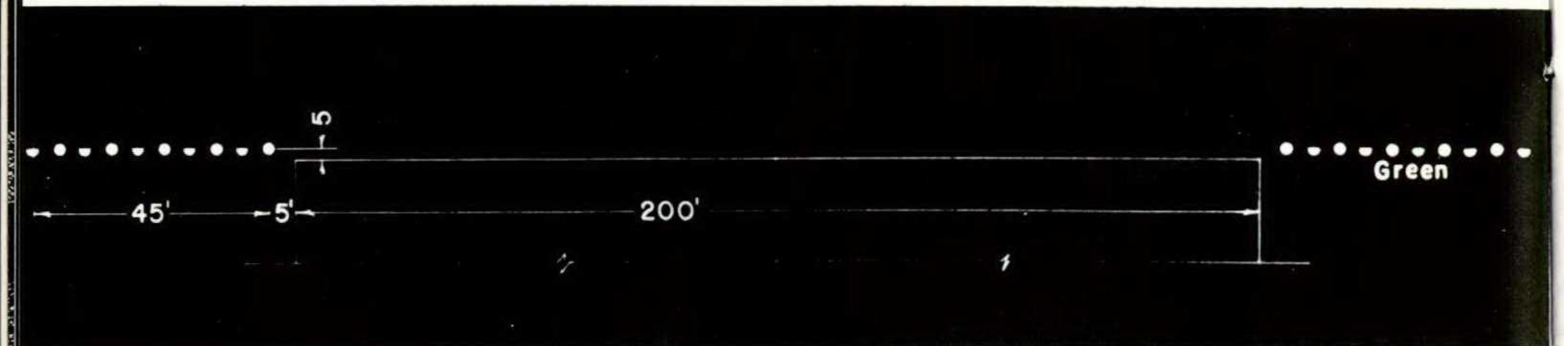


Fig 9. R.C.A.F. Experimental High Intensity Threshold System

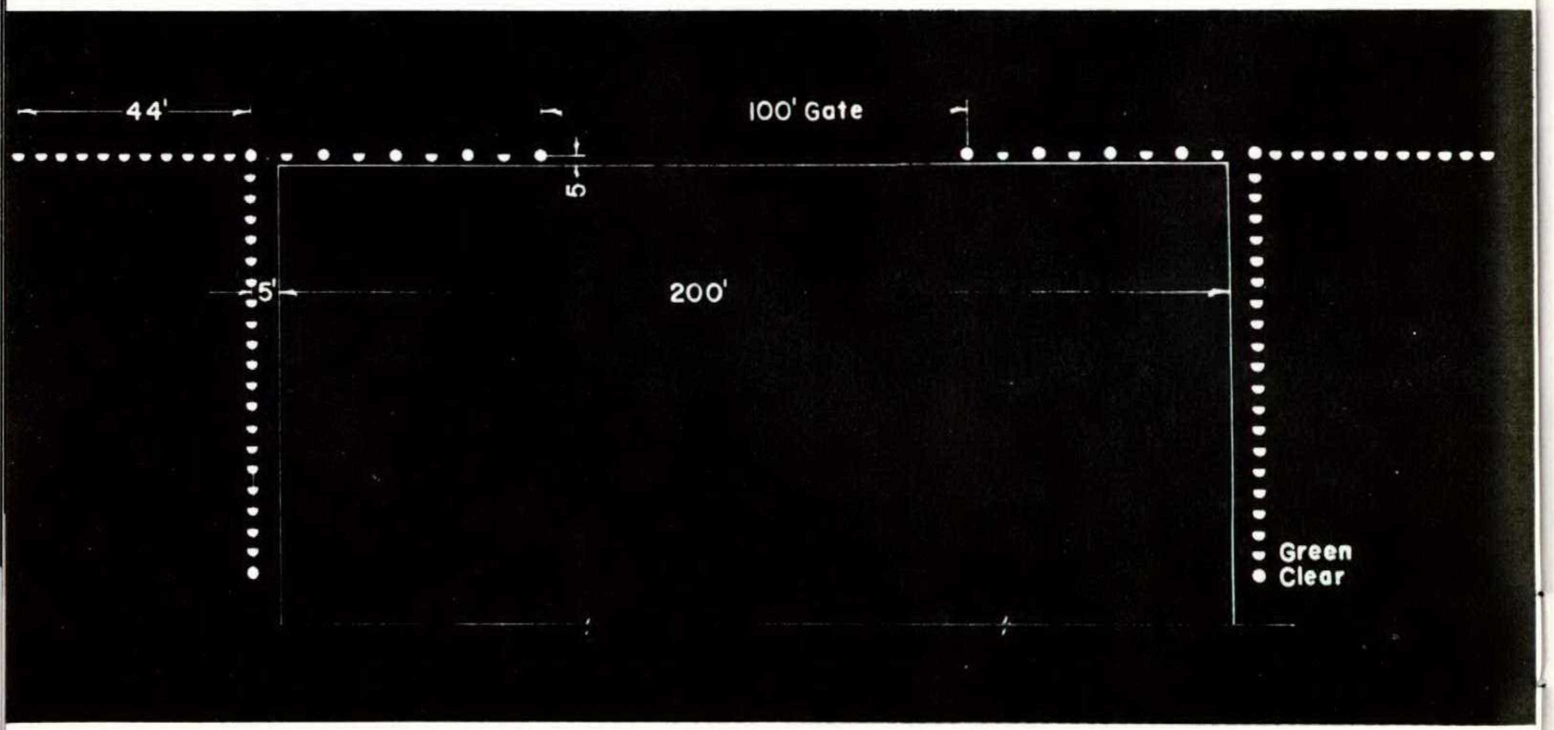


Fig 10. D.O.T. Standard High Intensity Threshold System

MUCH PROGRESS has been made in developing efficient aerodrome lighting systems. However, it will be plain from the foregoing that much further study is necessary before the ideal configuration can be attained. Even if such a system was devised tomorrow, it would be a number of years before all aerodromes could be equipped. Thus, the problems confronting us today will undoubtedly be with us for some time to come. We must make the best of them.

Adequate pre-flight briefing of all pilots is vital if we are to secure the maximum benefit from present approach lighting systems. You pilots can help yourselves as well. If a flight is to be made to an unfamiliar airfield, study the lighting system in use, study the latest NOTAMS, and know before you start what you can expect at your destination. Remember the point we made earlier?

WITH A 200-FOOT CEILING YOU HAVE ONLY 20 SECONDS TO MAKE A SAFE LANDING AFTER BECOMING VISUAL

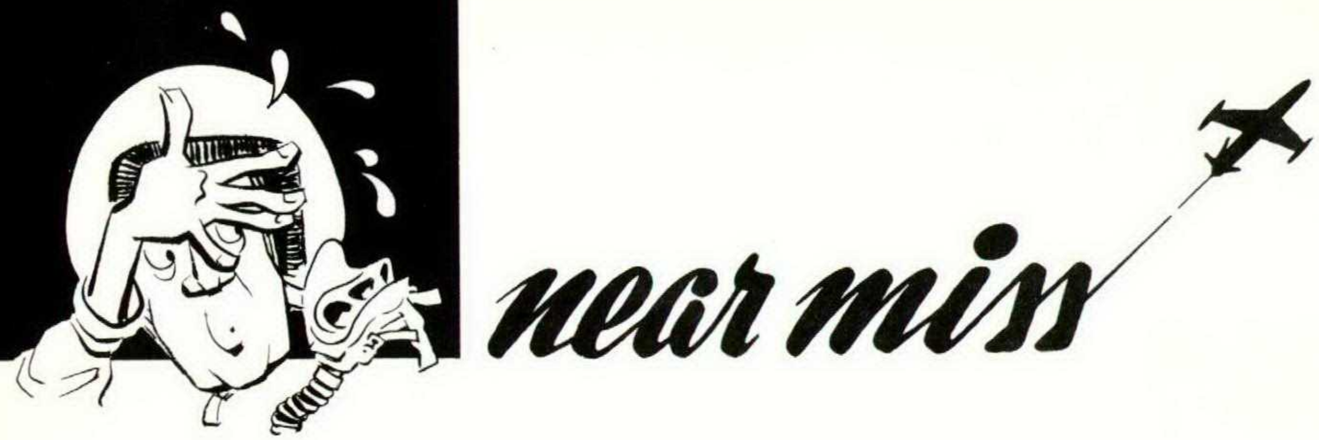
It's Your Neck Take Care Of It

The Author

F/L D.L. Snowdon was born in Toronto in 1916. He joined the RCAF in 1939, trained in meteorology and served as an airman at RCAF Station Trenton until March 1942. At that time he received his commission in the flying control branch and was transferred to the northwest staging route with headquarters at Edmonton, Alberta.

After a period of a year and a half at RCAF Station Fort St. John, BC, he was transferred overseas where he served in flying control with the RCAF's wartime No. 6 Bomber Group Headquarters in Leeming, Yorkshire. Returning to Canada in August 1945 he was posted to RCAF Station Trenton where he served as senior flying control officer and later as an instructor at the School of Flying Control.

In November 1948 he was transferred to RCAF Station Edmonton where he remained until March 1953. Since then F/L Snowdon has been in charge of radio and landing aids with the Directorate of Air Staff Services at AFHQ.



CLOSE SHAVE

I was the navigator on a Canuck MK 3B flying a high level GCI calibration exercise at 40,000 feet indicated (to maintain a true altitude of 42,000.) We had climbed through approximately 20,000 feet of cloud and were flying straight and level at altitude 250 NM north of base. RT reception at the time was strength one.

After being airborne for two hours we started our return to base. I had been plotting API fixes every five or 10 minutes and was busy rechecking our course home when I noticed we were in a slight climb. Normal crew chatter had ceased for approximately one minute when our GCI controller passed us general "info" which my pilot failed to answer. Then it struck home—oxygen!

I gave my pilot three or four loud sharp commands to check his mask and oxygen on 100%. Nothing came back but a long-drawn-out yawn. After a few more sharp commands, the pilot did regain some normality and I finally got him to switch to pressure breathing for a moment or two, after which he pushed the nose down and descended to 30,000. Prior to eliminating our trouble we were in a slow climb passing through 42,000 indicated—mere seconds away from stalling out. The remainder of the leg home was normal after my pilot tightened his mask, left his oxygen on 100% and resumed fairly continuous inter-crew chatter.

Our situation was not critical but it could have been in just a few more seconds.

- Check oxygen mask for snug fit prior to takeoff
- At high altitudes leave your oxygen on 100%
- Keep inter-crew chatter alert and continual.

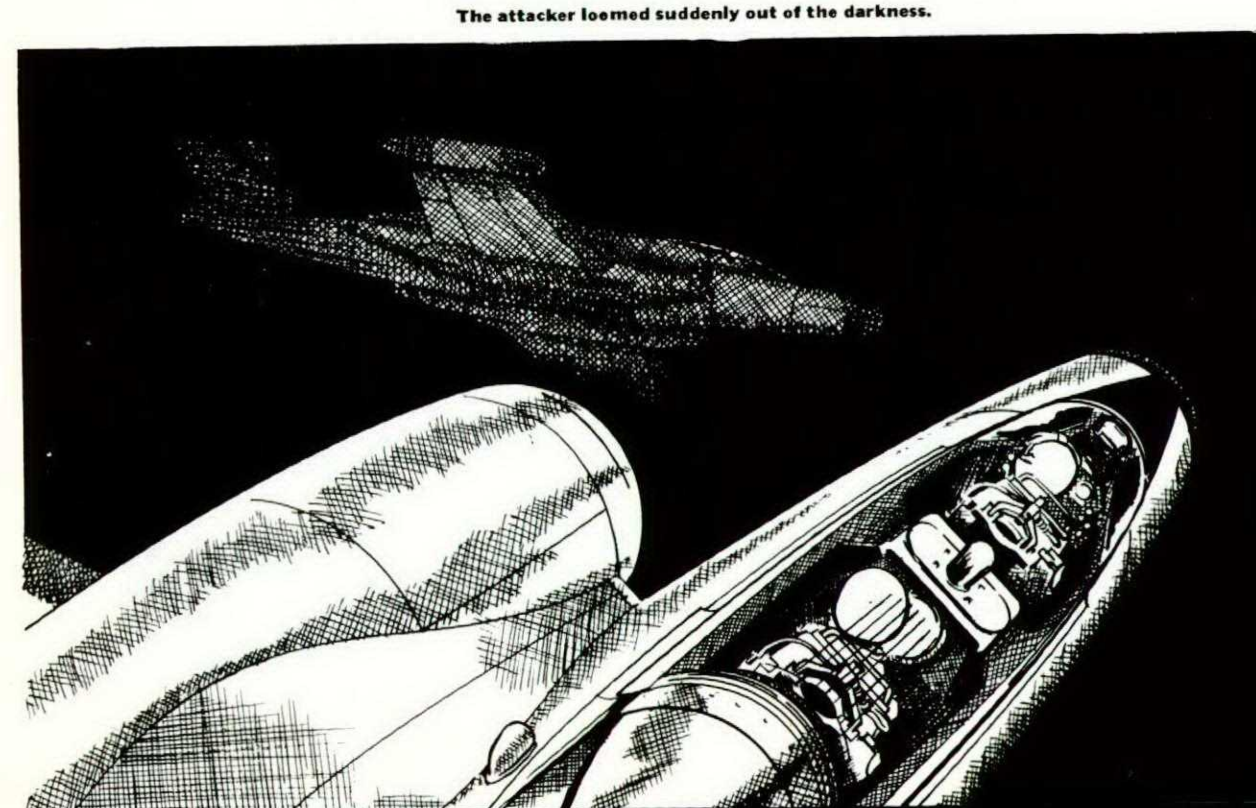
NIGHT INTERCEPTION

Two Canucks were flying practice night interceptions under GCI control, simulating actual combat conditions with all lights out. They were given a one-thousand-foot separation, one fighter acting as the target and flying at a higher level. The "attacking" aircraft was vectored onto its target in the usual beam position for radar pick-up. Radar contact could not be obtained on the target with the fighter's AI radar, and GCI reported that both blips had merged on their scope. What happened in the air was that the attacker loomed suddenly out of the darkness and headed straight for its target on a collision course. Both aircraft were at the same altitude. At the last moment the attacking pilot made visual contact with his blacked-out target and managed to veer off, barely avoiding a fatal collision.

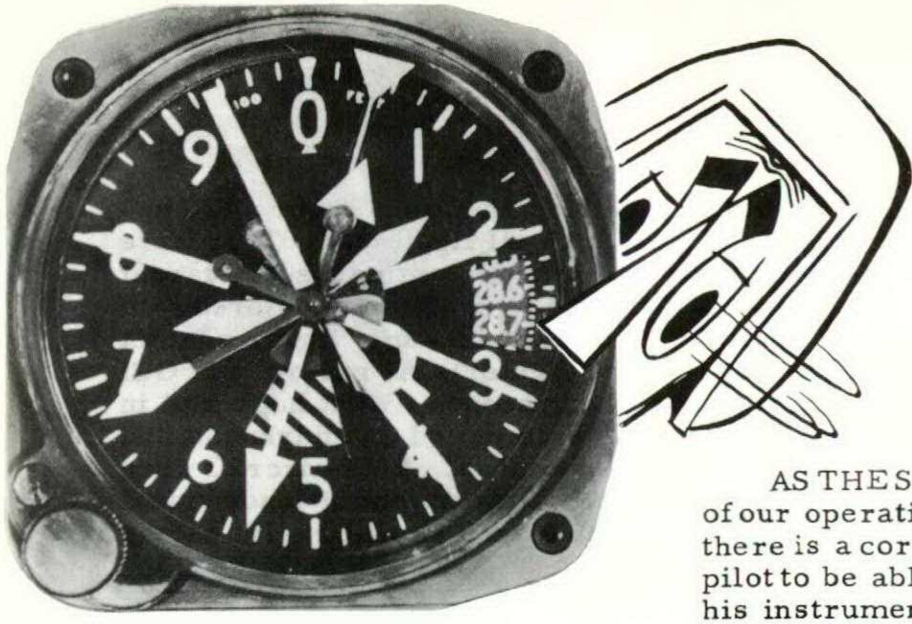
Two factors were responsible for both aircraft being at the same altitude instead of having a one-thousand-foot safety clearance as laid down. A check of the altimeters when both aircraft were at the same height revealed that there was more than a five-hundred-foot difference between the two, so either one or both instruments were in error. In addition the pilots had possibly erred in holding their aircraft at the assigned altitudes.

The writer recommends that on future night exercises of this nature pilots synchronize their altimeters at height before commencing an exercise, take measures to ensure that they are flying at the assigned altitudes, and request the target aircraft not to put out its lights until AI contact has been obtained.

The attacker loomed suddenly out of the darkness.



WHAT'S YOUR ALTITUDE?



AS THE SPEED and performance of our operational aircraft increase, there is a corresponding need for the pilot to be able to read and interpret his instruments in a much shorter time than formerly. Hence the deficiency of the present altimeter presentation. Recent aircraft accidents —in which the cause may well have been the pilot's misinterpretation of the altimeter—have dictated the requirement for an indication that will warn the pilot when he reaches low altitudes and will reduce the possibility of him reading the altimeter incorrectly.

The problem has been approached in two phases. Phase one is an interim modification to improve the presentation of the present altimeter; phase two calls for the development and production of an altimeter that will meet the requirements of future high performance aircraft. Close co-operation between Canada and the United States has enabled the RCAF to take advantage of test work already completed by the USAF's Air Proving Ground Command. Assessment of these test results by human engineers of our Institute of Aviation Medicine has confirmed the USAF selection of the best interim "fix". With minor modifications this presentation is being adopted by the RCAF and modification kits are now on order.

Changes are simple but effective. The short, 10,000-foot pointer has been extended by adding a long, thin pointer with a triangular end (see fig.1). The two sides of the triangle are curved inward so that it will hide as little as possible of the millibar sub-scale when in that position. This modification provides a positive indication of the 10,000-foot reading and reduces reading time considerably.

The second modification is the introduction of a flag warning window immediately above the 500-foot position (see fig.2). The flag is painted in yellow and black stripes so as to be clearly visible by day or night. As the aircraft reaches the 10,000-foot level, the flag gradually disappears from the window, until at approximately 15,000 feet the window is clear. During descent the flag starts to move across at roughly 15,000 feet, and by 10,000 the window is completely covered. Thus, at any time, one quick glance will tell the pilot whether he is above or below the 10,000-foot level.

Modification of existing altimeters is being carried out as quickly as possible. Retrofit of Sabre, Canuck and T-33 aircraft will be given first priority, and it is intended to modify all existing altimeters as soon as modification kits can be produced. Units will be advised when the modified altimeters are available.

Investigation is continuing to determine the ideal altimeter presentation. Meanwhile, the interim "fix" should provide more accurate and more positive reading of altitude at all times and reduce the possibility of a jet pilot misreading his altitude during letdown.

Fig 1. Older model (above) with short pointer, and new model (below) showing long, thin pointer with triangular end.

Fig 2. Older model (left) and new model (right) showing flag warning window.

DE-ICING CHEMICALS
1. AF Spec. 3609 — 80% (by volume) ethylene glycol; 20% (by volume) isopropyl alcohol; 10.5 grams dextrose (corn syrup) per gallon
2. Ethylene glycol and water (3 to 1)
3. DTD 406A (Shell 7) — 85% ethylene glycol; 5% isopropyl alcohol; 10% distilled water (percentages by volume)

ELIMINATION OF ICE, FROST OR SNOW FROM PARKED AIRCRAFT

CHECK POINTS

1. Top and bottom of all flight surfaces
2. Air intakes and vents
3. Control surface gaps
4. Hinge points
5. All movable parts
6. Antennas and radar enclosures
7. Windshields and adjoining areas

TYPE DEPOSIT	*DRY SNOW*	*WET SNOW*	*FROZEN SNOW*	*ICE*	*FROST*	*FROZEN MUD*
Weather Conditions	1. OVERCAST SKIES 2. TEMPERATURE BELOW 30° F.	1. OVERCAST SKIES 2. TEMPERATURE 30–35° F.	1. TEMPERATURE DROP AFTER WET SNOWFALL	1. UNIFORMLY OVERCAST SKIES 2. TEMPERATURE 25–32° F.	1. TEMPERATURE NEAR FREEZING 2. CLEAR SKIES—NIGHT 3. HIGH RELATIVE HUMIDITY 4. LITTLE OR NO WIND	1. THAWING CONDITIONS
Prevention Other Than Hangar	1. PROTECTIVE COVERS 2. FREQUENT REMOVAL OF SNOW PREVENTS PACKING	1. *WATERPROOF* PROTECTIVE COVERS 2. FREQUENT REMOVAL MORE IMPORTANT	1. DO NOT ALLOW WET OR DRY SNOW TO REMAIN ON SURFACE AND THAW AND REFREEZE 2. DO NOT REMOVE AIRCRAFT FROM HANGAR DURING SNOWFALL	1. FREQUENT APPLICATION OF DE-ICING FLUID MAY PREVENT FREEZING 2. REMOVE WATER OR SLUSH THAT MAY FREEZE	1. PROTECTIVE COVERS 2. APPLICATION OF DE-ICING FLUID (TEMPORARY PROTECTION ONLY)	1. AVOID TAXIING THROUGH WATER OR MUD
Removal	1. SWEEPING 2. CLOTH STRIP 3. GROUND RUN	1. SWEEPING 2. MOPPING 3. CLOTH STRIP	1. SWEEP TO REMOVE LOOSE DEPOSITS 2. APPLY CHEMICALS BY MOP OR SPRAY 3. USE HEAT UNDER COVER AS ALTERNATIVE METHOD	1. ALLOW ICE TO MELT OFF IN HANGAR 2. BEAT OFF WITH SHORT RUBBER HOSE 3. APPLY CHEMICALS GENEROUSLY 4. USE HEAT UNDER COVER	1. CHEMICALS, MOP OR SPRAY 2. CLOTH STRIP 3. PLACE AIRCRAFT IN BRIGHT SUN	1. HOT WATER, MOP OR SPRAY 2. USE CHEMICALS IF TEMPERATURE IS BELOW FREEZING
Cautions	1. CHEMICALS ARE WASTEFUL IN REMOVING DRY SNOW 2. CHECK ALL AIR INTAKES AND OPENINGS FOR BLOWN SNOW	1. CHECK ALL OPENINGS, MOVING PARTS, ETC., WHERE SNOW MAY COLLECT AND FREEZE 2. DRY SURFACE AFTER REMOVAL OF SNOW 3. CHECK FOR FROZEN SLUSH ON UNDERSIDE OF SURFACES	1. CHECK SURFACES FOR FROZEN SNOW AFTER WET OR DRY SNOW HAS BEEN REMOVED 2. DO NOT HEAT SURFACES OVER 160° F.	1. CHECK ALL OPENINGS AND MOVABLE PARTS 2. CHECK FOR RUNOFF THAT HAS FROZEN BETWEEN OR ON UNDERSIDE OF SURFACE 3. TAKE CARE TO AVOID DAMAGE TO SURFACE WHEN HEATING	1. DO NOT UNDERESTIMATE EFFECT OF FROST. REMOVE FROM TOP AND BOTTOM OF ALL FLIGHT SURFACES AND ANTENNAS	1. CHECK MOVABLE PARTS 2. LEAVE NO WATER TO FREEZE AFTER CLEANING

Cold and Current

by S/L G.A. HECK

TO WRITE AN ARTICLE on cold weather flying should be as easy as it is unnecessary. After all, about half of the RCAF's flying could be classed as "winter operations". One would therefore expect most RCAF pilots not only to be well informed on this phase of flying but well versed in the art itself. Besides, a great deal of printed matter is already in existence covering all phases of winter operations; and operational notes on the same subject are contained in practically every EO or publication that concerns flying—including Pilots' Notes General and Pilots' Operating Instructions for every type of aircraft.

The purpose of this article, then, is not to give you a long list of do's and don'ts and a lot of advice that probably doesn't apply to the type you are flying anyway; instead, we will attempt to find a new approach to the problem of cold weather operations and encourage the wider use of methods we already possess.

*

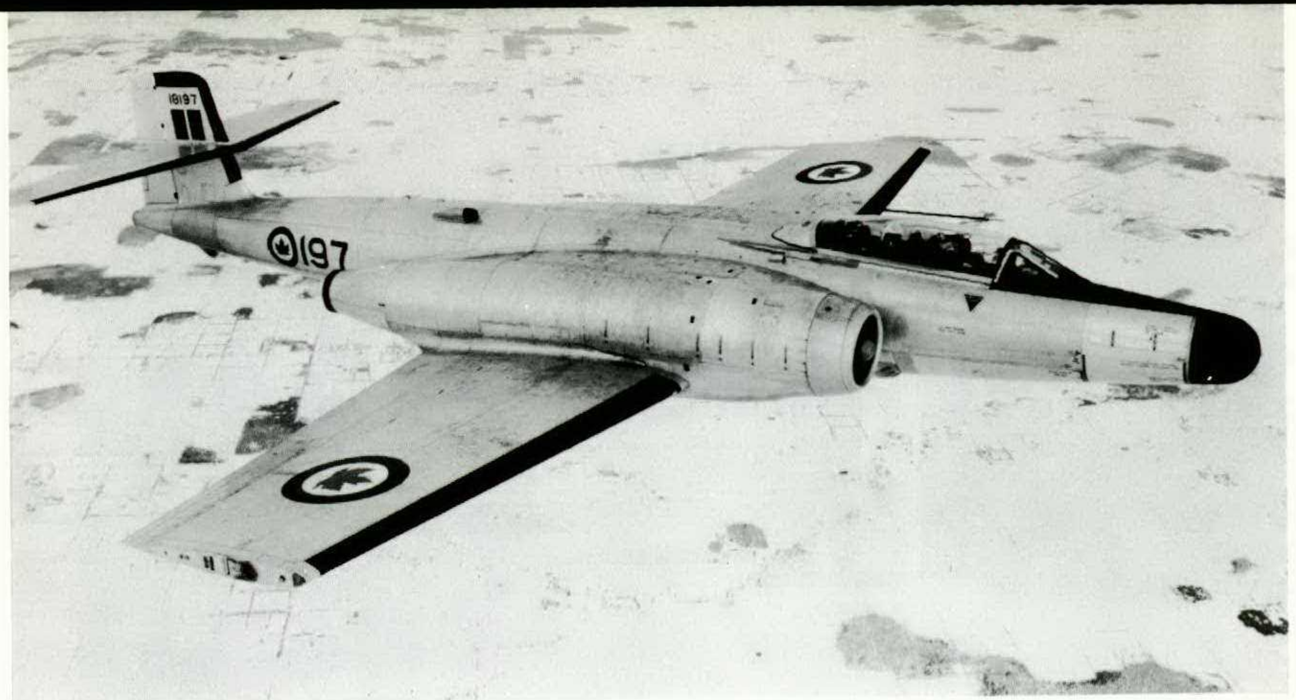
One of the most mysterious sidelights of an article on winter flying is the publication process. If you are caught for impaired driving, an article will appear in print in about 45 minutes. But if you want to publish an article on winter flying it must be prepared in April, revised in May, edited in June, worked over in August and published in September. It must be by this means that summer heat contributes to the lack of conviction so often apparent in articles on cold weather flying! However, once you've said that, you have mentioned the only point that makes winter flying really different. Up until now, you may have been fooled; but if winter flying isn't different, why was this article written in the first place?

To begin with (the claims of residents of North Bay and Cold Lake notwithstanding), there isn't really any such thing as cold. At least we can make this claim valid by defining cold as "the absence of heat". In any event it's just a matter of degree (or maybe a lot of them) and basically nothing has changed. All the basic laws still apply—and they are not repealed on cold days. There you have the most important feature of winter flying: it's similar to any other type of flying; it's all a matter of degree and basic knowledge. This probably doesn't sound too sensible (after all everyone has said that it's different), so maybe a couple of examples will be a good idea.

If you run off the edge of a runway, taxi strip or tarmac in the winter, you'll probably damage your aircraft on a snowbank. Well—if you live on that kind of an airfield, you'll damage the thing in the summer too. Sure it's not snow then; it's probably gravel. Anyhow it's a matter of opinion whether a parachute seems heavy due to the heat in June or the lack of it in January. And you can think about it as you walk back to the hangar.

Example two concerns the boy who forgot that he was using carburettor heat and ran himself out of gas. Why blame the winter? The damned thing won't run without gas in the summer either. No doubt the board found that bad flight planning was the culprit.

Maybe these two examples aren't convincing, but aside from treating the aforementioned absence of heat with a bit of respect, every winter situation has its parallel in the summer, fall or spring. Or at least the end result is the same.



There are as many kinds of winter operations as there are kinds of commands and aircraft, so you can easily see that it would take quite an expert to write an article about them all. Just remember that the cold weather procedures specified for your aircraft and operation do make sense and that it is as basic to know them as it is to know how to start the engines or fly the aircraft.

No doubt we could discourse at great lengths about the hazards of icy runways and bad airfield conditions that occur in winter. But in this enlightened era you will run into bad airfield conditions about as often as any other flight problem such as icing, turbulence or fog. If your flying knowledge is worth a pinch of coonskins you should know how to handle these problems and all other unusual flight situations as well. There are lots of techniques peculiar to cold weather handling—low temperature limitations, engine starting, oil dilution and so on—but you would be a little insulted if anyone intimated that you couldn't handle your aircraft on a hot day. Why would you be less insulted in the winter? Let's face it, you're supposed to know this stuff—and it's readily available.

Another good feature that is helping us all is the fact that new aircraft and engines are less prone to develop bad habits because of cold weather. Maintenance people will not agree with this 100%, mind you, but from the aircrew point of view it is quite true. Therefore, as aircrew, your main concern during winter operations will be with the adverse weather and airfield conditions.

At the expense of being thought repetitious, let's just run over this business again:

- Winter operations and problems should be treated with respect

- Proper procedures for cold weather operation are readily available

- Recognizing winter situations and dealing with them intelligently is part of your job.

If you don't think it's part of everyone's job to be able to operate successfully in winter, just think back on some of the reports you've read in this magazine. That's right. You've rarely—if ever—heard of an accident that was blamed on winter conditions alone. It was always someone's inability to recognize or cope with a dangerous winter situation that caused the accident. The onus is right smack on the operator: knowledge of proper cold weather operating techniques is a part of being current and proficient. In the finance racket, lack of currency means bankruptcy; and in the flying game there's no limited liability when you're bankrupt.

The Author

S/L G.A. Heck was born in Stettler, Alberta in 1925. In 1943 he joined the RCAF and was trained as a pilot. During the remainder of the Second World War he served with No.45 Transport Group at Dorval, P.Q. In 1945 he left the Service to attend the University of Alberta, re-enlisted in the RCAF the following year and remained at university on leave of absence. Graduated in 1948 with a B.Sc. degree, he was posted to the Winter Experimental Establishment at Edmonton for duties as a test pilot.

Posted overseas in February 1950 S/L Heck attended the Empire Test Pilots' course at Farnborough, England and was awarded the McKenna Trophy for the highest standing on the course. Returning to Canada in 1951 he was transferred to WEE at Edmonton, remaining there until July 1952. At that time he moved to Canadair Limited, Cartierville, P.Q. where he served as a test pilot for 15 months.

Since October 1953 S/L Heck has been Detachment Commander for the Central Experimental and Proving Establishment (NAE) Detachment at RCAF Station Uplands.

Flying

LETTERS TO THE EDITOR

Forced Landings

Dear Sir:

In a recent edition of "Flying Safety" (Feb 56) is an article entitled "Down, Boy, Down" dealing with the advisability of landing any modern jet fighter in an emergency using the gear-down rather than the gear-up configuration.

It is considered that the information contained in that article is adequate enough to receive confirmation from RCAF sources. I know that most of the facts contained in the "Flying Safety" article will come as a surprise to a majority of RCAF pilots, however, as a great number of RCAF personnel do read flight safety magazines. It would probably be a good thing if your magazine could express the views of DFS personnel on this very important subject.

R.M.L. Bowdery, S/L
Canadian Joint Staff
London, England

A number of observations have been made concerning RCAF policy following the publishing of the USAF article "Down, Boy, Down". RCAF statistics in crash landings of this kind do not support the American findings at present. There are a lot of variables to be considered in each case such as terrain, speed, whether or not control of the aircraft is maintained, etc. However, relevant commands have been made aware of the information. Your suggestion for a discussion of the subject in a future issue of FLIGHT COMMENT will be considered. — ED

Aircraft Chocks

Dear Sir:

The Mar - Apr issue has been of great interest to our maintenance staff —particularly the article "Safe Maintenance". However, may we draw your attention to the article "Airfield Hazards". The upper left illustration on page 22 shows a Lancaster aircraft parked on a piece of tarmac which is apparently covered with a sheet of solid ice. Under these conditions it is surprising to note the inadequate chock being used under the main wheel.

In a magazine devoted to the promotion of efficiency and safe practices it is most unusual to come across such a flagrant violation of regulations. Or is this a deliberate plant? Perhaps you are testing our powers of observation. In that case, our letter will show that safety precautions are taken seriously at this station.

R.J. Milroy, F/O
OC Repair
RCAF Station Summerside

Good eye! — ED

Somebody Dropped the Ball

An excellent cloud shot appeared in the title layout of the article "CuNim" in the May - Jun FLIGHT COMMENT. Through an error made somewhere between our editorial offices and the presses, a credit line disappeared from below the picture. The photographer is A.F. McQuarrie of the aviation forecast office at Calgary. We tender our thanks and apologies. — ED

Attention, Commanders!

Recently released is the new amendment (AL 21/56) to AFAO 21.56/01 concerning the Reporting and Investigation of Aircraft Accidents and Incidents.

Some of the more significant changes to the order are contained in the following sections:

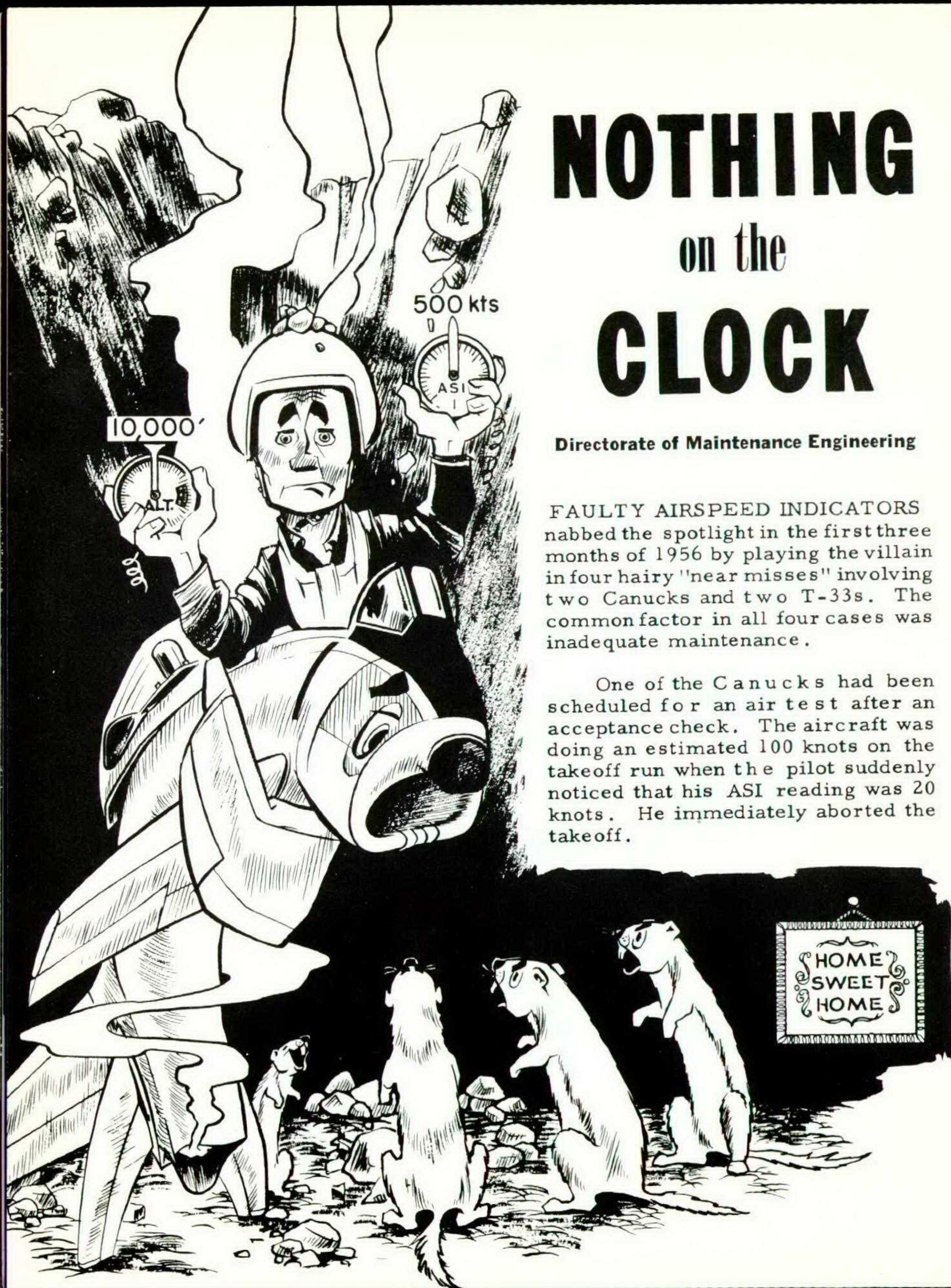
- Category of damage
- Crown or RCAF aircraft at contractors
- Form T97A, Crash Message
- Impounding of log books
- Overstressing reports
- Accidents to NATO military aircraft

Check today to ensure that your copy of the order contains the latest amendment. — ED

FLIGHT SAFETY PRESENTS

ABC of G — MN-3446 | **Land and Live in the Arctic** — 14C/853

THIS DOUBLE FEATURE HAS BEEN CHOSEN FROM A FILM SURVEY CONDUCTED BY TRAINING COMMAND. WATCH THIS SPACE FOR FUTURE BILLINGS. FILMS ARE LISTED IN CAP 428.



NOTHING on the CLOCK

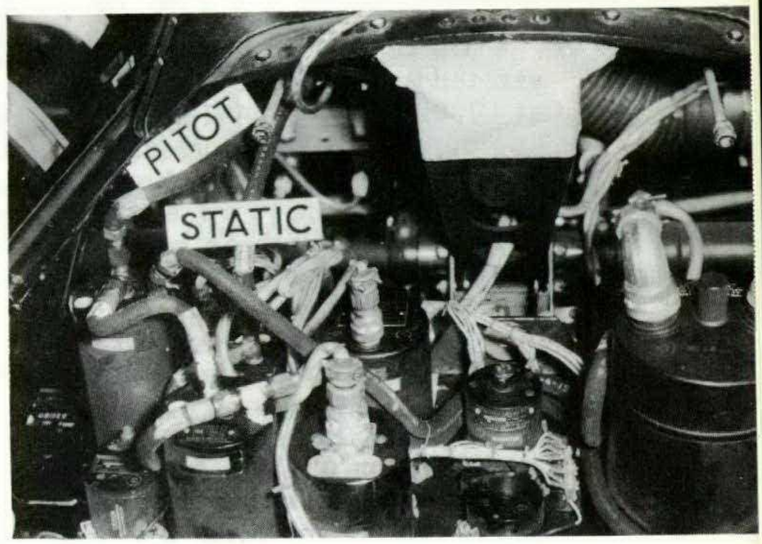
Directorate of Maintenance Engineering

FAULTY AIRSPEED INDICATORS nabbed the spotlight in the first three months of 1956 by playing the villain in four hairy "near misses" involving two Canucks and two T-33s. The common factor in all four cases was inadequate maintenance.

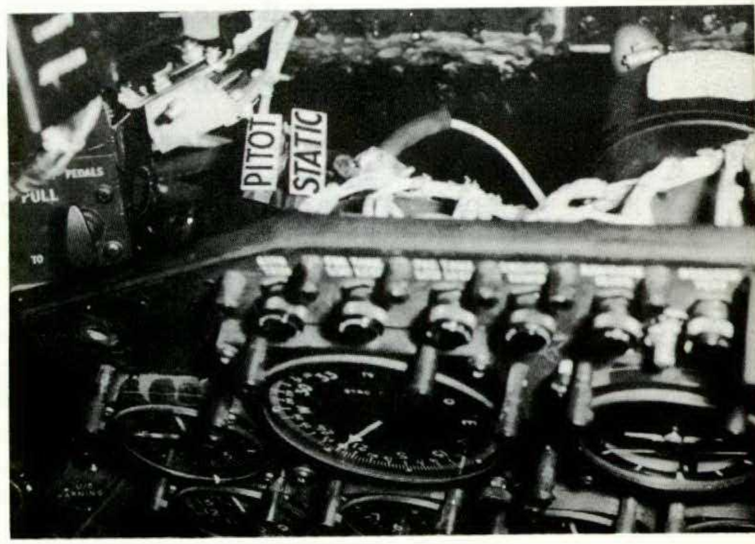
One of the Canucks had been scheduled for an air test after an acceptance check. The aircraft was doing an estimated 100 knots on the takeoff run when the pilot suddenly noticed that his ASI reading was 20 knots. He immediately aborted the takeoff.

Maintenance on the Canuck had included lowering the front instrument panel, and all lines and leads had to be disconnected and tagged. These were subsequently replaced, the tags being used as a guide. Investigation revealed that the pitot-static lines had been crossed at the airspeed indicator—and no check was carried out on the pitot-static system after re-installation of the panel!

The second Canuck was taxiing out for takeoff when the navigator mentioned that his altimeter was fluctuating. As the pilot's instrument was behaving properly, little importance was attached to the incident at that time. Takeoff appeared to be at a speed slightly lower than normal, but the pilot was not too sure because it was a night operation.



The site of the trouble: Instrument panels of T-33 and Canuck aircraft.



Shortly after they were airborne, one leg of the landing gear showed unsafe and the pilot reduced speed for a re-selection. The IAS fell off at such an alarming rate that full power was applied in an effort to maintain flying speed. At 10,500 feet indicated, with the aircraft in straight and level flight, the IAS continued to decrease gradually. As the aircraft appeared to be travelling at a speed considerably higher than indicated, the pilot suspected a faulty indicator. A check with GCI gave him a ground speed of 420 knots although the indicator read 130. When the speed brakes were applied and power reduced to 80%, the IAS fell off to zero. (The pilot later stated that he was relieved to find the aircraft still flying.) Eventually a landing was made with the assistance of another aircraft and no further difficulty was encountered. It was later discovered that the pitot-static line had been left disconnected from the altimeter in the navigator's cockpit.

The first T-33 was on its takeoff roll. When it was noticed that the airspeed indicators in both cockpits were unserviceable, the takeoff was aborted. The attempted flight was the first since the front cockpit indicator had been changed. A check of the pitot-static system revealed a leak which was causing a large error in the ASI reading. Both static and pitot connections to the front cockpit ASI were only finger-tight, and maintenance had neglected to perform a leak test after the installation.

The second T-33 was on a routine test flight following a 600-hour inspection. When the pilot started up, the VSI showed a descent of 1000 feet but steadied within a few seconds. At 18% power the artificial horizon and gyrosyn compass toppled but soon settled down. The pre-taxi check showed all instruments to be operating normally.

On takeoff the pilot estimated he was going 60 knots before the ASI started to register. During the climb all instruments were normal—but at 10,000 feet the ASI fell off to zero. On a slight dive it built up to 320 knots, which the pilot estimated to be about right. The altimeter was indicating a descent although the aircraft was in a level attitude. When the nose was raised slightly, the ASI again fell off to zero. Both the ASI and the altimeter were erratic. The pilot therefore requested that the tower send up another aircraft to give him assistance in making a landing. While waiting for it to appear, he decided to simulate a landing at altitude, so the aircraft was stalled intentionally. When recovery from the ensuing spin could not be effected, the pilot bailed out.

During the 600-hour inspection, a mobile repair party had applied modification 05-50C-6B/8 to the instrument panel. Because both jobs were being done at the same time, RCAF personnel removed the instruments, the MRP modified and re-installed the panel, and RCAF personnel re-installed the instruments. During the inspection RCAF technicians also carried out modification 05-50C-6A/143.

After the accident, a full examination of the pitot system was not possible due to fire damage. However, it appeared obvious that some maintenance error had caused the unserviceability of the three instruments concerned.

The airspeed indicator is a primary flight instrument—probably the most important on the instrument panel. Because many modern aircraft give little warning of an impending stall, a pilot is in grave difficulty without an airspeed indicator—especially if the assistance of another aircraft is unobtainable.

For technicians we cannot over-emphasize the importance of properly checking out the pitot-static systems after any servicing. This includes a leak test. As for the pilot, if he can spot an unserviceability soon enough the flight should be cancelled and the aircraft placed unserviceable. But, if he does run into this sort of trouble in the air, his best move is to call for a pacer aircraft to help him down.

mist and DE-MIST

by F/L G.F. HOFFOS

PILOTS WILL ALWAYS be faced with the problem of restricted visibility. Canopy and windscreen misting is one of the commonest forms today, although before the appearance of high altitude jet aircraft, it was normally a seasonal hazard encountered only during cold weather operation.

How Does it Form?

Misting occurs when warm moist air passes over a cold surface. In jet aircraft, the warm moist air is the pressurized supply tapped from the turbine; the cold surface is the windscreen and canopy. The colder surface causes the moisture to condense out of the warm air, and the pilot sees it as a mist on his windscreen.

Three variables determine the amount and condition of this misting. One of these is the quantity of water vapour present in warm moist air. Atmospheric conditions are the principle factor here. The greater the water vapour content, the greater the danger of misting and the greater the amount of misting. Bear in mind that the water vapour present—not the relative humidity—is the problem. Cold continental air with a high relative humidity does not necessarily contain as much water vapour as a warm maritime air mass with a lower relative humidity. Remember too that the water vapour content of the air is greater during cloud penetrations; and that, when an aircraft is flying in precipitation at airspeeds in excess of 250 mph, the water vapour content is again increased due to ram effect at turbine intakes.

The second variable is the temperature of the colder surface. Jet aircraft normally operate at altitudes where sub-zero temperatures are prevalent the year 'round. While flying at these altitudes the aircraft —particularly windscreen and canopy—will cool to the temperature of the surrounding air. In addition to forming the basis for condensation, the colder surface will determine its composition: the colder the surface, the more crystalline the condensation—ergo, icing on the windscreen.

Finally we have the third variable: the period of time that the warm moist air passes over the cold surface. Since it is self-explanatory, there is no need for further elaboration.

How is it Eliminated?

Now to consider preventive action. If misting can't be avoided, then attempts should be made to limit the amount that will occur and the length of time it will last. As for the cause of misting, it would appear that if the colder surface causing the condensation could be eliminated the problem would be solved. Hence the two principle methods presently employed:

- Windscreens which are heated electrically
- Windscreens which are heated by deflecting warm (moist) air from the turbines.

Regardless of the method employed, neither is of value unless used properly. De-misting equipment is intended to warm the windscreen, but because of its construction and size cannot do so in a matter of seconds.

The part the pilot plays in misting and de-misting is nothing more than good airmanship. Knowing the cause and having recourse to de-misting equipment he should endeavour to take advantage of both.

- Water vapour is always present in the atmosphere—the lower the altitude the greater the content. Always anticipate misting conditions during a descent from altitude.
- When operating at an altitude in cloud where severe misting occurs (commonly found on GCA initial approach), request a change of altitude to evade cloud.
- Use the de-misting equipment available and place it in operation long enough prior to a penetration to prevent serious misting of the windscreen.
- Keep in mind that a misted windscreen not only restricts forward visibility, but also creates a dangerous parallax error.

An article of this length could not attempt to cover in detail the subject of misting. However, if it stimulates discussion it has served its purpose. What we need is someone to devise a method of dehydrating cockpit intake air so that the problem can be eliminated. Until such an invention appears on the scene, the safest bet is to use the de-misting apparatus—"following the instructions for little engineers".

The Author

Born in Assiniboia, Sask. in 1920, F/L G.F. Hoffos received his senior matriculation at the Assiniboia High School in 1938. He enlisted in the RCAF in 1942 and served as an instructor in Canada on completion of his pilot training in 1944. In April 1945, he transferred to the Royal Navy Fleet Air Arm, serving overseas for the remainder of the war.

On his return to Canada in December 1945, F/L Hoffos left the Service to become a pilot for a civilian airways company. In 1951 he re-enlisted in the RCAF and after refresher pilot training at RCAF stations Portage and MacDonald, Man., was transferred in 1953 to the RCAF station at North Bay, Ont. for instruction in jet flying.

He was posted to RCAF Station Cold Lake, Alta., in April 1955, when the All-Weather Fighter Operational Training Unit was moved there from North Bay, and served as an instructor until April of this year. At that time he was appointed to the position of staff pilot, and is presently flying T-33s and Canucks.

"CEILING AND VISIBILITY MINIMUMS"

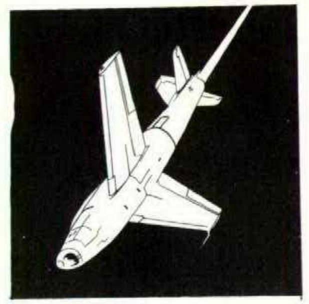
only make an approach legal.

OTHER FACTORS

may make it impossible!

Accident Resumé

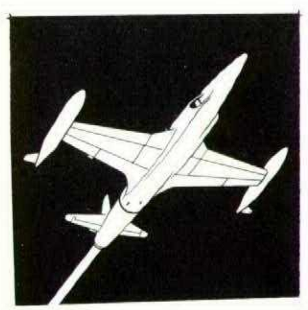
Could You Have Got Out?



Completing a four-plane battle formation exercise, the section broke up into two elements for air-fighting practice. During the combat manoeuvres, both wingmen lost position and found themselves too far back. In concentrating a lookout on their individual element leaders they lost sight of one another and collided with such force that number 2 was stunned and number 4 lost half his starboard wing. Number 4 reacted immediately and bailed out successfully. Number 2 recovered consciousness to find himself in a vertical dive, flicking violently to the right with his cockpit full of smoke. Unable to check the spiral he also ejected and parachuted to safety.

The vital necessity for careful position holding and a constant awareness of other aircraft in this type of exercise can not be over-emphasized. However, since the collision occurred at about 12,000 feet, it is also apparent that only prompt application of a thorough knowledge of emergency procedures saved this collision from becoming a tragedy. Could you have made it?

By the Book



Two students were signed out for a mutual IF exercise in a T-33. After completing some aural null procedures the student under the hood in the front cockpit requested an unusual position. The captain took control, climbed to 20,000 feet, executed a roll at 98% rpm and put the aircraft into a left spiral almost on its back. The other pilot then tried to pull through without touching power. The captain again took control and rolled out, reducing power and opening the speed brakes—but not before the T-33 was overstressed to plus 8G. The damage incurred was categorized as "D".

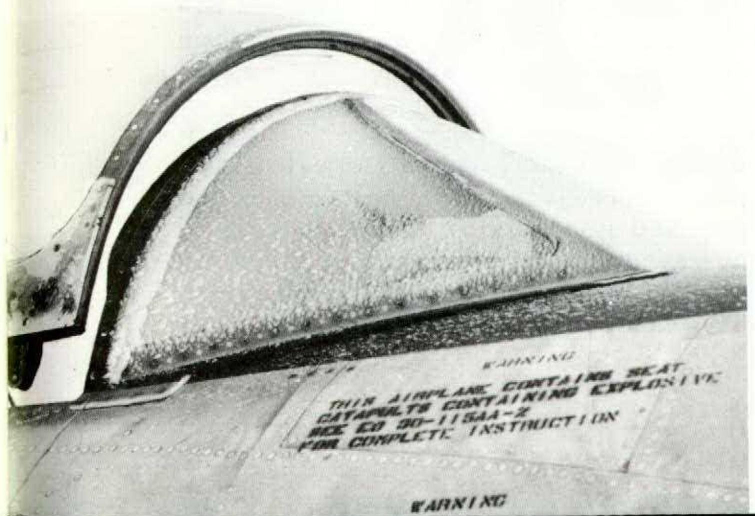
The students were doubly wrong. While being authorized for the mutual instrument flight they were briefed to attempt no unusual positions or recoveries. Furthermore, prohibitions in this regard are spelled out by the book—in this case, Training Command Instruction 55.00-2, 1 Nov 55 as well as Station Flying Orders. The disciplinary action taken may serve to persuade these students—and other pilots—that there are times when it pays to live by the book.

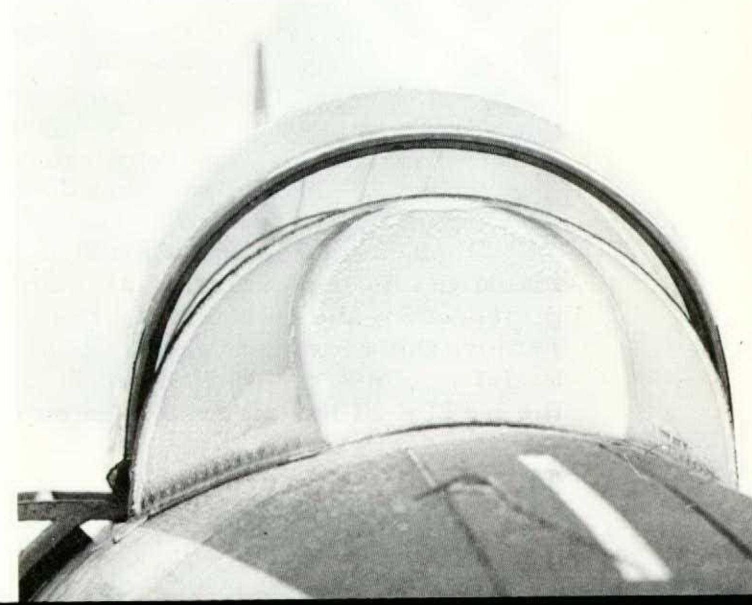
No Ice in Mine

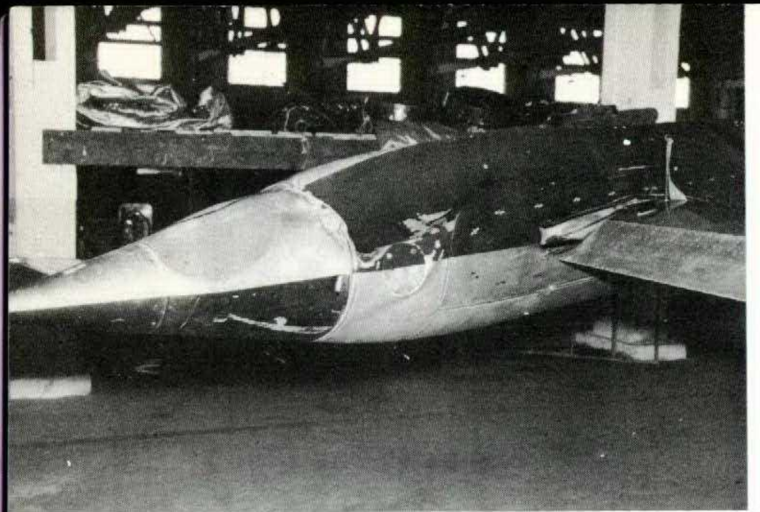
Ice is a most useful commodity in its place but the accompanying photographs illustrate a situation in which it is anything but desirable. The pilot, because of his experience, was detailed to fly the T-33 on a weather check but remain clear of cloud. A ceiling of about 5000 feet existed and the weather forecast warned of the possibility of freezing rain, although up to takeoff time none had been reported.

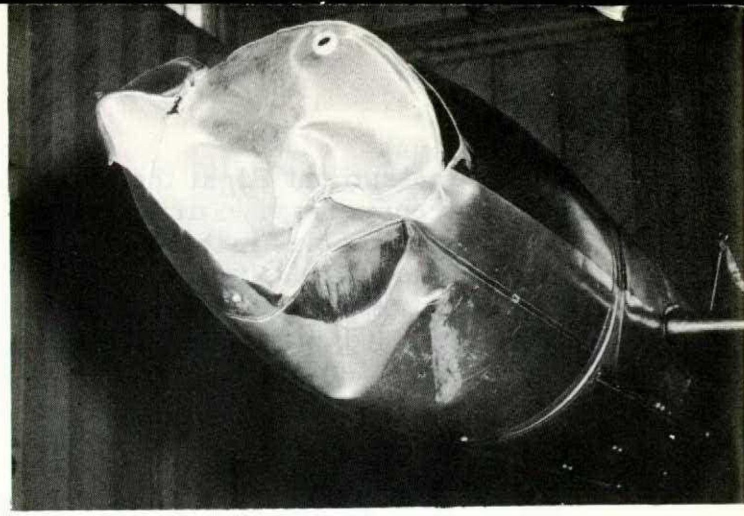
After an uneventful takeoff the pilot climbed to 2000 feet, at which point he encountered freezing drizzle and immediately reported the condition. Simultaneously with the pilot's report, word of freezing drizzle was received from a nearby station. Ice built up rapidly until it was one half to one inch thick on the canopy and airframe and quickly reduced the pilot's visibility to zero. Since defrosters were ineffective he attempted an immediate landing with special assistance from the tower; but as he turned at low speed to correct for a slight misalignment, the aircraft stalled and damaged a tiptank when it struck the runway.

With malice towards none, let us, for the coming winter, determine to avoid ice except in those times and places where it can be of real use and comfort. And further to the subject of ice and associated cold weather phenomena, we direct your attention to the inside back cover and to the article entitled "Mist and De-Mist" on page 29—all pertinent to the season ahead.





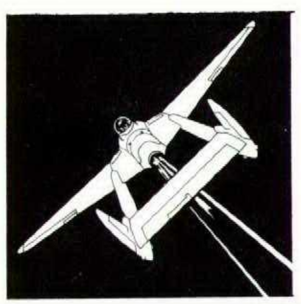




Cause and Effect

A T-33 carrying a student and an instructor was signed out on a clear hood dual training flight (no formation). Shortly after takeoff this aircraft joined up with and formated on another T-33 which was flown by a junior instructor who had been signed out on a local solo clear hood exercise (again no formation). Following a short period of unauthorized formation flying led by the junior instructor, he initiated formation aerobatics—also unauthorized. In the words of number 2, "We did a loop and I lost position on the recovery and pulled into the lead aircraft."

As shown in the photographs the two aircraft were damaged; but after stall checks both were landed safely. For flying illegally, the instructors were formally charged with violation of regulations and flying discipline.



Where's My Hat At?

An airman was assisting with a Vampire engine start. The start was successful but, after a few seconds at 2500 rpm, engine speed dropped off and tailpipe temperature climbed to 750°C. The pilot stop-cocked. Believing a wet start to be the trouble, he had the tailpipe drained and made a second attempt. Again the rpm dropped from 2500; and when jet pipe temperature rose to about 800°C, the engine was shut down a second time.

Upon investigation a foreign object was noticed in the impeller and identified as the assisting airman's cap. Receiving a signal from the pilot after the first start, the airman had gone under the port wing to remove the energizer plug. He had then stepped out from under the wing to get a screwdriver with which to close the starting plug access door in the belly of the aircraft. In so doing he passed too close to the air

intake and his field service cap was drawn in. Because of the commotion at the time, he didn't realize it had left his head.

If the loss had been merely that of a cap the accident would not have been serious. However, high tailpipe temperatures necessitated engine removal and overhaul—a costly business. Line personnel have again been warned about the type of head gear that is to be worn on the job. Nonchalance in the vicinity of idling aircraft is dangerous. People are still being killed by propellers and by getting sucked into jet intakes.

Don't Depend on the Horn

Two experienced pilots were flying a Harvard on a mutual exercise. After some instrument work they began practising various types of landings at a radio-controlled satellite field with which they had not made radio contact. While on final for a 180-degree, power-off approach they heard their base controller broadcast the frequency of the satellite tower. In the

confusion involved in checking the radio set for the required frequency, they skipped their pre-landing checks—and the Harvard bellied in.

Both pilots stated that the warning horn did not sound until after the propeller first hit the runway. While the system checked serviceable immediately after the accident it was agreed that ice from slush picked up on previous circuits could have caused a temporary malfunction of the warning system. But why depend only on the horn? These pilots had the combined experience of some 9000 hours' flying behind them. Are we expecting too much of them when we say they should have learned prior to takeoff the frequency of the facility they were to use? Furthermore, should we not also expect them to know that permission—either visual or aural—must be gained before joining a circuit? Had these two procedures been correctly attended to at the proper time, undoubtedly the vital pre-landing check would not have been missed. It is somewhat ironical to record that preoccupation with the radio problem also caused both pilots to miss a red warning light from the tower.

Pyrotechnics and Powers of Perception

The student took off from runway 34 on his first solo flight. Immediately afterward a general broadcast was sent out by the tower on VHF channels A, B and C to warn of a runway change from 34 to 02, but the student later claimed that he did not hear it because of a squeal on his B channel. However, the smoke generator, indicating a runway change, was operating on the button of 34 and the tender was also in position and clearing aircraft to land on 02 when the tender operator noticed the student approaching runway 34.

The DFCO was notified and another broadcast went out on A, B and C channels warning the pilot to go around. At the same time the tender operator fired two red flares directly at the Harvard while the operator of the control tower vehicle (which by now was also on the field) fired two more red flares in an attempt to persuade the student not to land. Finally, a control tower airman standing near the button of runway 34 waved his arms wildly in an attempt to warn the pilot off.

But all this desperate effort was wasted. The student came right on through and landed. An instructor in another Harvard was forced to use harsh brake and stand his aircraft on its nose to avoid a collision. When the student's aircraft was checked, no radio malfunction could be found.

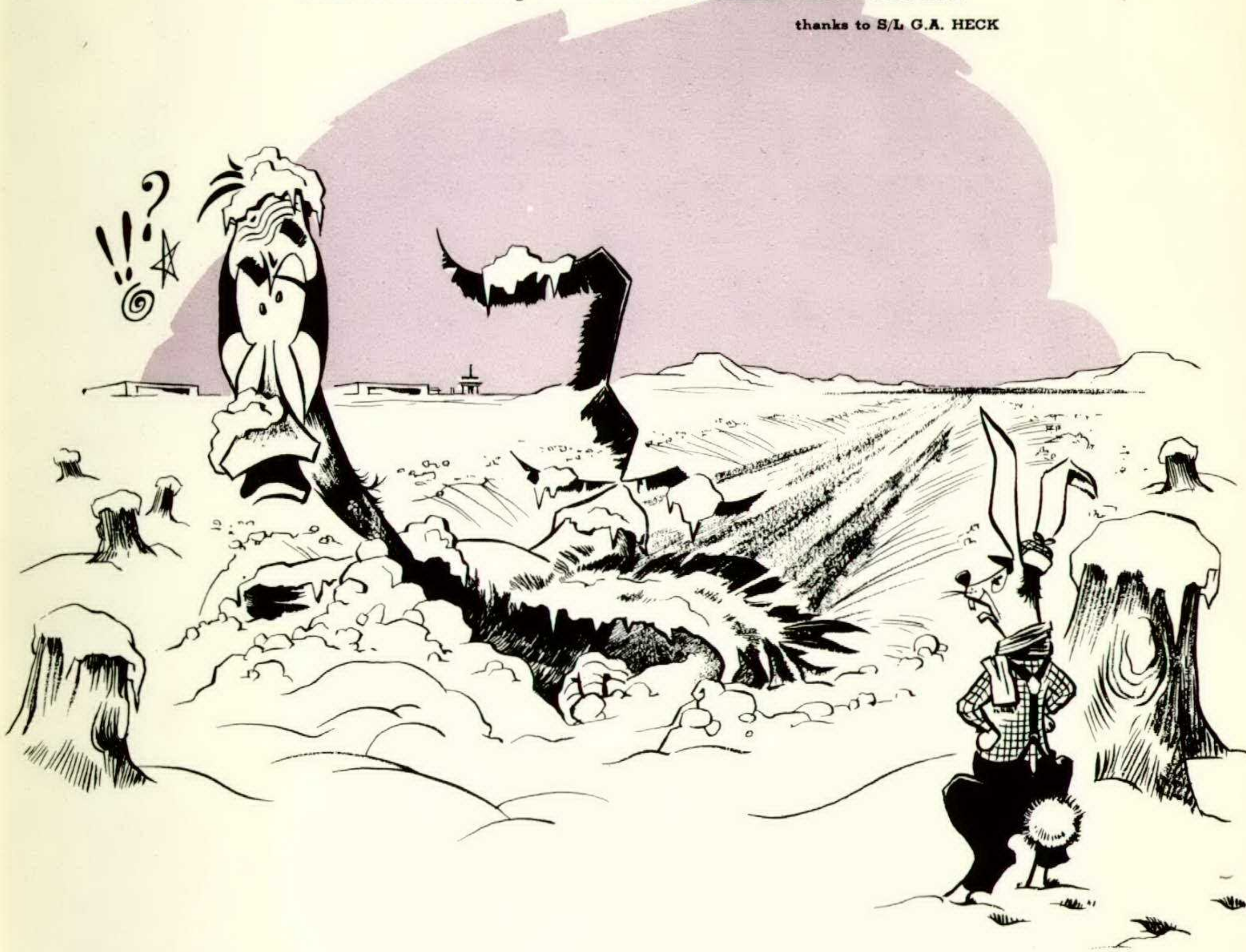
The necessity for flying with heads up, eyeballs uncaged and neck on a swivel is becoming more and more urgent as aircraft speeds increase. While this was the student's first solo and he had had no briefing on runway change procedures for 10 days, it is still a wonder how he could possibly have missed all these warnings.

WHITE-WINGED SWAMP-SITTER

Watch for this species on crisp, cold mornings. May be found in rough or swampy ground off the edge of an airfield. Easily recognized by the white, frosted appearance of wings and tail. Sound effect accompanying the perching manoeuvre is Keeee-runch!

Call: a somewhat plaintive WHYNHELLDIDNTIGETOFF

thanks to S/L G.A. HECK



BIRD WATCHERS' CORNER

DFS