FLIGHT COMMENT

ISSUED BY

DIRECTORATE OF FLIGHT SAFETY

R.C.A.F. HEADQUARTERS • OTTAWA, ONT.

SECOND QUARTER • 1954

RESTRICTED

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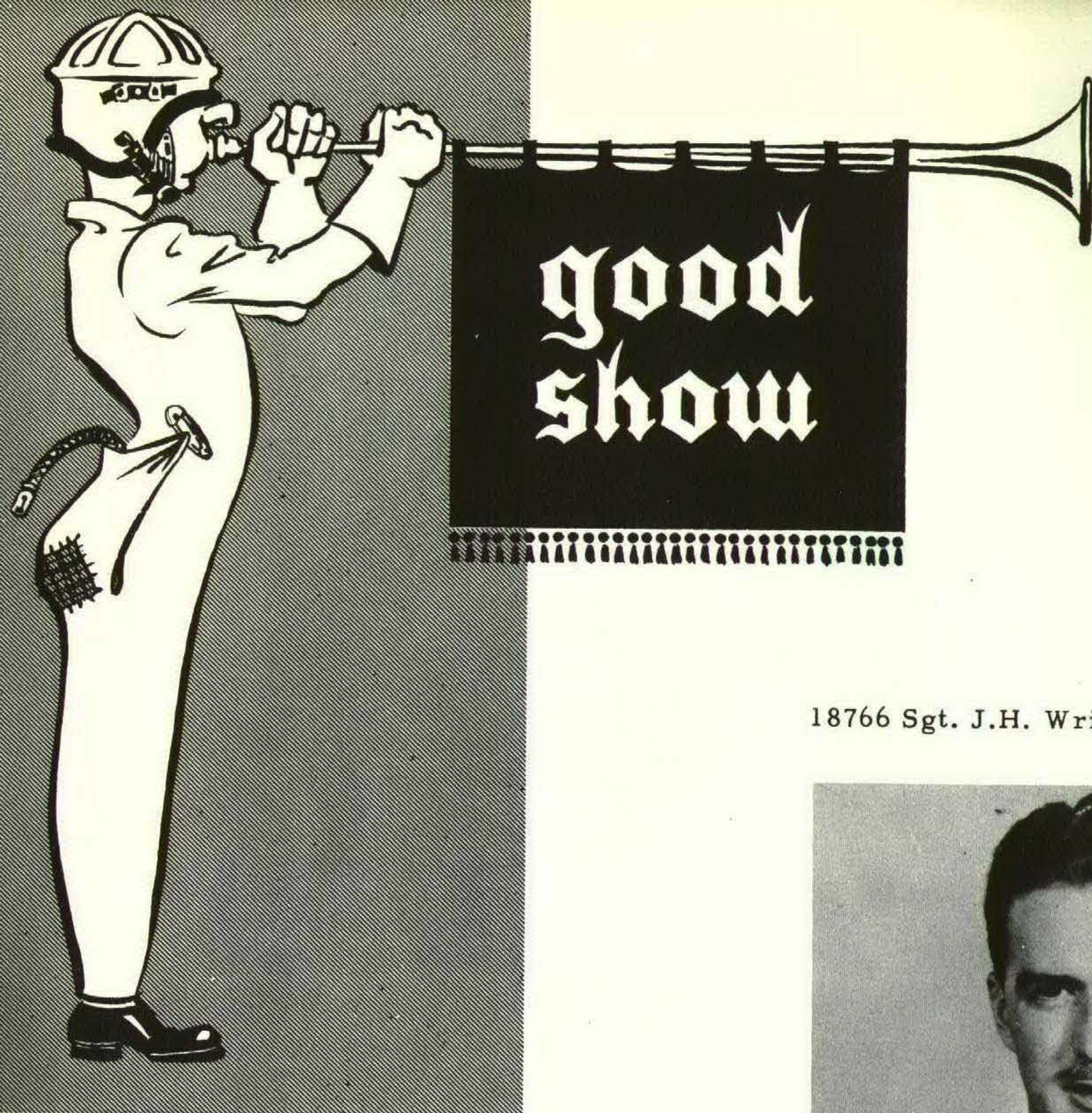
EDITORIAL

The role of an Air Force involves the assumption of calculated risks. The degree of accident risk can be kept to a minimum by acquiring safe flying habits. As a pre-requisite it is necessary to understand and believe in the need for safety measures. It is then a matter of education, of keeping up to date in our knowledge and skills and of being constantly alert to avoid preventable aircraft accidents.

Flight Comment, published by the Directorate of Flight Safety, AFHQ, is designed to promote a better understanding of safety-of-flight measures. Whether you fly or provide supporting services you can learn with advantage from the experience and knowledge of others. By so doing the accident risk can be reduced and the efficiency of the Air Force improved.

C.R. Slemon

(C.R. Slemon)
Air Marshal
Chief of the Air Staff



18766 Sgt. J.H. Wright

Sgt. Wright was on control tower duty one afternoon at Currie Field, 25 AMB, when he heard a distress call on the RT. Over and over again a voice called "Help, I'm lost", periodically lapsing into French which Sgt. Wright could not understand, although he concluded that the pilot was a NATO student flying a Harvard out of either Claresholm or Penhold. A check revealed that these two units were receiving the same distress call but were unable to take bearings or make radio contact.

Sgt. Wright finally succeeded in getting through to the pilot by speaking very slowly and distinctly. He learned that there were mountains on the pilot's left but could not make out what heading he was flying. The voice on the radio sounded panic-stricken—the pilot was desperately in need of help.

The Sergeant, speaking calmly and clearly, told him to climb to 9000 feet. Because Currie Field's VHF/ADF had been dismantled and no other direction-finding apparatus was available, he then turned the tower's receiver gain to minimum and called the pilot at roughly one-minute intervals. When the returning signals progressively faded, Sgt. Wright realized that the Harvard was flying away from the tower. Accordingly he instructed the pilot to steer 140°M, a course which he felt should bring him away from the mountains and back in the general direction of Currie Field. The strength of the RT signal steadily increased, indicating that the aircraft was getting nearer.

A few minutes later the familiar roar of a Harvard sounded overhead. Sgt. Wright called the pilot to tell him he was over the field, and then, to attract his attention, fired several flares—whites followed by greens. The aircraft landed safely with about twenty gallons of fuel remaining.

Sgt. Wright acted with great presence of mind throughout the emergency and thereby saved both pilot and aircraft from what might have been certain destruction.

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You and your HARD HAT

by

F/L W.K. Hobbs

(Recognizing that hard-hats are continually under fire from those who wear the equipment, we are publishing this article by the Institute of Aviation Medicine in order that all facets of the design problem may be more generally appreciated by aircrew. If you have constructive suggestions for improvement of the present flying helmet, why not pass them along to the Directorate of Flight Safety at AFHQ?)

Considerable misunderstanding and dissatisfaction exist in the Service regarding the present and proposed types of pilots' protective helmets—commonly known as "crash helmets". There is no doubt that the helmets presently in the field are inadequate, but it is expected that they will be completely replaced by the new issue very soon. However, the new issue of helmets will still bring forth the same criticisms from the users because of a lack of appreciation of the fundamental purpose and possible hazards of wearing a protective helmet and because of the dissemination of some erroneous propaganda. The helmet story requires some clarification.

What is … Primarily, it must be a stable carr… earphones and possibly a vi… mask suspension in itself is s… Secondarily, a helmet must … f protection. It must protect … solar radiation and perhaps … se functions are essential but … 's helmet is not a decoration … . Nor does it have to be h…

In order … tions, a pilot's helmet asser… d neck as possible in orde… irm a hold on the head as … quipment. The oxygen mask … trong, broadly-dispersed su… a fixed position

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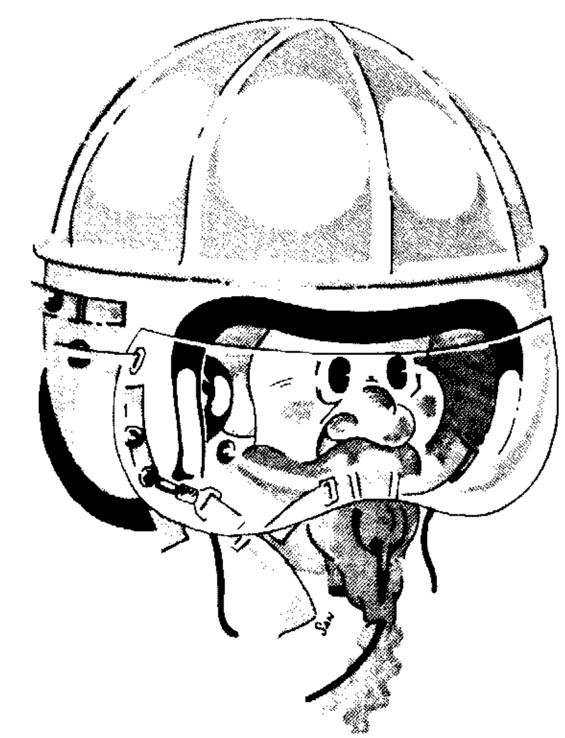


and closely applied to the face and ears. The oxygen mask in particular must be secure enough so as to withstand any externally applied sub-lethal force. If the oxygen mask is lost at high altitude, the brain becomes anoxic and useless and all other protective measures for the head are then unnecessary.

The main protective feature of the helmet is the rigid outer shell which encloses the whole head except for the face and back of the neck. It is obvious that this shell gives some protection from fire and weather but its prime purpose is protection against mechanical forces. Two basic physical principles are involved in sparing the skull from injurious blows by the use of a hard shell. The first principle is that of dispersing a force over a large area so that it exerts a lower pressure and less damage than if the force were concentrated in a small area to produce high pressure. The protective helmet does not stop a force from reaching the skull but it does spread the force out over the skull by means of the suspension and chin straps. The second principle involves the laws of acceleration and deceleration. If two objects collide, the force of the collision depends on the rapidity and degree of deceleration, which in turn depends on the distance through which the deceleration takes place. The space between the hard shell of the helmet and the skull represents increased distance for deceleration and subsequent decrease of decelerative forces with crushing or penetrating collisions. Thus the helmet, because of its hardness and suspension, disperses moderately severe blows. Under violent blows the hard shell and suspension deform and dissipate some of the collision energy during deceleration across the intervening space from the helmet to the skull. If pilots' helmets were made strong enough to resist the extreme blows that soldiers' metal helmets withstand, they would not only be too heavy but would also transmit too much energy to the skull instead of absorbing it in collapsing.

It must be recognized that the protective shell is not primarily a crash helmet but is intended to protect a man's head against moderately severe blows of the type commonly sustained during buffeting and bailout. A tight harness and a strong cockpit structure, however, are still the best protective factors in crash survival. As for the helmet, by establishing an upper limit to the protection which it will afford, its size and weight can be kept within reason in order to minimize encumbrance.

What of the hazards of wearing a protective helmet? Because of its size, shape and mass, the protective shell may attract large forces, particularly from high speed wind-blast. The attracted forces may be in excess of the ability of the head and neck to withstand them. Therefore, a helmet must be so designed as to leave the head when it becomes more injurious than protective. If it does leave the head, it must not take anything essential with it, such as the oxygen mask. A protective helmet is like a fire: It can be a life-saver; but if not used carefully, it can be a killer.

A consideration of the preceding remarks may indicate the reasons for deciding against a one-piece helmet and in favour of the two-piece assembly. It is quite conceivable that, at some future date, a one-piece assembly may be devised which will be stable and firm under moderate violence but which will permit the outer shell alone to separate under extreme forces. At the present time, the H4 pilot's protective helmet assembly best meets the requirements, although the inconvenience of two pieces must be accepted as a necessary evil. The H4 assembly is designed with positive-locking, quick-releasing, pull-the-dot snap fasteners located on the chin strap, oxygen mask suspension and outer helmet attachments. The outer helmet attachments incorporate a link which will break under an applied force of approximately 50 pounds. This break-link permits the wearer to fasten the chin strap without risk of injury should the outer helmet be torn off. If the assembly is correctly fitted, there is no need to draw the chin strap uncomfortably tight—but it must be fastened.

Many claims have been made that the one-piece helmet will stay on the head if streamlined with a visor. This has not been definitely proved. There is sound evidence that the helmet will blow off in high mach blasts and that it will certainly take the oxygen mask with it—and possibly the wearer's head as well.

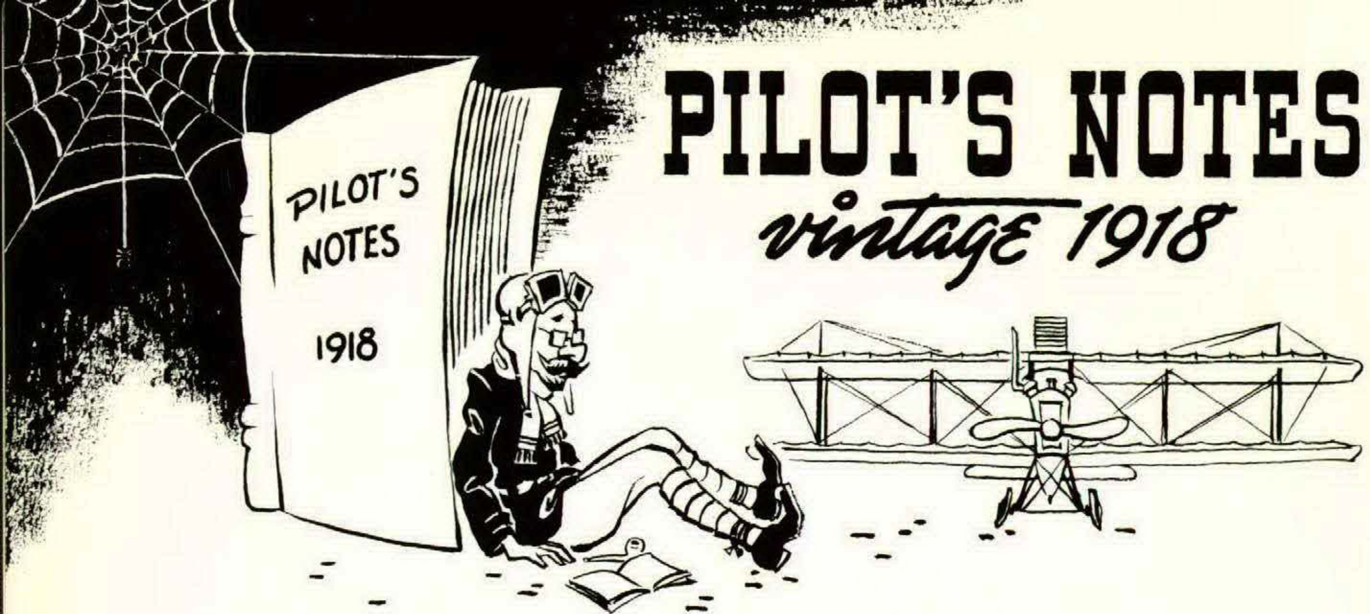
The most important consideration is a proper fit. You should be as careful in fitting your helmet assembly as you are in fitting your shoes. If your helmet fits, it will stay firmly in place even though you shake your head or hang by your toes. Also, remember always to fasten your chin strap, leaving it loose enough to be comfortable.

F/L W.K. Hobbs

The Author

F/L Hobbs was born in Oshawa, Ontario. He enlisted aircrew with the RCAF in 1943 and received pilot's wings and commission in 1945. After discharge he entered medical school at the University of Toronto and received his MD degree in 1950. After one year in general medical practice, he was appointed to permanent commission in the RCAF as a Medical Officer and is now on staff in the Flying Personnel Medical Establishment of the Institute of Aviation Medicine.

PILOT'S NOTES
vintage 1918



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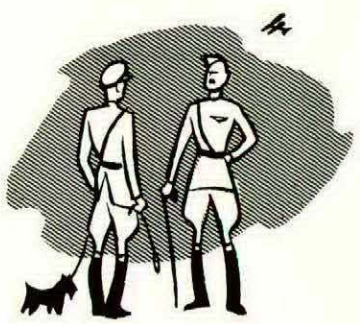

RISK

A Government pilot flying a Government machine is not justified in running any risk unless he has a good prospect of obtaining some advantage for the Government. The education of a pilot is an advantage to the Government. The amusement of a pilot is not.

APPROACHING AN AERODROME

When a pilot arrives over an aerodrome on which he wishes to land, his sole duty is, and his one idea should be, to apply the machine to the ground as gently as possible in exactly the right place and in exactly the right way. The question of frightening the observer or impressing the assembled public should not be allowed to weigh with him or influence his actions for a moment.

Every perfect landing is the result of a combination of (1) Judgment and (2) Knowledge.

(1) Judgment is not worth discussing. It is a thing which you have, or you have not (and moreover it varies with the state of the pilot's liver).

(2) Knowledge can be acquired, and it is the pilot's duty to neglect no opportunity of acquiring it.

The following is the knowledge which a pilot would like to have when he is landing on a strange aerodrome (1) The nature of the ground surface and (2) The strength and direction of the wind.

(1) can frequently be guessed and it is therefore the pilot's duty so to arrange his descent as to give himself a chance of guessing rightly. Even if you are landing on the aerodrome on which you were born and bred, some person may have dug a hole or left a wheel barrow in the middle of it while you were away.

applicable to all types of RCAF aircraft.

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'HEN THE WRIGHT BROTHERS charged into the blue half a century go, flaps were both unknown and unnecessary. Over the years, the esign of aircraft has altered radically and rapidly to enable man to y higher, faster and farther. This increase in performance was chieved by using more powerful engines, reducing airframe drag, nd by improved wing design. This, of course, resulted in increased ing loading.

Unfortunately, the design requirements for good high speed and ow speed performance of a wing are incompatible. As wing design hanged to achieve higher cruising speeds, takeoff and landing speeds lso increased. In order to decrease landing speeds, aircraft designers earched for methods of increasing the low speed performance without ompromising high speed characteristics. About twenty years ago, ing flaps were invented to achieve this purpose.

Flaps filled the bill by altering wing camber and, in some cases, spot at the right speed. No one will ever be able to do this. A pilot who has to use spirals, S-turns or other manoeuvres to find the right spot is thereby acknowledging the inferiority of his judgment.

The use of the engine for landing destroys all the instructional value of the flight as regards landing, because all landing practice is intended to be practice for forced landings when the engine is not available.

FLYING ETIQUETTE

(1) Do not allow an engine to be started if the tail of the machine is pointing into a shed or into the face of a pilot sitting in the next machine.

(2) Do not try to induce the mechanics to remove the chocks while the engine is still delivering about 60 H.P. Sooner or later one chock will come out without the other, and the machine will swing round, behead the mechanic whose chock would not come out, and run into a shed.

(3) Do not, when arriving at an aerodrome at 3000 feet, cut in under a pilot who has already begun to glide down from 4000. For all you know he may have lost his engine. The man who cuts his engine off first has the right of way.

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RISK

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APPROACHING AN AERODROME

(4) When you are one of a crowd arriving at an aerodrome in a strong wind do not taxi wildly about the aerodrome. If the wind is so strong that it is humanly impossible to taxi straight, acquiesce in the facts and sit still until the mechanics come to guide you in.

(5) If you are one of a crowd starting off from an aerodrome and everyone else is doing left-hand circuits in climbing, don't do right-hand circuits.

WHY THE FLAP ?

The following article is addressed to RCAF personnel engaged in flying Harvard aircraft. It will be obvious to readers that the procedures cited here are not applicable to all types of RCAF aircraft.

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WHEN THE WRIGHT BROTHERS charged into the blue half a century ago, flaps were both unknown and unnecessary. Over the years, the design of aircraft has altered radically and rapidly to enable man to fly higher, faster and farther. This increase in performance was achieved by using more powerful engines, reducing airframe drag, and by improved wing design. This, of course, resulted in increased wing loading.

Unfortunately, the design requirements for good high speed and low speed performance of a wing are incompatible. As wing design changed to achieve higher cruising speeds, takeoff and landing speeds also increased. In order to decrease landing speeds, aircraft designers searched for methods of increasing the low speed performance without compromising high speed characteristics. About twenty years ago, wing flaps were invented to achieve this purpose.

Flaps filled the bill by altering wing camber and, in some cases, by also increasing the wing area. The flaps on a Harvard, for example, alter the wing camber when extended. When retracted, they conform to the basic wing configuration.

It should be noted that the first fifteen degrees of flap usually give an appreciable increase in lift, and hence a decrease in stalling speed, for a relatively small increase in drag. Consequently, 15° of flap is useful for low speed precautionary flying and for precautionary takeoffs. Additional flap gives an appreciable increase in drag and a relatively small increase in lift. The use of flap steepens the gliding angle and, on landing, causes the aircraft to decelerate more rapidly and so reduces the tendency of very "clean" aircraft to float.

If our landing runs were always unlimited and the approach unobstructed, and if we were equipped with foolproof tires and brakes, the value of flaps would be nil. However, such is not our fortune. Without flaps we must approach fairly flat and fast to keep above stalling speed and to get down on a runway of limited length. Modern aircraft, however, are fitted with flaps and the problem remaining is thus one of using that equipment intelligently.

* *

THE PRINCIPAL AIM in landings is to get an aircraft down safely using the least possible amount of runway. Achieving this requires a low but safe approach and landing speed and a steeper angle of descent to improve visibility. Is it enough merely to select full flap? It is not! Too many pilots have neither rhyme nor reason for their use of flaps, although the rule to follow is a simple one: LET THE WIND BE YOUR GUIDE.

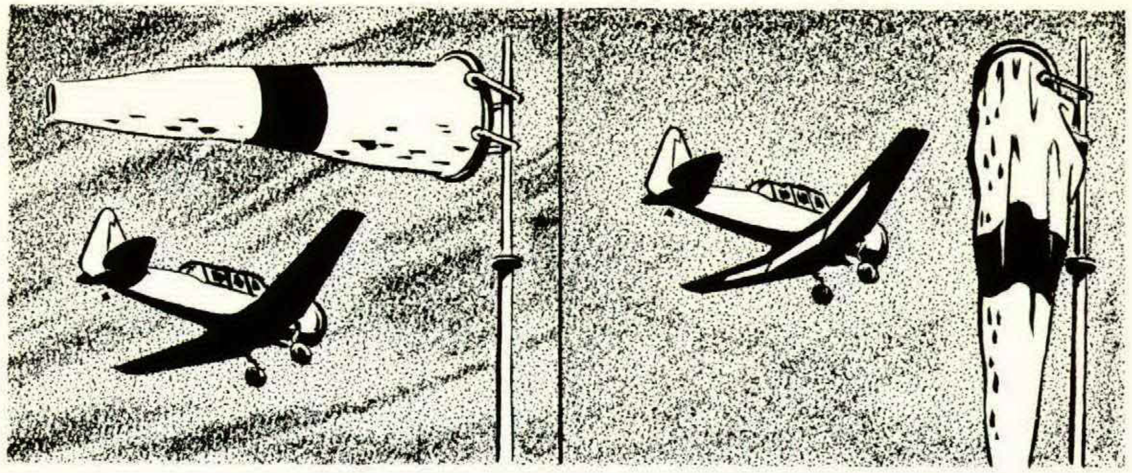
A strong wind achieves the same effect as full flap: it lowers your approach and landing speed and it steepens your descent—or, more simply, it decreases your horizontal travel in relation to your vertical descent. Full flap in a strong wind is not only useless but in many cases dangerous for hovering or ballooning after roundout is usually the end result. It would be so simple if the wind was always straight down the runway and at a speed of either 30 knots or 0 knots, for then we would have only two possible selections: nil flap or full flap. Normally, however, the wind strength varies from light and variable to upwards of 30 knots and a maximum angle of 40 degrees to the runway (at Centralia). Therefore there can be a great variety of possible combinations of wind direction and speed. A hard and fast rule for the amount of flap to be used is difficult to come by. However, although experience is the greatest teacher, some guidance can be given.

The US Air Force, after considerable experimental work with the AT-6 (Harvard) in all wind conditions, came up with the following figures:

Wind Speed	Maximum Flap Setting
0 - 10 MPH	0 - 45 deg flap
10 - 20	0 - 25
20 MPH and above	0 deg

(This table is good for crosswinds up to 30 degrees)

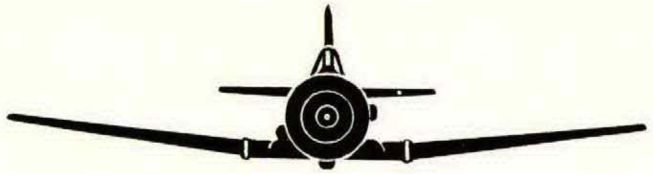
* *



Some people judge the amount of flap to be used by looking at the windsock before taking off. If the sock is blowing straight out—NO FLAP; if it is drooping from the standard—FULL FLAP. Unfortunately, a great many students are something less than intelligent in the correct use of flap—a claim whose veracity can be readily checked if the reader will just sit out at the end of a runway for fifteen minutes on any day of the week. There he will see flap setting selected blithely anywhere from 0 - 45 degrees regardless of wind strength or direction.

The average instructor should be able to land a Harvard safely in almost any wind condition regardless of flap setting. Not so with the student. He must be conscientiously taught the correct way to use flap—and then he must never be allowed to forget it.

Accident Summary
1 FTS, Centralia



Ten Commandments

FOR AN INSTRUMENT PILOT

1 Set thyself well upon thy fifth vertebra, leaving not thy fingerprints on the controls, and chewing not on thy fingernails.

2 Know thine instruments, for they are true and appointed prophets.

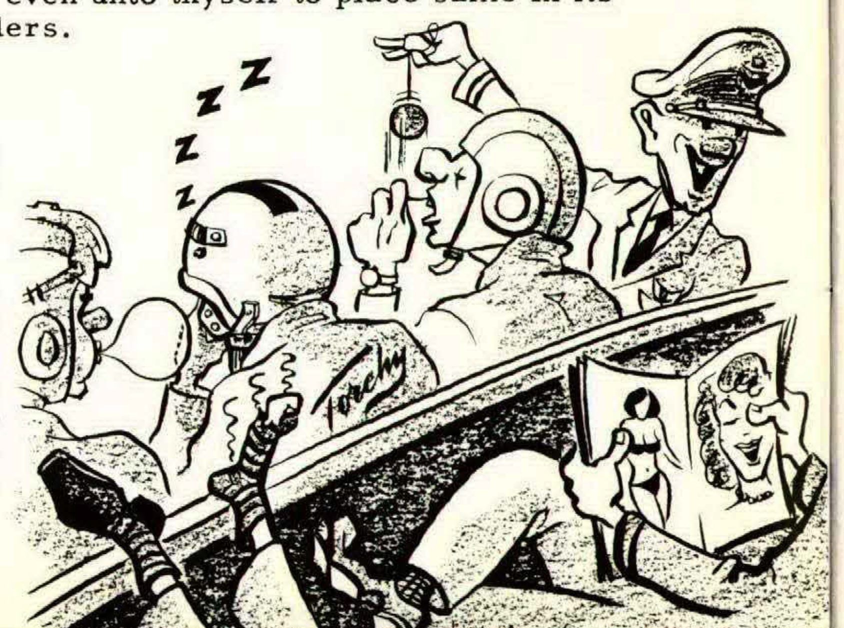
3 Follow the indications of thine instruments and verily the aircraft will follow along, even as the tail follows the sheep.

4 Do not stick out thy neck a foot; stay within the confines of thine ability, and thus thou shalt live to a happy old age.

5 Know the appointed words and approved methods so that if thy neck drapeth out, thou shalt be able even unto thyself to place same in its proper place—upon thy shoulders.

6 Follow thy radio beams (where thou canst read them clearly) for their ways are the happy ways and will lead to the promised land—ing.

7 Listen carefully, yea verily, to the signal impinging on thine eardrums for sometimes they seem to have the tongues of snakes and will cross up thine orientation, to the sad state of where thou must ask Heaven for guidance.



8 Assume not, neither shalt thou guess that thy position is such, but prove to thine own satisfaction that such is the case.

9 Boast not, neither brag; for surely Ole Devil Overcast shalt write such words in his book, and thou shalt someday be called for an accounting.

10 Trust not thy seat (of thy pants) but follow thine instruments; read and truly interpret the words as given from thine instrument panel; know that the responsibility lies not with the hand that rocks the control column, but in and with the mind that directs the hand, and thou shalt be blessed with a long and happy life.

USAF "Flying Safety".

PORPOISING SABRE

During an air test at 300 feet, a Sabre developed severe porpoising. It ranged from 11 positive 'g' to 6 negative 'g' at an I.A.S. of 535 knots.

The pilot managed a partial recovery and changed his flight path to a climb. He had intended ejecting but in the process of going into the climb he blacked out. Subsequently he regained control and landed safely.

Investigation showed that the Sabre had not been carrying ammunition on the flight. The resulting aft C. of G. had accentuated the porpoising initiated by the pilot over-controlling

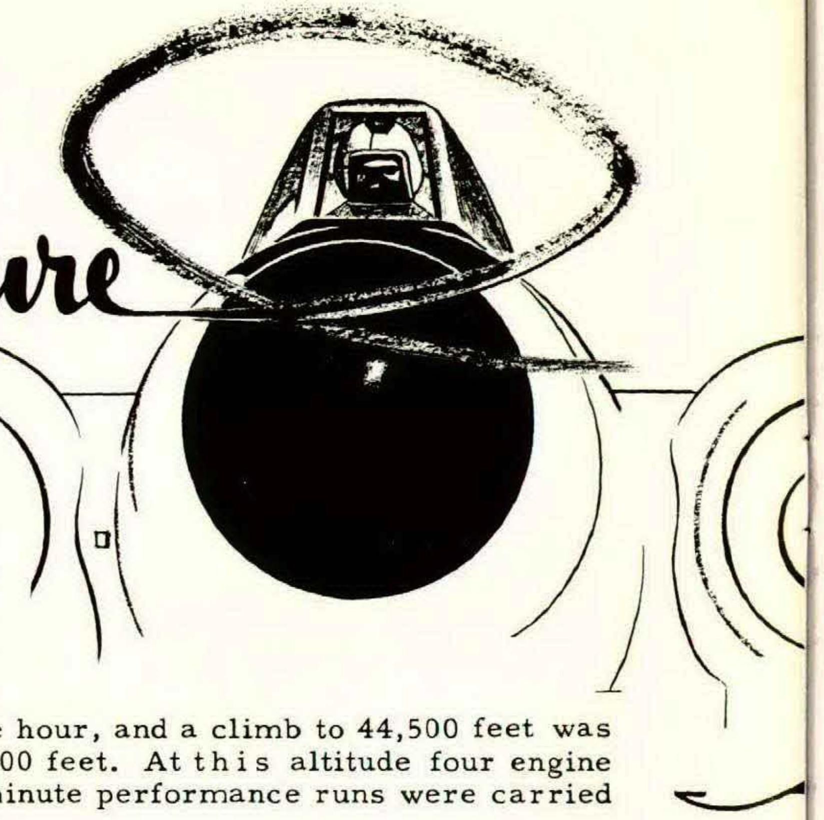
COMMENT: Pilot error was responsible for this incident. It was not any fault of the aircraft.

All Sabres are sensitive at high indicated airspeeds and naturally are more so with an aft C. of G. But the aircraft will not porpoise unless it is made to do so by the pilot - intentionally or otherwise.

Porpoising can be stopped simply by releasing the control column, although the safest and quickest method is to pull back on the stick and hold a slight constant pressure.

RAF "Air Clues"

CANUCK
Canopy Failure



REPORT ON
EXPLOSIVE DECOMPRESSION

An explosive decompression occurred recently in a CF100 which was being flown by T.P.M. Cooper-Slipper, test pilot with the A.V.Roe Company of Canada. The aircraft had been aloft for approximately one hour, and a climb to 44,500 feet was followed by a descent to 40,000 feet. At this altitude four engine accelerations and two seven-minute performance runs were carried out.

The second performance run was made at 210 knots, and cabin altitude was 26,000 feet. Suddenly there was a loud bang! Two-and-a-half square feet of plexiglass had blown out of the port side of the rear canopy behind the observer's seat.

Following the explosion, the Canuck's cabin interior fogged up and inside altitude bounced instantly to 48,000 feet [possibly due to venturi effect]. The high initial pressure built up inside the pilot's mask and forced it off his face. Although it was fastened tightly it would not return to its former position and had to be tugged back into place by the pilot so that he could relocate the lower part of it properly under his chin. During the decompression Mr. Cooper-Slipper's anti-buffet helmet was forced upwards against its securing straps. After the high initial surge lessened, normal pressure-breathing pressure was felt and resulted in leakage around the upper part of the mask.

Seconds after hearing the decompression bang the test pilot closed the Canuck's throttles, extended dive brakes and made a descent to 20,000 feet at the limiting mach number.

He reports that, at speeds above 200 knots, he heard what he describes as "a very loud organ note", which phenomenon was accompanied by a severe high frequency vibration. The cabin of the aircraft became very cold and, although the pilot was warmly clothed, he became so cold himself that he had difficulty flying the Canuck—although he was able to carry out a normal landing without further incident.

handling than will be discovered or corrected. The most practical advice on the handling of new spark plugs is to take them out of their containers and install them in the engine with the least possible amount of handling.

**

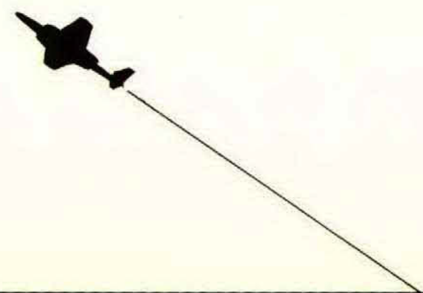
A very large percentage of spark plug malfunctions can be traced to the improper use of such things as anti-seize compound, DC-4 (Dow-Corning) compound, improper torque values, re-use of copper gaskets without annealing, improper installation and removal, and haphazard maintenance practices. All of these will be discussed in an effort to point out some of the more frequent malpractices and misconceptions.

Anti-Seize Compounds: When anti-seize compound is used, it should not be allowed to contact the electrodes. If it does, it will almost invariably foul the plug the first time it is fired. Another and equally serious problem can also take place because of the excessive use of anti-seize compound. When the plug is torqued down, the excess compound squeezes under the copper gasket. Even though a torque wrench is used, proper torque values are not attained. Then, as the engine is run up, the compound melts and the result is a loose spark plug. A loose plug will not reject heat properly, and pre-ignition (with the accompanying burned pistons and valves) can result.

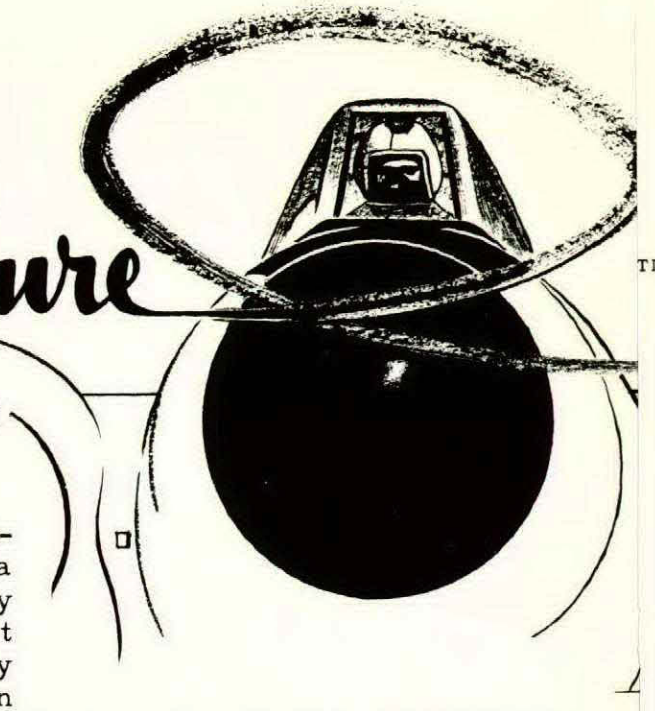
[illegible] anti-seize compound is to apply it

As a result of this experience with explosive decompression, Mr. Cooper-Slipper has made four recommendations which, "Flight Comment" readers will note, closely parallel—and consequently emphasize—the drills already laid down in orders.

1. KEEP YOUR OXYGEN MASK FITTED CLOSELY
2. SECURE YOUR HARD HAT PROPERLY
3. ALWAYS WEAR ADEQUATE CLOTHING
4. REDUCE ALTITUDE IMMEDIATELY



CANUCK
Canopy Failure



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needing the most supervision. The general attitude has therefore been, "what's so complicated about changing a spark plug"? The answer is simple—nothing about spark plug changing is so complicated that proper care and handling can't serve to correct.

* *

One of the most important things to remember about a spark plug is that the less you handle it, the less trouble you will encounter. Every time a plug is picked up, a potential malfunction is introduced through contamination with dirt, grime, grease or rough and careless handling. The spark plug manufacturer has taken every precaution through assembling, testing techniques and rigid inspection, to assure that a perfect spark plug is delivered to the user. Because of this, the chances of a bad spark plug's getting past the manufacturer's inspection is remote. Much more remote than the chance of a potential trouble caused by excessive handling.

Why go to all the extra work, time, and expense of degreasing, testing, and checking a new spark plug, when it has already been done by the manufacturer with trained specialists and much more precise and exacting equipment? The limited facilities at base level make it highly probable that more troubles will be caused through excessive

handling than will be discovered or corrected. The most practical advice on the handling of new spark plugs is to take them out of their containers and install them in the engine with the least possible amount of handling.

* *

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Anti-Seize Compounds: When anti-seize compound is used, it should not be allowed to contact the electrodes. If it does, it will almost invariably foul the plug the first time it is fired. Another and equally serious problem can also take place because of the excessive use of anti-seize compound. When the plug is torqued down, the excess compound squeezes under the copper gasket. Even though a torque wrench is used, proper torque values are not attained. Then, as the engine is run up, the compound melts and the result is a loose spark plug. A loose plug will not reject heat properly, and pre-ignition (with the accompanying burned pistons and valves) can result.

The correct way to use anti-seize compound is to apply it sparingly with a small brush. Leave the first two threads (those nearest the electrode) dry, to prevent contact with the electrodes. A good procedure is to apply the thread lube properly, turn the plug in about four-and-one-half to five turns, back it off about two turns (this lubricates the two dry threads), then tighten the plug finger tight. Use a torque wrench to obtain proper tightness.

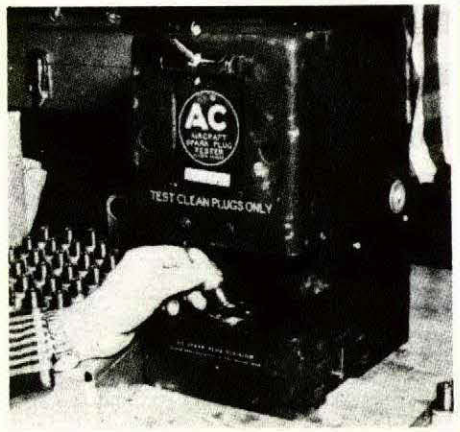
If stainless steel bushings or helicoil inserts are used, some spark plug manufacturers recommend installing plugs completely dry. However, the torque values obtained may not be a true indication of the tightness of the spark plug on the copper gasket. Some of the torque indication is that of friction between the spark plug threads and cylinder rather than between the spark plug seat and gasket. Therefore, with stainless steel bushings or helicoil inserts, a thin coating of light engine oil should be applied to the spark plug threads in much the same manner as anti-seize compound, in the event the manufacturer has not already done so.

*

Dow Corning DC-4 Compound: DC-4 compound is a non-conductive compound used primarily to retard the formation of moisture in a spark plug barrel. It's misuse, however, can cause more trouble than it's worth. It should not be smeared on the terminal in large quantities. Don't put it on the contact spring or contact button, and never squeeze it down into the spark plug barrel. Such improper usage may cause high resistance circuits, harness "blow-outs" and other malfunctions. All that is needed is a very thin coating on the terminal sleeve.

*

Torquing: One of the most important factors in proper spark plug installation is torquing, yet it is often given the least amount of attention and consideration. Technical Orders and information bulletins have been written time and again insisting upon the use of proper torque wrenches and proper torque values. Some maintenance personnel, however, still persist in the idea that they are expert at installing spark plugs. Let us consider why a torque wrench should always be used and the troubles that may result from not using one.

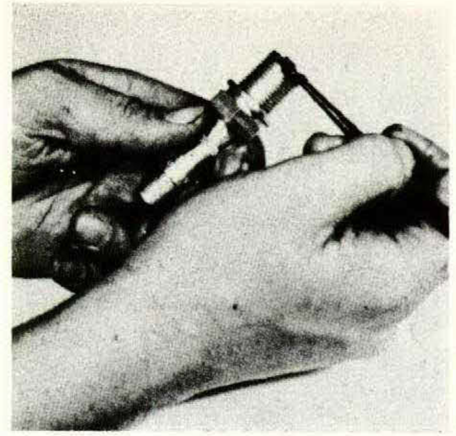


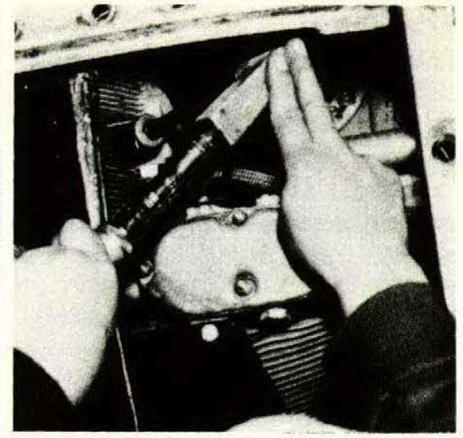
Testing is no trick, why risk failure?


Even "experts" need torque wrenches.

Spark plug ceramic core nose temperatures get as high as 1550°F at takeoff power. At 1600°F pre-ignition starts. As one step in preventing pre-ignition temperatures, the spark plug has to dissipate heat very rapidly. One of the mediums for such dissipation is through the copper gasket to the outside air. If the spark plug is not properly torqued on the gasket, it cannot dissipate the heat properly, and pre-ignition will probably result.

One might say, "So what, I always give it an extra twist to be sure it's good and tight". This can be disastrous, because if a spark plug is torqued excessively, the steel shell will "stretch" and break the internal bond between the insulator and the shell by lifting the insulator off the sealing gasket between it and the shell. Here again, the heat rejection rate is interrupted, and pre-ignition may result. In addition, the stretching of the shell causes the electrode gaps to


A little goes a long, long way.


Seat wrench squarely on plug hex.

narrow down and early fouling will be the result.

It can be seen that proper torquing of spark plugs is of the utmost importance. Only by using a torque wrench can proper torque values be assured and the possibility of a spark plug malfunction and engine failure be reduced. To go further, it is equally important that all torque wrenches be cleaned and calibrated at least once a month. A crew chief can get an indication as to whether his assistants are properly torquing the spark plugs by checking the copper gasket after a plug has been removed. A properly torqued spark plug will produce about a .004 to .005 indentation in the gasket. Less than these values indicates under-torquing, while more indicates over-torquing.

*

Copper Gaskets: Copper gaskets should be kept clean and free from dirt and grit. They should never be re-used without first having been annealed. Once a copper gasket is used, it becomes work-hardened. Its re-use without careful annealing will result in an improper torque value during installation.

To prove the point, take a new gasket and twist it between your fingers. It bends quite easily, Now try to twist it back—you will find it has become quite hard just from one twist, and the only way to soften it is by annealing. If it is necessary to re-use gaskets, they can be annealed by heating to 1100°F (a cherry red) and quenching them in engine oil.

*

Terminal Sleeves: Terminal sleeves can be divided into two distinct types. The first is the ceramic "cigarette" type, used mostly on low altitude spark plugs (AC 161, R372-1, RB27R, RC 26S, etc). Before installation this connector should be wiped off with a clean cloth, moistened with acetone, wood alcohol, naptha, or white gasoline. Under no circumstances should leaded gasoline be used, as lead deposits will be left on the connector and the spark plug barrel and present a good "flashover" path to ground. If DC-4 compound is used on the connectors, remember that a thin coating should be brushed on the ceramic terminal. Do not put DC-4 compound in the spark plug barrel well.

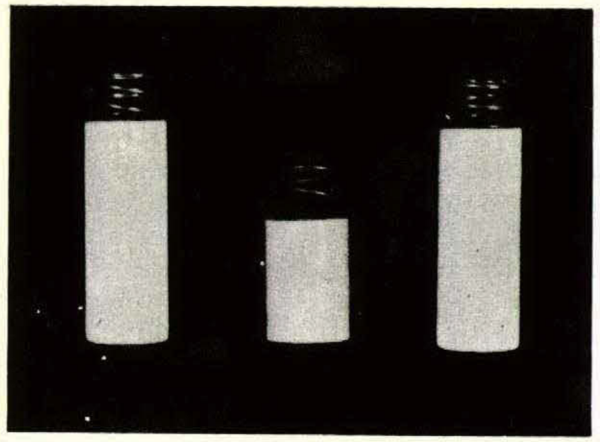
When inserting the connector terminal, always be sure that it enters the plug barrel in a straight line to avoid fracturing the insulator. The connector nut should be turned into place, finger tight and then tightened an additional quarter turn with a suitable wrench.

The second type is the silicone or neoprene high altitude terminal, of which there are two somewhat different designs in service today. One is the straight type design, somewhat like the ceramic cigarette. This type has a tendency to swell up and stick in the spark plug barrel, making it difficult to remove. For this reason it is necessary to apply a very thin coating of DC-4 compound to act as a lubricant and prevent sticking. The other is the tapered type. This one has a very distinct taper end, designed to allow for a certain amount of swelling and still prevent its sticking. If this type is used, there is no need for the DC-4 compound. Just wipe it clean and dry, then install it. With both types it is necessary that no dirt or grit gets on the shoulder of the seal between the spark plug barrel and insulator. Dirt or grit at this point prevents a good tight seal. Even a very small amount can cause the spark plug to "flash-over" in the barrel at altitude. Engine backfire and spark plug fouling then take place.

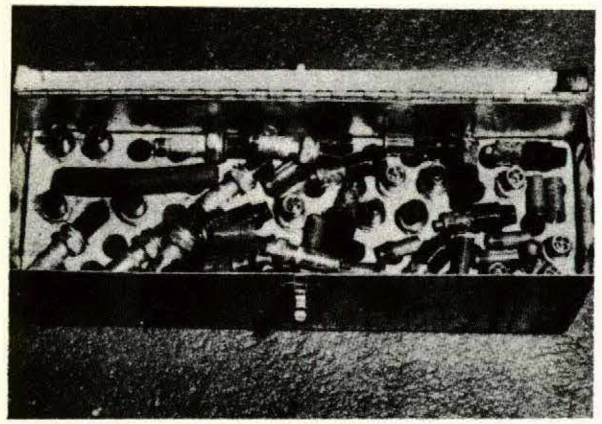
*

Miscellaneous: Some other good points to remember in the handling of spark plugs are: If for any reason the plugs are installed but the leads are not connected, the lead terminals and spark plug barrel openings should be covered to prevent the accumulation of moisture, dirt or grit. All three are serious malfunction sources. The best procedure is to install the spark plug and connect the lead before going to the next plug.

When a spark plug is tightened, the wrench should be placed squarely on the plug hex so that no side stresses are exerted on the plug barrel that might cause insulator breakage or thread damage. Do not leave good spark plugs in open trays or boxes around the shop or hangar. They will collect moisture, dirt and grease. Keep spark plug trays clean at all times. A metal tray is preferable to a wooden one, for it is easier to keep clean. Do not install an exceptionally cold spark plug in an engine, because condensation may cause trouble. If



Airman Murphy's chowder.



NEVER clean terminals with leaded gasoline.

a spark plug is dropped, it should not be used. Tag it properly, make a notation that it has been dropped, and turn it in for shipment to the depot for checking.

When your airplane is parked, keep all the intake openings covered with dust covers. If you don't, you are only asking for more spark plug trouble, particularly in dusty climates. Dust or sand can get into the aircraft intake and onto the firing end of the spark plug. Sand contains silica; silica and lead salts from normal combustion residue fuse into a very highly-conductive "glass" at spark plug operating temperatures. Shorted plugs result.

*

Spark Plug Removals: When a spark plug is removed, the shielded terminal connectors are removed by loosening the connector nut with the proper size crow-foot wrench. Terminal sleeve assemblies must be pulled out in a straight line to avoid damaging either the sleeve or barrel insulator. Spark plugs should be loosened by use of the proper size, deep socket wrench. The socket should be seated securely on the hex to prevent damage to the plug. An impact wrench should not be used. It is also important to check the socket wrench and be sure the socket handle drive is not too long, since it will cause damage to the chamfer at the end of the plug barrel. This is particularly true with high altitude spark plugs which have longer barrels. Metal spark plug trays should be used to facilitate handling. It is good practice to remove spark plugs in pairs from each cylinder and place them in the tray, marked by cylinder number. This procedure often simplifies trouble shooting if one or more spark plugs in the set are noticeably different in appearance at the firing end. For example, if two plugs from the same cylinder look as though they may have been subjected to pre-ignition (melted ground electrodes on fine wire plugs or copper melted from the center electrode on massive electrode plugs), a compression check should be made on that cylinder.

When used, thermocouple gaskets should be carefully removed to prevent damage to the thermocouple lead wire. Usually only one thermocouple gasket is used on an engine; no regular gasket is required on this particular spark plug.

When spark plugs are prepared for shipment, they should be treated with an anti-rust preservative compound. Do not dip the whole spark plug. If you do, the compound will get between the steel shell and the ceramic insulator, making it almost impossible to clean. The proper method is to paint the preservative compound on just the upper and lower threads. Do your painting with a small brush, and then simply pack the plugs in their separate cartons and prepare for shipment to the overhaul depot.

It is just as important to use care and common sense in preparing a spark plug for overhaul as it is in getting a plug ready for installation. Spark plugs that are extra hard to clean during overhaul require more sand blasting and handling. This decreases their service life.

It is unfortunate that spark plug malfunctions brought about by improper care and handling almost always result in a fouled or shorted plug. For instance, a dirty barrel allows for barrel flash-over (the spark fires in the barrel rather than across the electrode). When this happens, the plug electrodes do not fire and very shortly become carbon-fouled. The immediate reaction is to UR the spark plug for fouling, even though it was the result, rather than the cause of the trouble. No thought is given to the real cause...poor maintenance.

* *

Take care of your spark plugs. Remember, any extra care on your part during installation or removal is a little more insurance, and that insurance could very well be the difference between the success or failure of a mission. The dividends that come about as the result of care and common sense will be added service life, smoother engine operation, and a lighter work load.

USAF A.A. and M. Review

RCAF T 97 A (Rev.)
850 Pads of 2'—1-54 (7907)

RCAF CRASH MESSAGE

FILE

FOR COMMCEN SIGNALS USE — NUMBER

PRECEDENCE–ACTION	PRECEDENCE–INFO	DATE–TIME GROUP	MESSAGE INSTRUCTIONS
	DEFERRED		

FROM — PREFIX GR

TO — SECURITY CLASSIFICATION

ORIGINATOR'S NUMBER CRASH

INFO

Injury Classification Red (Fatal) Blue (Injury) White (No Injury).	A	
Unit to Which Aircraft Belongs.	B	
Place, Date and Time of Accident.	C	
Type and Registration Number of Aircraft.	D	
Category of Damage. (AFAO. A6/3).	E	
Number, Rank and Name of Pilot, whether injured, fatal, major or minor, uninjured or missing. (AFAO. A6 3).	F	
Full Names, Ranks, Numbers and Duties of Other Occupants and whether injured, fatal, major or minor, uninjured or missing.	G	
Full Names, Ranks, Numbers of Other Personnel Involved (Not Occupants of Aircraft), and whether injured, fatal, major or minor, uninjured or missing.	H	
Names, Relationships and Addresses of Next-of-Kin of Personnel injured, fatal or major, or missing.	J	
Whether Next-of-Kin have been advised.	K	
Nature of Duty on which engaged at time of accident.	L	
Nature and Short Description of Accident.	M	
Cause of Accident if apparent; if obscure state "obscure".	N	
Present Location of each Member of Crew.	O	
What further investigation projected. AIB investigation requested?	P	

PAGE OF PAGES — REFERS TO MESSAGE — CLASSIFIED YES ☐ NO ☐ — DRAFTER'S NAME — OFFICE — TEL.

FOR OPR'S USE	R	DATE	TIME	SYSTEM	OPERATOR	D	DATE	TIME	SYSTEM	OPERATOR	RELEASING OFFICER'S SIGNATURE

THE NEW CRASH MESSAGE

The RCAF Crash Message (form RCAF T97A) has been designed to assist the originators of crash messages in the rapid and accurate preparation of the information required on aircraft accidents. Complete instructions on the reverse side of the form will aid in proper addressing, assigning of precedence and use of commercial telegraph facilities.

Unit Commanders will find the form useful as a means of ensuring correct reports from aircraft captains involved in accidents while on detached operations.

Crash Messages are <u>not</u> to be used for reporting aircraft <u>incidents</u> as defined in AFAO A6/3 para 14.

Object of the "Crash Message"

1 The object of a crash message is to provide quickly essential information to initiate:

(a) casualty procedure;

(b) technical and other corrective procedure;

(c) investigatory assistance; and

(d) co-ordinated preventive measures on "epidemic" type accidents which occur at several units.

Text

2 The information required on the front of form T97A (Rev) is to be sent by message to AFHQ in accordance with the instructions prescribed in the following paras.

Procedure

3 The following procedures are to be observed:

(a) All crash messages are to be passed with "Routine" precedence except when the provisions of AFAO, A6/3 para 36(a) cannot be implemented. In such cases sections A, B, C, D, E, M, N and P of this message must be reported immediately with a higher degree of precedence.

(b) Aircraft accidents other than those listed in AFAO, A6/3 para 36(a) are to be reported within <u>*12 hours.*</u>

(c) A message covering a crash as in subpara (a) or (b) is not to be delayed for information not available. A supplementary message providing the additional required information is to be dispatched as it becomes available.

(d) Subject to subpara (e) crash messages and supplementary messages are to be originated by the parent units, addressed to AFHQ, AMCHQ, the command or group of ownership and of occurrence, and the regional AIB inspector as applicable.

(e) When an accident occurs at a considerable distance from the parent unit, the CO of the unit nearest the accident scene is responsible for sending the crash message to the addressees listed in subpara (d).

(f) All crash messages concerning foreign military aircraft are to be addressed as for RCAF accidents and transmitted with a higher degree of precedence than "Routine".

(g) <u>CRASH MESSAGES ARE NOT TO BE TRANSMITTED FOR AIRCRAFT INCIDENTS AS DEFINED IN AFAO, A6/3 PARA 14.</u>

Classification.

4 All crash messages are to be sent "Unclassified" except when a crash occurs on a classified operation; the message is then to be graded with the classification of the operation.

Precedence

5 The crash messages requiring a high degree of precedence are listed in para 3(a) and (f) above.

Use of Commercial Telegraph

6 All crash messages transmitted by domestic telegraph or international cable facilities are to be annotated "Full Rate" message.

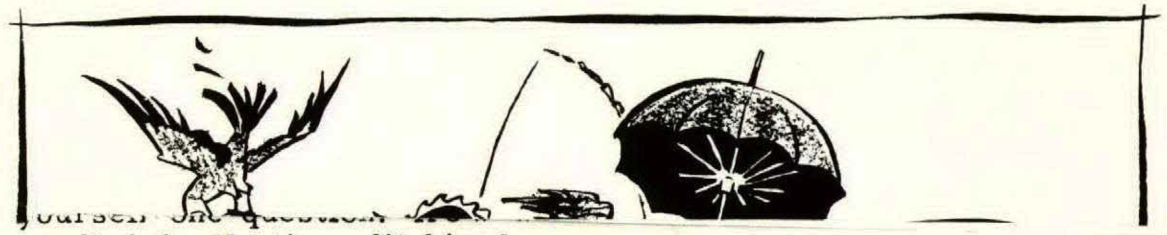
DITCHING IN THE *Med*

THE DITCHING of a four-engined RAF Hastings transport in July of last year will be of considerable interest to all RCAF personnel flying regularly over water, for within the report of the accident lies a wealth of detail on the ditching itself and the performance of emergency equipment. On board the Hastings were a crew of six, an additional engineer, and a party from RAF Transport Command Headquarters. The remainder of the load consisted of heavy freight.

An hour-and-a-half after take-off the aircraft was over the Mediterranean, about two hundred miles south-east of Malta, when the inboard engines failed. A few minutes later the outer port engine conked out! Crew and passengers prepared for immediate ditching. Emergency transmission went out and the morse key was clamped down. Passengers and crew donned Mae Wests, emergency escape hatches and the astro-dome were removed, and fuel was jettisoned. The navigator and spare engineer retired to ditching positions in the passenger compartment; and captain, co-pilot, signaller, engineer and quartermaster braced themselves in the crew compartment in normal positions. All of these precautions were taken within the <u>four minutes</u> that elapsed from the time the third engine cut out until the Hastings struck the water!

Touchdown was so violent that the aircraft's wings were torn from the fuselage and left some 30 to 40 yards astern. As soon as the fuselage itself had come to a halt, the passengers evacuated from the port emergency escape hatches and also by way of the port parachute door which had been removed following impact. The quartermaster made it through the rear door, having crawled over the freight to get to it. Following his escape, the freight shifted, blocking the doorway between crew and passenger compartments and forcing the captain, co-pilot, engineer and signaller to exit through the astro-dome. However, no real difficulty was encountered in leaving the aircraft. The survivors all swam to a J4 type dinghy which had been taken by one of the passengers from its stowage near the main door and thrown into the sea. The four dinghies from the wing stowages had inflated and were left floating when the wings sank. Three of these were retrieved, the fourth drifting out of reach.

When the survivors had distributed themselves among the four remaining dinghies, a roll-call was taken and disclosed that the full complement of the aircraft had escaped—a feat of some proportions considering that the aircraft sank in about a minute-and-a-half after ditching! Obviously, the success of the evacuation owed much to the high standard of crew and passenger drill for emergency procedures. Unfortunately, two of the four dinghies were damaged in the crash, one



handled the Hastings ditching?

To be conscious that you are ignorant
is a great step toward knowledge
- Disraeli -

having developed a leak in the air chamber, the other a long rip in the flooring. The survivors were consequently re-settled in the last two dinghies. These were bailed out; emergency equipment was unpacked; and the radio gear was set up for immediate use.

* *

THE MOST REMARKABLE aspect of the ditching is that the only injuries suffered by the passengers and crew were minor cuts and bruises. Since the impact on touchdown was sufficient to rip off the Hastings' wings and yet leave the aircraft's passengers virtually unharmed, credit has been given to the rearward-facing seats which had been installed. These were all torn loose but one when the aircraft struck the water. Had the seats been of the forward-facing type, head and face injuries would have been suffered, likely resulting in unconsciousness and subsequent fatalities through injury and drowning. (Rearward-facing seats have already proven their worth in the RAF Transport Command: In two previous accidents involving Hastings and Valetta aircraft, these seats enabled all of the passengers to escape with only superficial injuries—although the two aircraft were complete write-offs!)

Passengers were further protected, in the event of an emergency, by the manner in which the heavy freight was stowed aboard the aircraft. It was located forward of the passengers, between them and the crew compartment. One can imagine what would have happened to the passengers had the freight been placed between their seats and the tail section of the aircraft. Crew members in a Hastings are protected by a stout bulkhead between them and the load.

* *

The wireless operator played a major role both before and after the ditching. Just prior to going down, his SOS message sent out the aircraft's position and time, true course, altitude and IAS, type of aircraft, nature of distress, and the information that the Hastings had altered course from the original flight plan. When touchdown was imminent he sent the word "ditching" and clamped the morse key down with the transmitter on. Before the aircraft hit the water an acknowledgment of the SOS came through and served to sustain the morale of the survivors during their long 13 hours adrift. The operator did have some transmission trouble, but because of his knowledge of emergency frequencies, he was able to select one for which DF facilities were available, thus permitting two stations to take a cross-bearing on the Hastings before it ditched. These factors undoubtedly hastened the arrival of search aircraft and the destroyer which eventually took the survivors to Malta.

* *

Life preservers carried in the aircraft are of the Mae West type, fitted with air bottles, fluorescine blocks and flash lamps. Some of the preservers contained kapok but others relied solely on their air content for buoyancy. As the dinghies were a short distance from the sinking fuselage, personnel relied on these life jackets to keep afloat. All but one of these functioned properly—and luckily the possessor of the faulty jacket was a good swimmer. A leak had developed at the junction of the air bottle and the rubber tubing that leads to the air chamber. Though the use of kapok makes the Mae West somewhat bulkier, its addition is thought to be well warranted because a faulty air bottle or a leaking chamber might well mean a casualty.

yourself one question. ...
handled the Hastings ditching?

To be conscious that you are ignorant
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- Disraeli -

* *

THE VALUE of dinghy equipment available to passengers and crew in the Hastings was amply demonstrated in this ditching. There are four dinghies stowed in wing compartments, one behind each of the four engines. They are inflated by an air bottle attached to the dinghy and released manually by cables attached to release toggles adjacent to the engineer's position in the aircraft. In this accident, the shearing of the wings from the fuselage had pulled the release cables which, in turn, inflated the dinghies by discharging the air bottles. When the wings sank, they broke the lines holding them to the rubber boats so that the latter were left floating free.

Besides these four seven-man dinghies, the aircraft carries a valise-type dinghy in the fuselage. It was to this one, positioned off the port side of the sinking fuselage, that the survivors swam. Since the ditching took place under almost ideal conditions—little or no wind, moderate swell and daylight—recovery of the wing dinghies was no problem. Had the emergency occurred under darkness, in heavy seas, or even in a moderate wind, they would have been lost. In view of this, the provision of valise-type dinghies in the fuselage of aircraft flying over water seems highly necessary.

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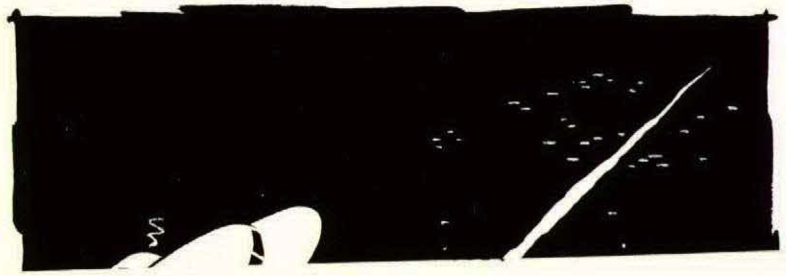

Signal cartridges included in the emergency gear consist of the two-star red variety. It is worth pointing out that

greatly appreciated by search parties trying to locate a small dinghy in rolling seas and flying spray.

* *

Finally, a word about some of the smaller units of emergency equipment. One box of flying rations was opened and the contents found to be in excellent condition. Also, matches were dry, and a bailer and sponge proved exceedingly useful. On the negative side, sea-water managed to leak through the gummed tape seals on various containers, damaging their contents.

* *

From the foregoing it is obvious that the RAF dinghy and ditching drill programs deserve some scrutiny by way of contrast with our own methods. Wet ditching drill is carried out by all RAF aircrews at least once every six months. Dry ditching drill is undergone by the crews prior to every flight from the United Kingdom, with the result that all personnel are fully acquainted with ditching procedures. Certainly the value of RAF technique has been amply demonstrated in the the foregoing narrative.

For RCAF personnel flying regularly over water, the report high-lights several significant facts: Crash damage can be extensive, even in relatively calm seas. Self-buoyant life vests, provided they do not interfere with the owner's movements and duties, ought to be worn as extra insurance. The proper locating and lashing of freight may prevent loss of life in emergency ditchings and landings. Complete familiarity with emergency procedures is of vital importance. And, finally, the regular practice of both wet and dry dinghy drills ensures that a man will instinctively make the wisest moves in the fastest possible time when a crisis arises.

Would you like a check on your own preparedness? Then ask yourself one question: How well would the men of this unit have handled the Hastings ditching?

To be conscious that you are ignorant
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\- Disraeli -

eyes speed and altitude

by
Colonel Glen T. Eagleston and
Colonel Bruce H. Hinton
(United States Air Force)

(Experience in Korea has demonstrated that the inherent problems of jet fighter warfare are the same as for all tactics in fighter aviation—with this important distinction: the greater speeds and higher altitudes involved emphasize forcefully the limitations of the human eye. Even if a pilot recognizes an enemy fighter at the maximum range of his vision, it leaves him, with the high closing speed, little or no time for decision and action. Then there is the problem of sighting the enemy at high altitudes against the background of dark sky. These and other considerations are dealt with in this interesting operational report of combat between the F-86 and MIG-15. The views expressed are those of the authors and are not to be construed as the official opinions or policies of the Department of the Air Force or of the Air University, Maxwell Air Force Base, Alabama.)

*

A common statement among fighter pilots is the often quoted "I'll never get shot down by one I can see". While this statement is open to argument, the most important factor in air-to-air combat between fighter aircraft still is seeing the enemy. In an engagement

between high-speed jet aircraft the techniques which were proved in reciprocating aircraft have again been found essentially sound. The exception is in changes imposed by the limitations of the fighter pilot's eyes.

Since the advent of the F-86A in the Korean air war, fighter-versus-fighter combat has been conducted at speeds and altitudes far greater than ever before. The inherent problems of jet fighter warfare were found to be the same as for all tactics in fighter aviation, and the devising of attack and defence methods centred on overcoming the difference made by the new conditions.

Speed, the salient characteristic of the modern fighter airplane, has imposed the stiffest challenge to both the security of the fighter force and the judgment of the pilot. Combat speed of 500 to 650 miles per hour has almost doubled the fighting speeds to which pilots were accustomed, and the high rate of closure of attacking aircraft approaching from abeam, around the front quarter to head-on, skyrocketted their difficulties.

ABOUT THE AUTHORS

Both have been prominent in developing combat tactics in Korea with the 4th Fighter-Interceptor Group. Col. Glenn T. Eagleston, a veteran with 96 missions and credit for $23\frac{1}{2}$ enemy aircraft destroyed in the Second World War, has 84 missions in Korea and credit for 2 MIG-15s destroyed, 1 probable, and 7 damaged.

Col. Bruce H. Hinton is credited with the first official MIG-15 kill. He has a total of 87 combat missions, 900 hours jet time.

Recognition of an attacker or of an enemy fighter force at the maximum range of the pilot's vision yet leaves, with the high closing speed, little or no time for decision and action. In head-on passes between the F-86 and the MIG-15 the enemy has frequently been lost from sight while a turn was being made to engage. On several occasions the formations of hostile airplanes have flown through each other before either had seen the other. At a closing speed near twelve miles a minute this is understandable, yet it indicates the extreme alertness required of the pilots.

The problem of recognizing the MIG-15 attacking from abeam has shown that the closing speed necessitates immediate action upon sighting. Usually a fast-flying MIG formation is already a threat before it is identified. In some cases enemy attacks have been pressed home despite the fact that the U.S.A.F. formation leader saw the enemy attacking and broke into his attack. The high speeds of closing and of interception are deceptive and have caused many pilots to fall short on a turn into a MIG-15. Since the speed variation is generally between 500 to 650 knots, it is a safe assumption that the F-86 should be flying in that speed range. But frequent encounters where the MIG was flying at 400 knots or thereabouts proved that too much speed is as hazardous and profitless as too little speed.

Judging the speed of a jet is extremely difficult when it can vary between 400 to 650 miles per hour. The deceleration of an attacking F-86 is equally difficult if the target is doing some 150 to 250 mph less. The actual judgment of the speed of a MIG-15 passing below or level has been a severe problem.

An F-86 closing on a MIG-15 with a 50 mph overtaking speed requires about seven or eight miles to close from 5000 feet to 2000 feet for firing, assuming the target speed is high. In dives or with a longer distance to close, this distance can stretch and has stretched to twenty miles. Thus speed has made it almost impossible to localize an air battle and to maintain concentration of force. Once a fight begins between two planes, there is seldom any one person who can report having seen all or even most of it. The battle generally occupies an area covering 30 miles, at all altitudes from the ground up to 35000 feet or higher. Swirling dog-fights, which usually start in one small area, quickly break up and separate into several fights, and often pilots who have been in the area of the many fights have reported not encountering anyone at all. With the speed and the high operating altitudes of these airplanes, the battles have been extended greatly in depth and the area covered has been more than doubled. Tactics have had to be adapted to meet these handicaps.

Another problem in jet fighter operations is sighting the enemy at high altitudes against the background of dark sky. Here the ranging of a pilot's eyes can be at fault. At high altitudes and except when the sun's rays are glancing directly off an airplane, the reflection of the deep blue sky serves as an effective camouflage. If eyes are not ranged exactly upon the aircraft distance, no sighting is made. Attacking aircraft can slip in without recognition until they are within dangerously close range.

All this enlargement of the sky area to be covered by the eyes of the jet fighter pilot has not enabled him to see any further. Consequently targets in the same piece of air but separated by 15000 to 20000 feet in any direction are likely to be missed, particularly since they are in the area very briefly.

F-86 pilots trying to cover the sky at all points of the clock at all levels, and at varying ranges, have found how easily they can be surprised. The elements of speed, altitude, and eye ranging often combine to present a firing MIG-15 at five o'clock when the pilot has finished clearing himself in that direction. It happens often enough to be considered a probability of jet air fighting.

It is recognized that these factors are not unusual and that even their more limited presence in air fighting during World War II was a threat. But their accentuation by greater speeds and higher altitudes has served to emphasize forcefully the limitations of the human eye.

USAF "Flying Safety"

CLOSE SHAVE

(The following "Near Miss" demonstrates how easy it is to have a brush with an accident. Even a minute oversight can have fatal consequences.)

A four-plane formation of T-33's had been flying for 20 minutes at about 18000 feet when one of the pilots became slightly nauseated. He turned on 100% oxygen and the unpleasant sensation disappeared.

Within a few minutes, however, nausea returned and the pilot felt dizzy and found himself unable to concentrate on what he was doing. Alarmed, he broke formation and descended quickly, inhaling deeply on 100% oxygen and supplementing it with additional bursts under pressure. At 10000 feet the dizziness left him; but the pilot continued to suffer from nausea for half an hour after landing.

In his report of the incident he recalled that his flying clothing had been overly warm and that his mask kept slipping because of the excessive perspiration on his face. So the aircraft oxygen system was tested. It proved serviceable. Next, an instructor and student flew the T-33—and the student suffered anoxia. On the instructor's advice he held the mask tightly against his face and the symptoms disappeared.

The Safety Equipment section concluded that it was the poor fit of the mask which caused the anoxia in both cases. The remedial action taken by the unit following these findings calls for a mandatory weekly inspection and re-fit of each oxygen mask by the SE section.

The care of OXYGEN MASKS

Specially reproduced for readers who have not yet looked it up, the following is an extract from the latest revision of EO-20-115LB-2, which was scheduled to reach the field by mid-May.

* *

SECTION V

SERVICE INSPECTION, MAINTENANCE AND LUBRICATION

1. SERVICE INSPECTION

a. A pre-flight test shall be made by the user prior to every flight. Establish the security of all parts with special attention given to the inlet check valves. The plastic shields must be inserted over the inlet valves at all times. The arrows on the shields should point downward to prevent excess moisture getting into the valves. The helmet is then put on and the mask strapped securely in place. Close the end of the mask tube with the palm of the hand and inhale gently. This should cause the mask to be sucked in tightly to the face. If the mask appears to fit properly but still leaks air when the test is applied, the exhalation valve is at fault. It is not inserted properly or is defective and should be replaced, i.e., the exhalation valve is stuck and not seating properly or otherwise leaking. To check the inhalation check valves take a deep breath, close the end of the mask tubing with the palm of the hand and then exhale. The valves are working properly if no difficulty is encountered in exhaling. If it is difficult or impossible to exhale the inlet check valves are not properly inserted, are dirty or defective and should be replaced.

b. Report all defective masks immediately to the Safety Equipment Technician.

2. MONTHLY INSPECTION

A monthly inspection shall be accomplished by the Safety Equipment Technician and/or the Medical Officer to determine the adequacy of fit and condition of the mask.

3. MAINTENANCE

a. GENERAL.—Since the mask is worn next to the skin it should be kept as clean as possible. This will not only help to make the mask more comfortable but will reduce the danger of infection and prolong the life of the mask. For ordinary cleaning which should be accomplished after each flight, wash the mask with a pure soap solution and rinse it well with clean water. If a microphone is installed use a clean swab instead of running water in order to keep the microphone from getting wet. To disinfect an oxygen mask swab it carefully and thoroughly with a gauze pad which has been soaked in a water solution of merthiolate (1 gram of merthiolate to 1000 cc water). Spray the inner crevices to make certain that the disinfectant penetrates thoroughly. Wipe the mask clean with a clean cloth and let it dry before it is used.

When not in use the mask should be kept in a clean dry place away from sunlight and heat as much as possible. Oxygen masks should be stored at a temperature in the range of 32° to 80°F.

If the mask is damaged and is to be replaced return it to the Safety Equipment Technician who will reclaim and test the valves in the mask before disposing of discarded parts.

b. ADJUSTING BUCKLES.—The suspension harness buckles may need adjustment at times to obtain a proper fit of the mask. Loosen the free end of the webbing and slide it forward or backward, forward to shorten and backward to lengthen the suspension harness.

c. FITTING THE MASK.—Align the upper webbing strap with the ear lobe and adjust straps with this alignment.

d. PRESSURE TESTS.—Fit the mask securely to the face and attach the mask to the helmet. Connect the delivery tube to the regulator hose then turn the dial to the various settings and tighten the tension on the upper and lower mask straps to prevent leakage during the respiratory cycle.

e. EXHALATION VALVE PRESSURE TESTS.—Connect the mask to the regulator, set the regulator to a pressure setting, draw in and hold a deep breath. If the mask is properly fitted and the oxygen still continues to flow, the exhalation valve is faulty in that it is not holding pressure, and should be replaced.

f. SERVICING MASK FOR COMFORT.—Since the mask must be held firmly against the face to withstand higher pressures, painful pressure points, especially against the nose, may result. In this event adjust the strap tension just enough to balance the pressure requirements. Do not allow the cheek flaps to jam against the edges of the helmet. Make certain that the flaps are trimmed properly. Do not remove the strap across the upper lip because removal impairs the essential efficiency of the breathing systems.

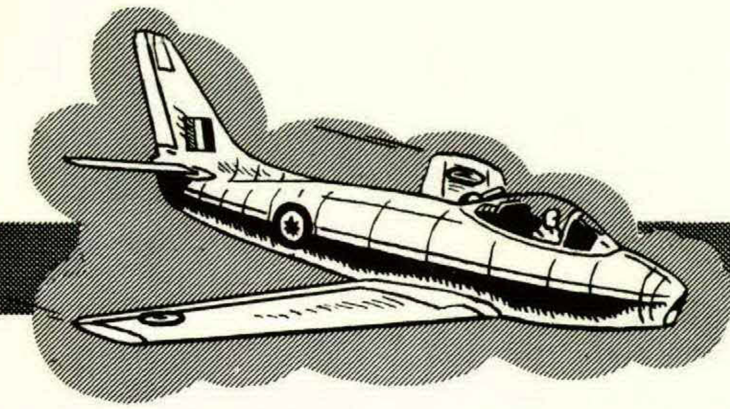
4. LUBRICATION

No lubrication or grease of any kind is required nor should be used on this equipment. This directive is important.

5. SERVICE TROUBLES AND REMEDIES

TROUBLE	PROBABLE CAUSE	REMEDY
INLET CHECK VALVE DOES NOT HOLD SUCTION	Valve not seated properly. Inlet check valve gasket not in place	Insert valve correctly. Insert inlet check valve gasket
MOISTURE IN INLET CHECK VALVE	Shield improperly placed	Position shield with arrow pointing down
AIR LEAKING FROM MASK DURING RESPIRATORY CYCLE	Loose suspension in harness	Tighten upper and lower straps
OXYGEN CONTINUES TO FLOW WHILE HOLDING BREATH	Exhalation valve not holding pressure	Replace valve
SKIN IRRITATED	Perspiration on cheek and chin flaps	Line flaps with chamois or trim flaps
LIP STRAP UNCOMFORTABLE	Temporary condition	Use for a longer period
MASK BLOCKS, CAN'T EXHALE	Dirt or foreign matter between inlet check valve body and valve flapper seats. Inlet check valve body and flapper damaged or warped. Exhalation valve blocked.	Clean with water weekly or as required. Replace defective parts with complete inlet check valve assembly. Replace exhalation valve.

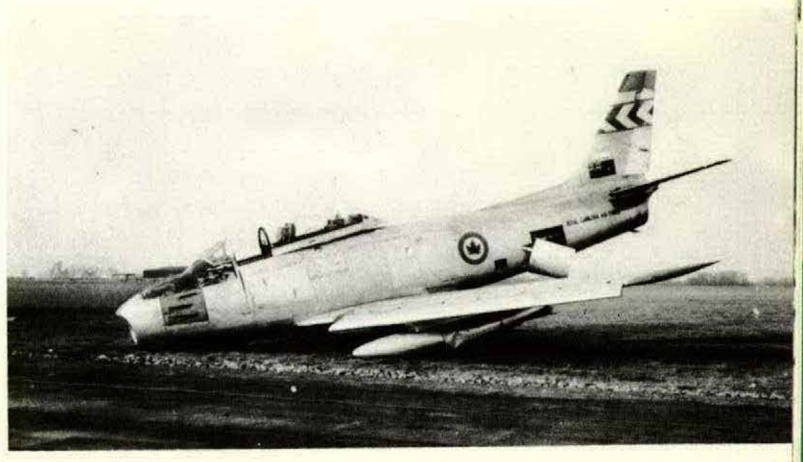
Accident Resumé



SABRE

ROUGH RIDE

The pilot was at "angels 37" on a practice interception when he noticed a lessening of elevator control and decided to return to base. Although there was no stick vibration he noticed the elevator shaking through all reductions in air speed. The pilot broke cloud at 1500 feet in the vicinity of base and elected to make a straight-in approach on a downwind runway because he believed the tail condition was worsening. He flamed out his engine when the tower informed him there would be a 55-knot tail wind. The Sabre ran off the runway when its port tire burst, the nose wheel collapsed, and the aircraft was badly damaged. Examination of the aircraft revealed no malfunction of either elevators or tailplane and a strip report on the tailplane actuator proved the latter to be serviceable. The port tire burst as a result of the harsh braking. In the words of the pilot's CO, "This pilot had a difficult decision to make. In all probability the vibration experienced would not have increased sufficiently to preclude a circuit and proper landing but, unfortunately, the pilot had no way of ascertaining this fact".



RUNWAY CLEAR?

A four-plane Sabre formation had been briefed to expect VFR weather at its destination. Beyond their "point of no return" the formation was requested to return to base as the weather at destination had deteriorated to a 500-foot ceiling with visibility reduced to one mile in rain. There were no alternates. On arriving over base the formation was cleared to land. Number three landed on the right side of the runway, his Sabre rolling about two thousand feet before striking a snowbank. The nose wheel collapsed and snow filled the air intake causing engine over-temperature. The snowbank varied from one-and-a-half to three feet in depth, consisted of hard snow and ice and paralleled the runway about 40 feet in from the edge. The pilots' forward visibility was reduced because of frozen rain on the outside of the windscreen and condensation inside. The accident cause was assessed "Ground" because flying control had proclaimed the runway clear when, in fact, a dangerous obstruction existed through inadequate clearance after a storm.

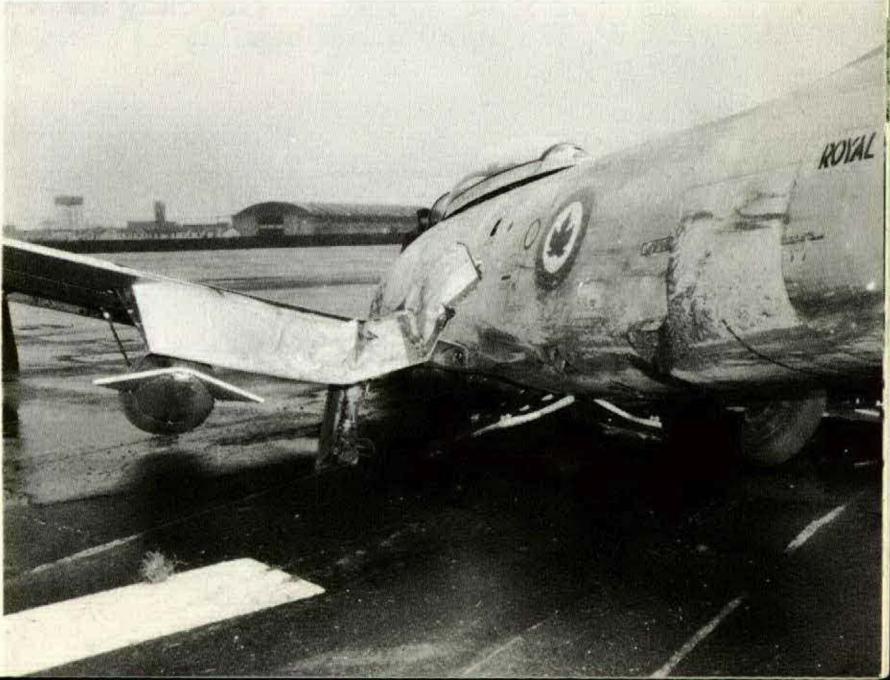
FORMATION FAULTS

The leader of a four-plane Sabre formation called for line astern. Number three misjudged his closing speed and then, without warning, throttled back and selected dive brakes "out". Number four took violent evasive action but struck three's tail assembly with his right wing. Both aircraft landed safely at base. Number three was primarily responsible for this collision because he displayed poor judgment in attempting to stay in line astern with an excessive overtaking speed. Furthermore, he displayed poor leadership in slowing his aircraft violently without warning his wingman. Number four erred in being too close behind his leader for safety at this stage of formation closure.

THE ALTERNATES WERE VFR

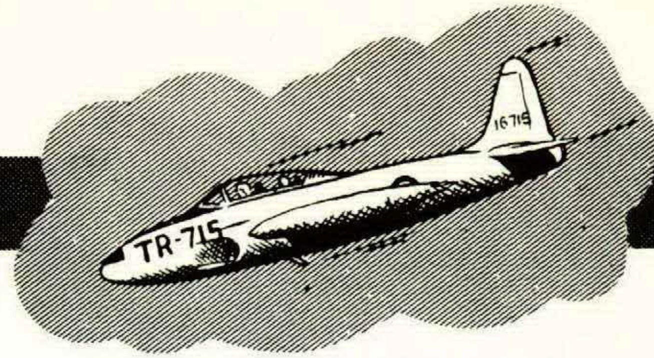
A two-plane Sabre formation was scrambled for an airborne interception. After interception the section leader was informed that the weather at base had deteriorated to 500 feet with one mile visibility. The leader was given permission to make one attempt to land at base. If unsuccessful, he was to lead his number two to a diversionary field that was VFR. As the section approached their base under GCA control, the leader ordered his number two to go line astern and follow him around a bad weather circuit. Number two lost his leader in the adverse weather but was safely diverted to the VFR field. The section leader continued his approach but decided to overshoot. However, his air speed was too low and the Sabre stalled about 300 yards short of the runway. The nose wheel snapped off when it struck the boundary fence and the aircraft continued down the runway on its nose. The formation leader disobeyed wing pilot orders in attempting to land in weather below the permissible minimum. Making no allowance for a heavy load of fuel he permitted his air speed to fall too low. The aircraft undershot the runway and a "B" category crash resulted. The leader displayed poor airmanship in not taking extra precautions while landing with an inexperienced wingman.

THE UNDERSHOOT PLAGUE



Number two in a two-plane formation was making a routine formation landing. The pilot permitted air speed to fall so low that his Sabre stalled and crashed 50 yards short of the runway. Since he was aware of an upgrade to the runway, the pilot should have exercised greater control over his approach.

T•33



STRAY RIVETS

Immediately after takeoff the trim ran away to the full nose-up position. The pilot and co-pilot tried to retrim the T-33 but found the controls inoperative in the full, ''tail heavy'' position. With both pilots forcing the control column forward, power was reduced and a normal circuit and landing completed. This aircraft had been tagged ''unserviceable'' after its previous flight because of runaway trim during an overshoot. However, when maintenance personnel inspected the aircraft and found no malfunction of the trim, it was marked ''serviceable''. After the second consecutive case of runaway trim, the front cockpit control column grip was stripped. A piece of a rivet was found jammed between number five and six terminals, thereby shorting the trim circuit and actuating the elevator trim tab. Cause of this accident has been assessed ''Maintenance''.

OVER-TORQUED NUT

The pilot was about to turn onto the runway for takeoff when the control tender officer noticed the starboard wheel wobbling. Before he could notify the pilot the wheel fell off. The cause of this accident has been charged against maintenance. The wheel had been removed on acceptance check for examination of the brake assembly, bearings, and other parts. On re-assembly the wheel nut was over-torqued causing the outer wheel bearing casing to fracture and the wheel to fall off.

FAILED LINKAGE

The student was receiving instruction in formation flying. With no warning of trouble the engine flamed out. The instructor discovered the throttle had free movement throughout its range with no effect on the rpm. He switched to the emergency fuel system but still had no control through the throttle. Finally he set up a jet forced landing pattern and successfully landed on the runway. The cause of the accident was attributed to improper maintenance. A connection in the throttle linkage had been improperly locked, permitting the linkage to fail and leaving the pilot with no throttle control.

LUCKY THIS TIME

The pilot was practising air-to-air firing. During an attack on the flag he exceeded the minimum range and angle-off established in range safety orders and his port wing struck the tow cable, sustaining a deep gash. The pilot landed safely at base. It is worth recording that he was warned on previous gunnery exercises about pressing his attacks too closely.

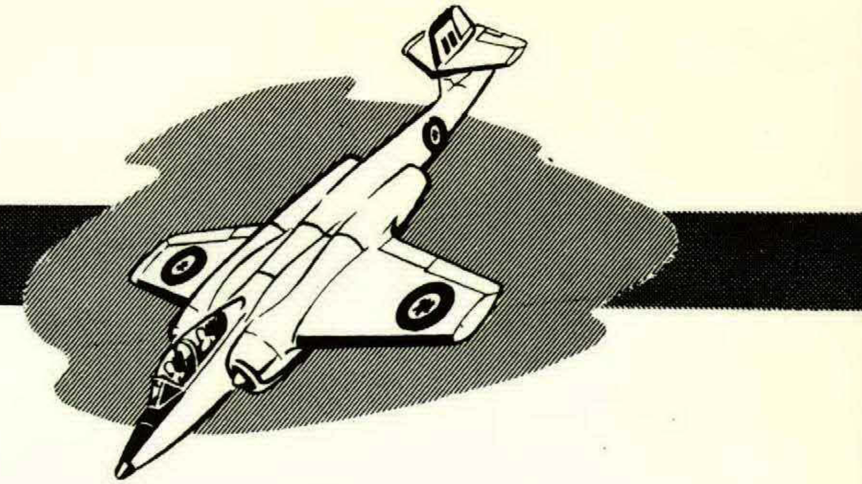
PORPOISING

Although his final approach speed was high, the pilot attempted a landing. His aircraft ballooned and he applied power for an overshoot; but the T-33 stalled onto the runway and began porpoising. Cutting the throttle did not prevent the aircraft from rolling off the runway into the infield. The pilot attempted to overshoot too late and then tried to hold his T-33 in the air below the critical speed.

USE YOUR AIDS

The instructor briefed the student for his familiarization ride in a T-33. After completing a reconnaissance of the local flying area the pilot climbed through the overcast to demonstrate aerobatics. On completion of the exercise the instructor homed on the inner beacon. The terrain did not look familiar to him and he could not see the aerodrome. He asked for an ADF homing and, on cross-checking his instruments, realized there was a difference of 30° between the standby and gyrosyn compasses. Fuel was dangerously low by this time but the pilot continued the homing in hopes of sighting base. Then the engine flamed out from fuel starvation and the pilot climbed for height. The student bailed out and landed safely but the instructor's seat harness was caught in his parachute harness, preventing him from jumping. The T-33 landed in timber and was destroyed. The instructor was injured but his crash helmet protected his head from serious harm. Weather was a contributing factor in this accident, ceiling being estimated at 3000 feet with visibility two and one-half miles in fog. However, the pilot made the grave mistake of not requesting homing assistance from the tower until his fuel situation was critical.

CF·100



WET TAKEOFF

After covering about 200 yards of his takeoff run, the leader of a section of two CF-100s struck a large pool of water. The pilot noticed his aircraft decelerating and discovered that both engines had flamed out. Water spraying up from the nose wheel had entered the air intakes causing a double flameout. The cause of the incident has been charged to "Ground". A drain at the left side of the runway was plugged and this factor, coupled with a rapid spring thaw, produced a deep pool of water. Flying control and unit flight safety officers alert to the hazards of spring conditions can prevent this type of accident.

HASTE MAKES WASTE

The pilot believed his CF-100 was short of fuel following an air interception. During the ensuing descent he noticed the wing fuel lights flickering on and off, so he switched to the fuselage tanks. In his haste he made a very poor circuit and approach. The aircraft landed heavily with drift and ran off into the infield. The starboard wheels snapped off and the aircraft swung through 180 degrees. A check disclosed that there w
the pilot been fully familiar v
that he had sufficient for sev

INCOMPLETE PERIODIC IN

The engines of a CF-1C
When the pilot began his desc to participate in an army co-operation
reduce below 74% power. In was to simulate rocket and dive bombing
and landing, he had to shut c try. On one pass the pilot flew too low
revealed that the jam nut his starboard wing. In the exercise
mechanism swivel connector arned against this very type of accident.
throttle control linkage to his altitude and pressed his attack too
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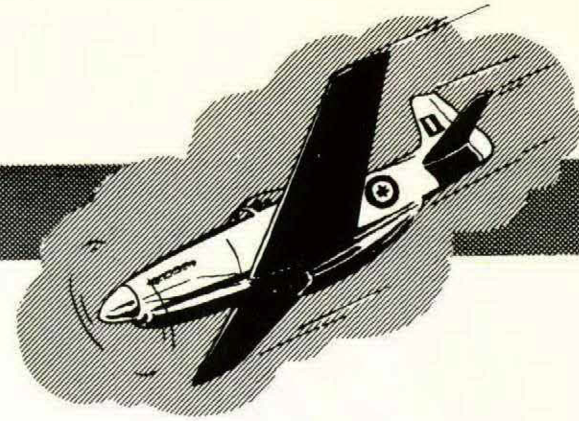


MUSTANG

WHOA! YOU MULE YOU!

The pilot was manoeuvring into the parking line when his propeller struck a towing mule. He had been taxiing along the ramp in a zig-zag manner and was about to turn into the line under the guidance of a marshaller. In the words of the OC: "At this point an airman driving a mule towing an oxygen cart was approaching the Mustang, intending to pass on the left of the aircraft. As the aircraft turned slightly left prior to turning right in the line, the airman became confused and, instead of stopping, turned left to attempt to pass on the right of the aircraft. This manoeuvre resulted in the mule and oxygen cart remaining in a blind spot in front of the nose of the Mustang. The airman then stopped and attempted to back up—at which point the mule and oxygen cart jack-knifed. The propeller of the aircraft hit the mule causing damage to the mule and the propeller of the aircraft".

The cause of this accident has been assessed as "Ground" because the accident is attributable to tarmac personnel. The mule driver did not stop clear of the taxiway as required when an aircraft approaches. In attempting to avoid the aircraft the driver manoeuvred so as to inadvertently stay on the pilot's blind side as the aircraft zig-zagged. Furthermore, the airman marshalling the aircraft gave no warning of the impending danger. Close liaison between the FSO and OC Servicing regarding line crew discipline and marshalling training would help eliminate this type of accident.

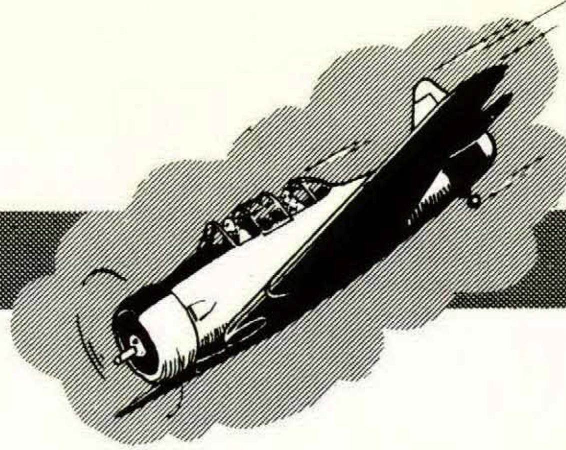
HIGH ROUNDOUT

The leader of a two-plane formation made his roundout for landing, realized he was too high, and applied power. Nevertheless, the Mustang stalled and landed heavily, swinging off the runway onto soft grass where the undercarriage snapped. This "B" crash category damage was the result of the pilot not taking sufficient corrective action after rounding out too high.

TARGET FIXATION?

The pilot was authorized to participate in an army co-operation exercise during which he was to simulate rocket and dive bombing attacks on camouflaged infantry. On one pass the pilot flew too low and struck some trees with his starboard wing. In the exercise briefing the pilot had been warned against this very type of accident. Nevertheless, he misjudged his altitude and pressed his attack too closely.

HARVARD



CLEAR THAT ENGINE

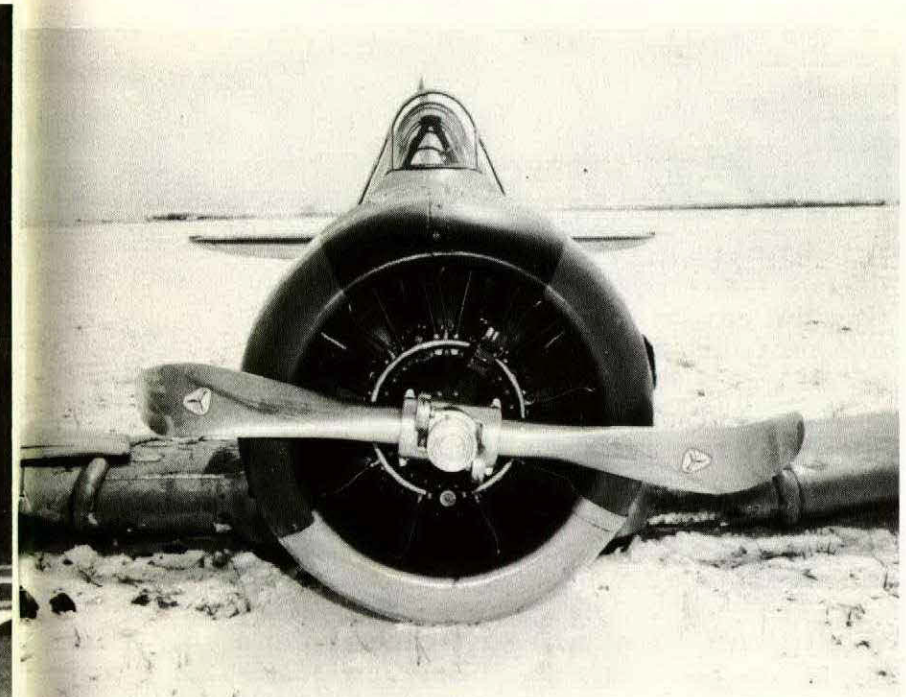
The student pilot was authorized for aerobatics and practice forced landings. After doing aerobatics for 20 minutes at 6000 feet the student used a practice forced landing descent to lose altitude. During the descent he twice warmed the engine, but at 1000 feet when he applied power to overshoot, the engine coughed and died. The student next closed the throttle and reopened it slowly. The engine responded for just a few seconds and then quit. Realizing he had allowed the engine to become too cold during his power-off descent, he decided to make an actual forced landing—a manoeuvre he handled successfully from a low altitude. Always ensure that your engine is warm and cleared before commencing overshoot from a practice forced landing.

CUT OUT THE DRIFT

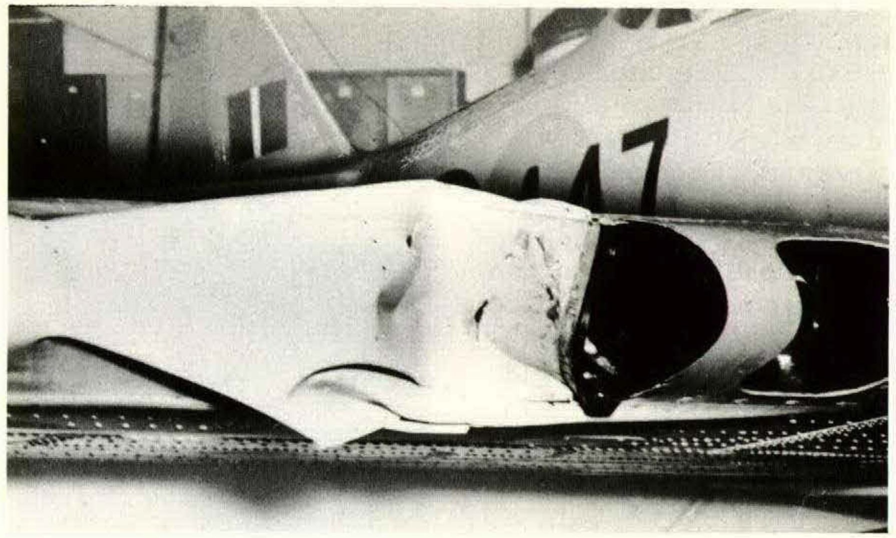
The student pilot failed to eliminate all drift on approach, with the result that his Harvard skipped on touchdown and the port wing dropped. Over-correction caused the aircraft to swing to starboard, the port oleo broke off, and the Harvard momentarily went up on its nose. The possibility of a groundloop is greatly increased if drift is not eliminated before touchdown.

DRILL OF VITAL ACTIONS

The student was too high on approach and decided to go around. He applied power, selected undercarriage "up" and noted his air speed at 90 knots. He then selected flaps "up" and began climbing. The engine started to vibrate and run unevenly, and as the Harvard was not gaining height the pilot decided to force land straight ahead. He erred in selecting flaps to the full "up" position in one movement at too low an altitude. Furthermore pitch control had slipped out of the full "fine" into a partial "coarse" position because the pilot had not sufficiently tightened the throttle quadrant friction nut.



TAKE OVER IN TIME



A student instructor was in the rear cockpit demonstrating night circuits and landings. His final approach was too low and too flat and the Harvard struck a fence post approximately 800 feet short of the runway. At this point the testing officer took control, applied full power, and landed on the runway. He erred in not taking corrective action as soon as he realized the aircraft was undershooting. The flying instructor is often faced with the problem of when he should take control from a student—a recognized dilemma, but hardly a legitimate excuse to permit a student to remain in control beyond the limits of safety to life and aircraft.

COUNT THE ERRORS

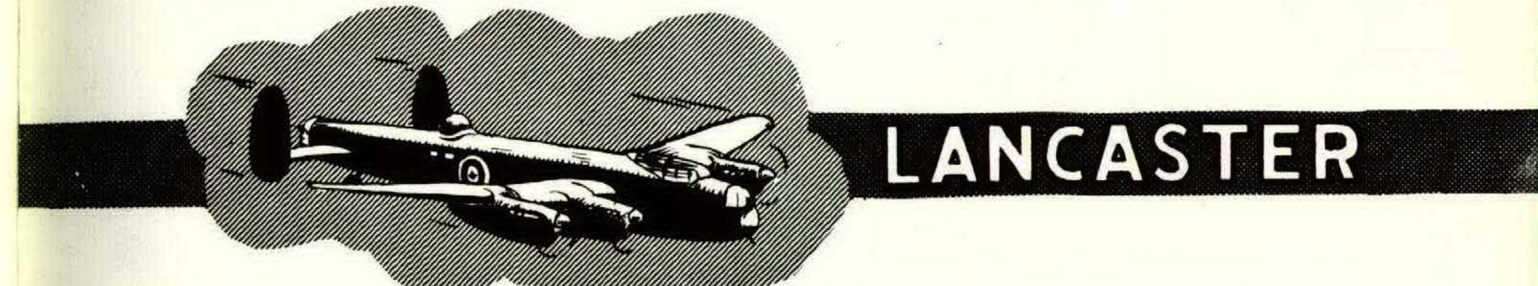
The student was receiving instruction on circuits and made his third landing without benefit of undercarriage. On final approach he had been told to lower full flap but raised the landing gear instead. Neither instructor nor student heard the warning horn blow although it subsequently checked serviceable on a retraction test. The instructor was not listening out on the radio and therefore was unable to hear any warning from the control tower—nor did either man see the red flare fired by the tower.

PREVENT FIRE—DON'T OVER-PRIME

A student pilot encountered difficulty in starting his Harvard and when he re-primed, the engine caught fire. The line crew's extinguisher proved unserviceable and the student failed to pull the engine fire extinguisher. The flames were finally put out by the station fire truck. The fire was caused when the pilot, through inexperience, over-primed the engine prior to starting.

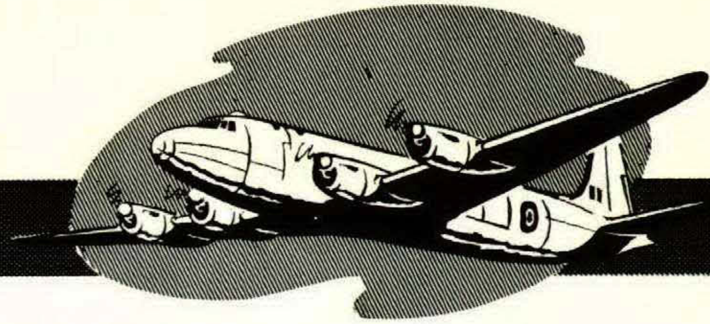
EXPENSIVE ENTERTAINMENT

Two student pilots were authorized to carry out mutual instrument flying practice in a Mitchell. During the flight they decided to do some unauthorized low flying. The aircraft subsequently struck some trees, sustaining "D" category damage. Despite extensive damage to both engines and the starboard wing these intrepid birdmen regained altitude and continued their instrument flying practice. The captain of the Mitchell was awarded a reprimand for permitting the second pilot to do unauthorized low flying. The second pilot was awarded a severe reprimand and a fine of $150.00 for his share in the performance.



CHECK THOSE PART NUMBERS

The pilot noticed oil leaking from the number one engine propeller hub. He feathered the propeller and landed safely at the nearest aerodrome. The leak was caused by failure of the gasket between the vacuum pump and the pump adaptor. Technical examination revealed that the wrong gasket had been installed by maintenance personnel. The type used was designed only for Pratt and Whitney engines and never authorized for Merlins. There is no similarity whatsoever between the parts reference numbers. An engine failure stemming from the same incorrect installation occurred in another Lancaster the day after this accident. Cause of both cases of engine failure has been assessed as "Maintenance". Needless to add, it is only good sense to ensure that a replacement is the exact part required.



NORTH STAR

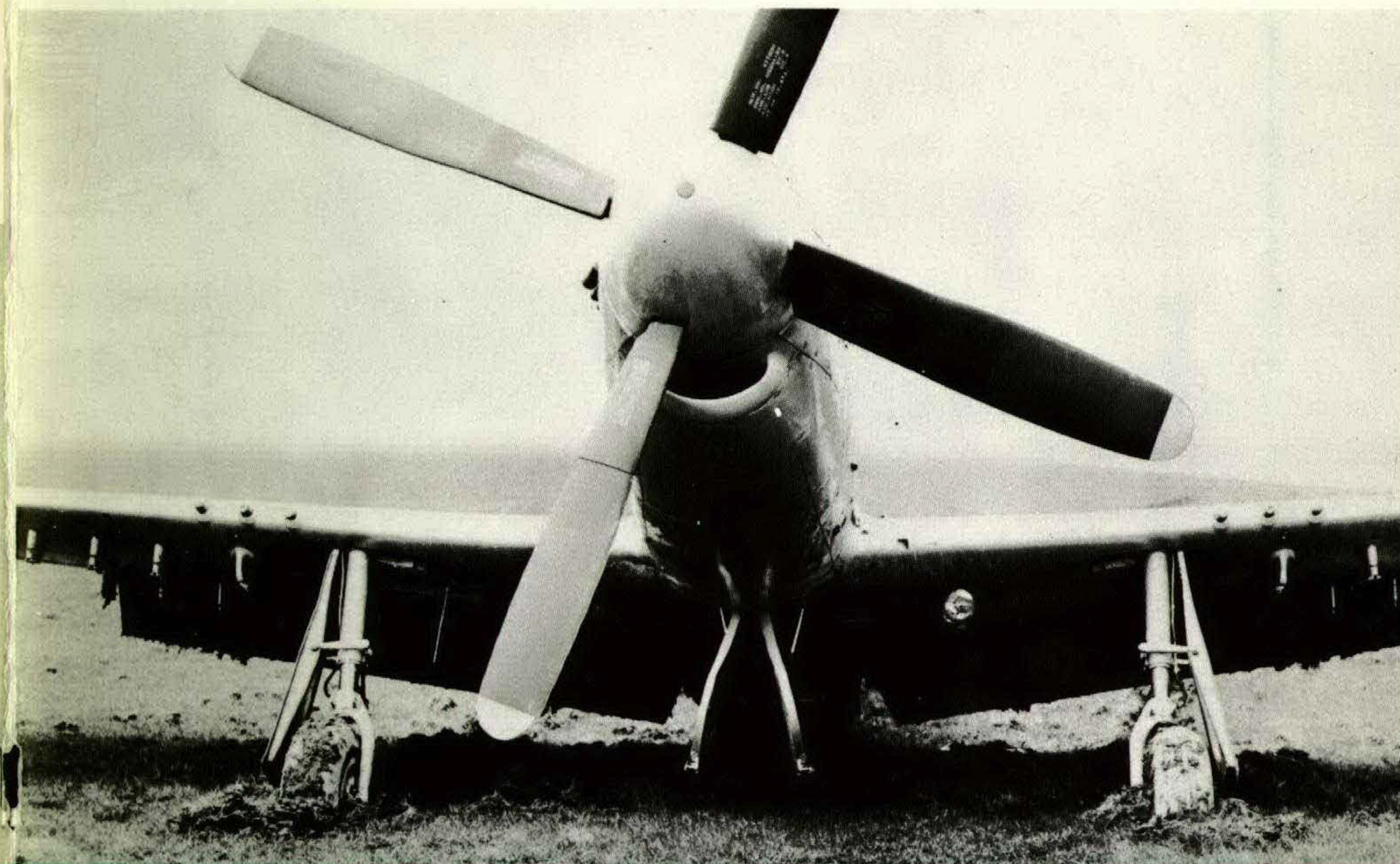
FOR WANT OF A FORECAST.....

This North Star was on a routine trans-ocean flight. At an intermediate refuelling base the pilot encountered adverse night landing conditions. There was a strong crosswind, gusting to 48 knots. Visibility was restricted to one-quarter of a mile in light snow and blowing snow, with a precipitation ceiling of 500 feet. The runway was slushy and icy so that braking action was poor. The first and second runs on GCA (the equipment was operating on emergency power) had to be discontinued because of snow obscuring the precision scopes. On its third GCA the North Star touched down and ran along the runway for three or four thousand feet. One strong gust blew the aircraft to the side of the runway and a second blew it off the runway onto rough ground. The undercarriage collapsed and the aircraft ended up on its nose at the bottom of a ravine. The flight deck telescoped on impact but crew and passengers escaped with only minor injuries. The cause of the accident has been assessed: Primary - "Pilot Error", Secondary - "Ground". The pilot was at fault in undertaking the flight in very marginal conditions. Through poor liaison with his crew he failed to receive accurate and timely weather observations for his destination. On arrival there he attempted to land under doubtful weather and runway conditions and with intermittently failing radio aids. Also, he remained in the area until he no longer had sufficient fuel to fly to an alternate. "Ground" navigational facilities contributed to time-consuming holding patterns while weather conditions were rapidly deteriorating. Furthermore, the captain did not receive the vital weather information in the mid-point landing forecast and thus had no opportunity to analyze the deteriorating weather at destination.

priceless prose

Pilot States:

"On bringing down the tail however, the aircraft swung to the right and was into the mud before I could gain control. In the mud of course, control was almost impossible".



DFS