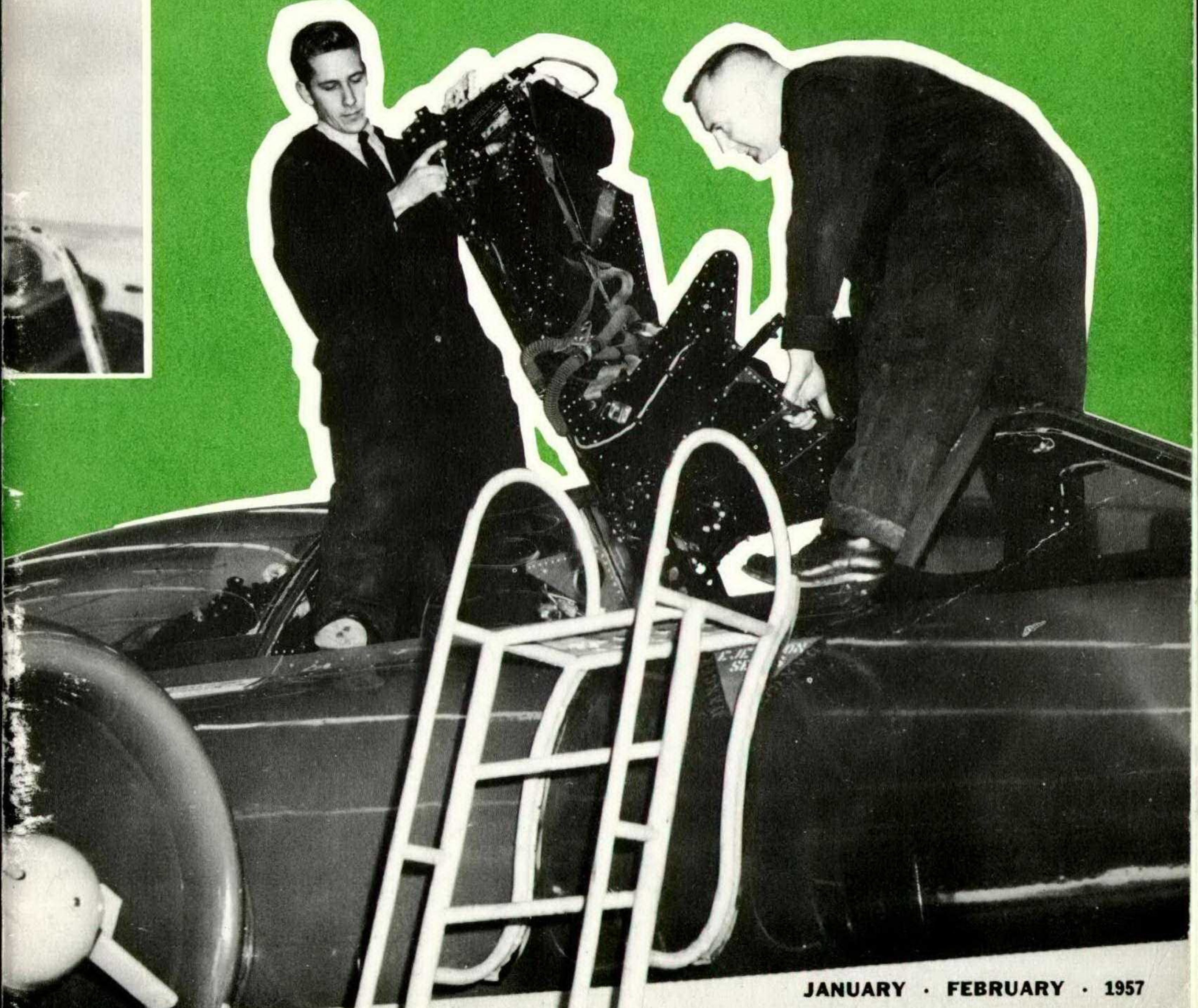
FLIGHT COMMENT



JANUARY · FEBRUARY · 1957

FLIGHT COMMENT

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

JANUARY · FEBRUARY 1957

C O N T E N T S

★ ★ ★

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

We welcome the o
furnishing of materia
in Flight Comment.

This publication
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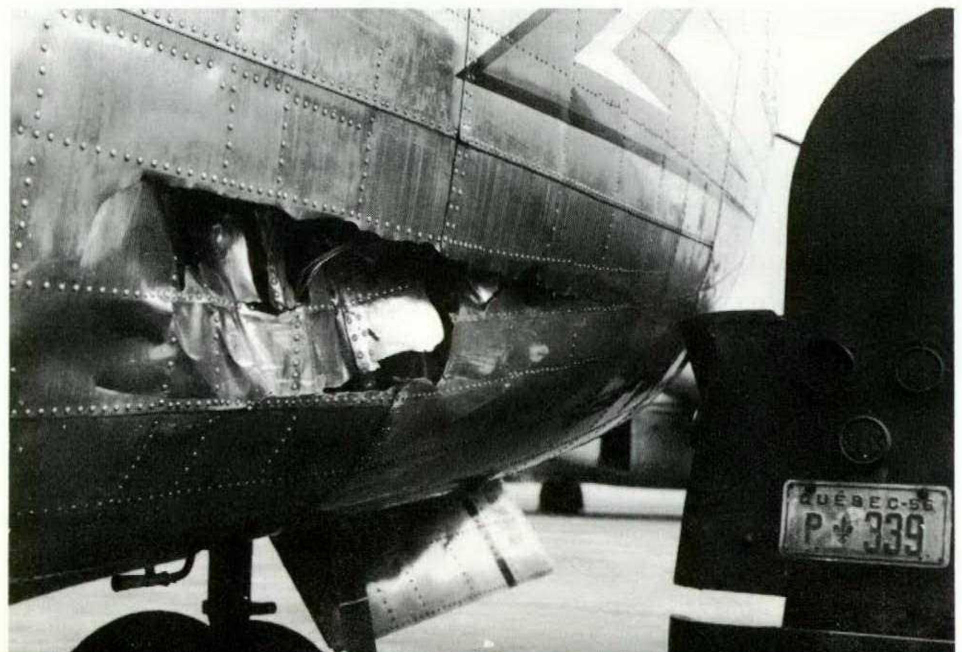

HANDLE WITH CARE

FLIGHT COMMENT

ISSUED BY
DIRECTOR
R.C.A.F. HEA

JANUARY · FEBRUARY

C O N T E N T S

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

Directorate of Maintenance Engineering

LACK OF manoeuvrability on the ground is a characteristic common to all aircraft. Up in the wild blue yonder (to coin a phrase) they will perform a variety of jobs well, from hustling freight to making like a Kingfisher on its way out to lunch. But get them on the ground and they all look like gorillas doing mambo.

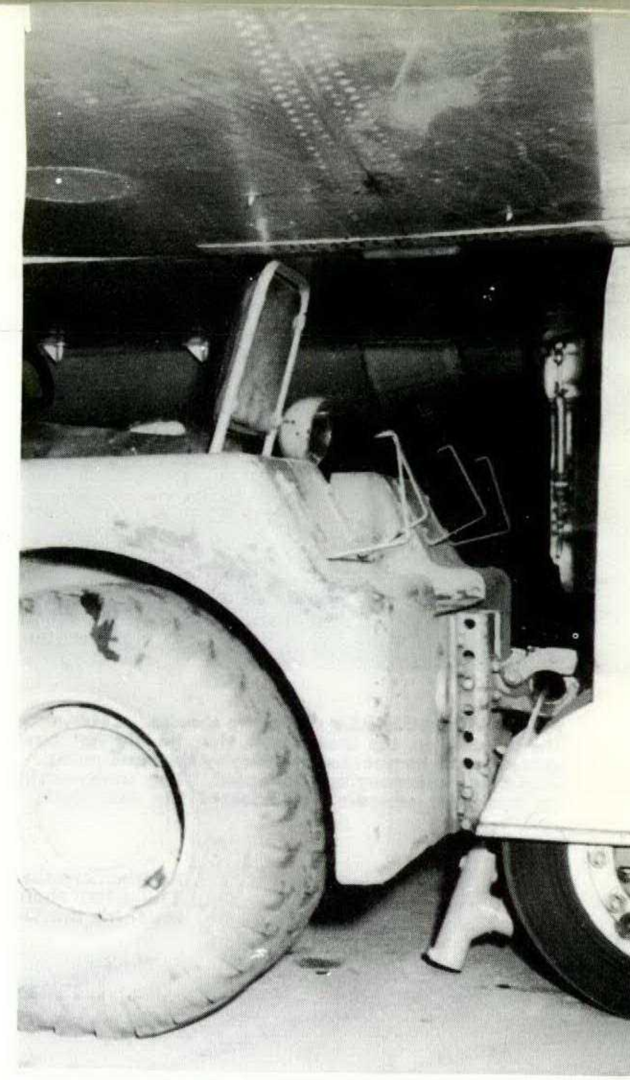
Fish Out of Water

Since few of our aircraft can remain airborne for 24 consecutive hours, it stands to reason that most of them have to spend a considerable portion of the day hanging around the airfield in what ought to be perfect safety. And that's where the trouble starts. Because, no matter what the breed—fighter, trainer or transporter—they're all reduced to the category of sitting ducks, becoming the helpless prey of what appear to be their natural enemies: tractors, refuelling tenders, energizers, APUs, snowbanks, hangar doors, hangar walls—and other aircraft!

Except for the necessary taxiing immediately prior and subsequent to flight, all aircraft movements on the ground are controlled by towing, a process wherein you take one helpless aircraft and attach it firmly to one of a variety of vehicles: tractor, shop mule, unitow or "cat". The vehicle is then aimed in the general direction of the desired parking spot. Too often the driver does something with his right foot which causes the whole assembly to take off at a high rate of knots. Consequently only with a large amount of luck (and provided everything else in sight manages to duck) will the aircraft arrive at its appointed place reasonably intact. Sometimes, if Lady Luck is busy elsewhere, a horrible crunching and grinding is heard as the aircraft jars to a halt.

95% Human Error

From April 1st to June 30th, 1956, 42 aircraft were involved in accidents on the ground. Eleven of these were damaged during towing operations and 14 others were struck directly



...nd was heard which could have been the shear-pin ... move the aircraft. It held. While the tractor was ... aircraft brakes. All hydraulic pressure had been ... the way, but in some manner he stalled it. The Canuck continued to roll forward over the mule, striking the driver's shoulder as he bailed out. A modification has been proposed to equip all tractors with ejection seats.

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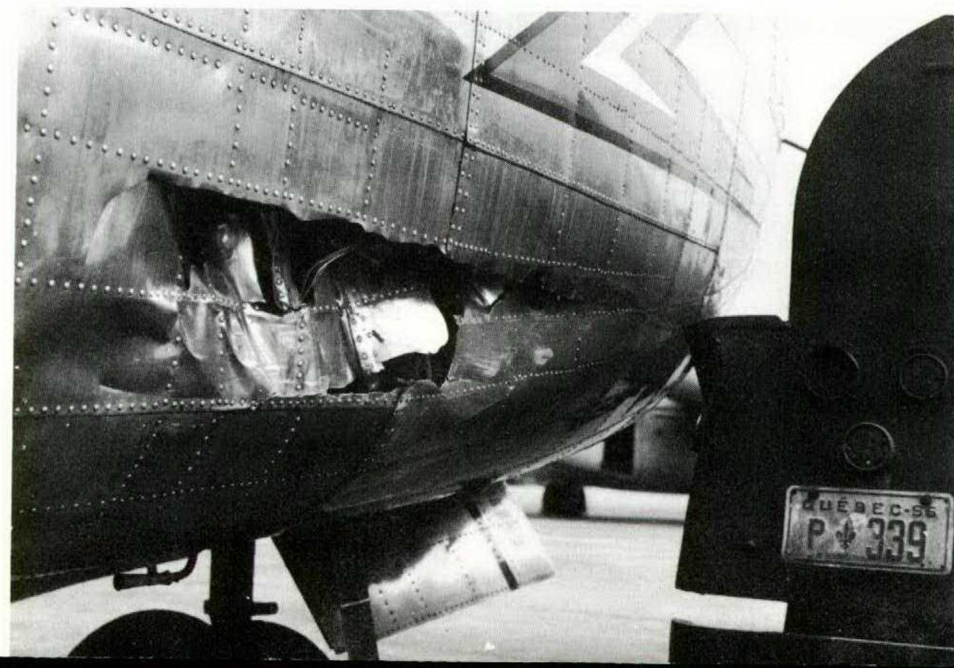

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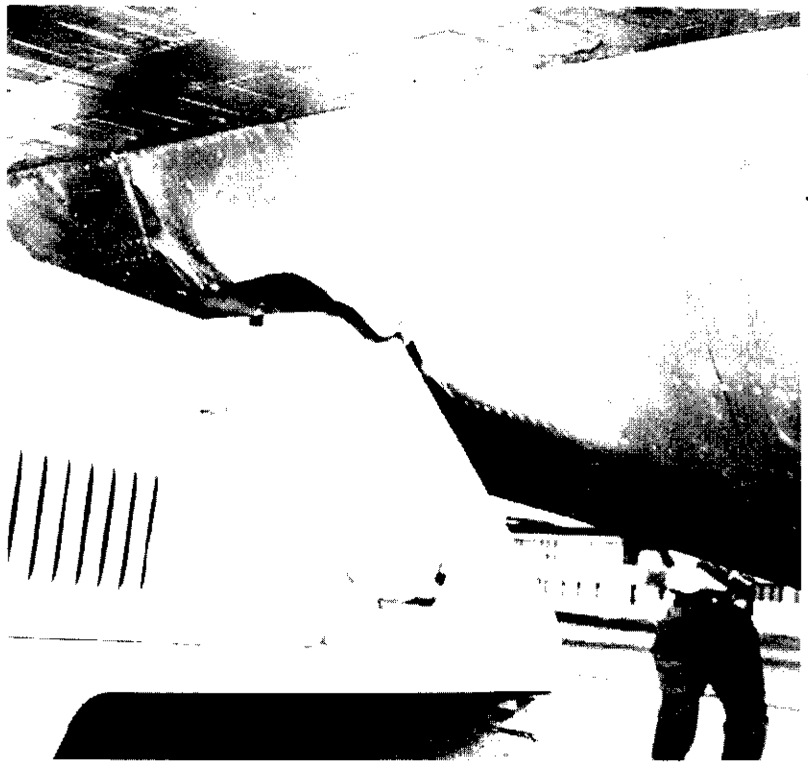

Damage to a Canuck flap. A tractor was towing an energizer when the latter came unhooked and headed for the aircraft. The driver applied emergency brake, jumped off and stopped the energizer. Unfortunately the emergency brake did not hold and the tractor collided with the aircraft. Subsequent investigation revealed that the hand-brake was completely u s. The driver did not have an ME6; it was refused because of his careless attitude. (He had been previously warned several times not to drive!) The towing hitch was completely serviceable.

snowbanks, hangar doors, hangar walls—and other aircraft!

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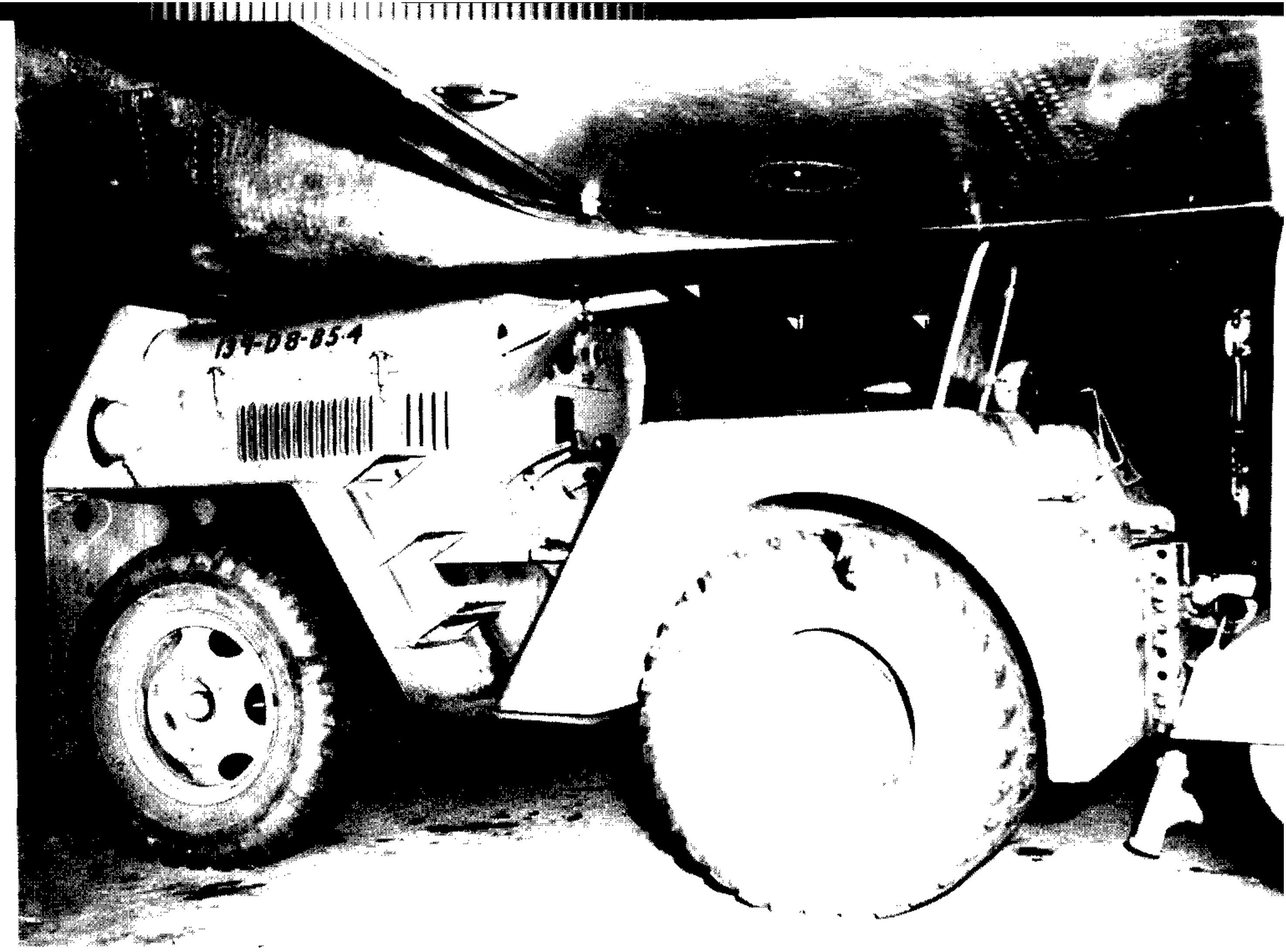

Another Canuck damaged. The aircraft was being towed out of a hangar when a sound was heard which could have been the shear-pin breaking. The aircraft brakes were applied and the tow-bar tested by an attempt to move the aircraft. It held. While the tractor was turning onto the flight line, the tow-bar failed—and there was no response from the aircraft brakes. All hydraulic pressure had been used during the previous test. The tractor driver attempted to move the mule out of the way, but in some manner he stalled it. The Canuck continued to roll forward over the mule, striking the driver's shoulder as he bailed out. A modification has been proposed to equip all tractors with ejection seats.

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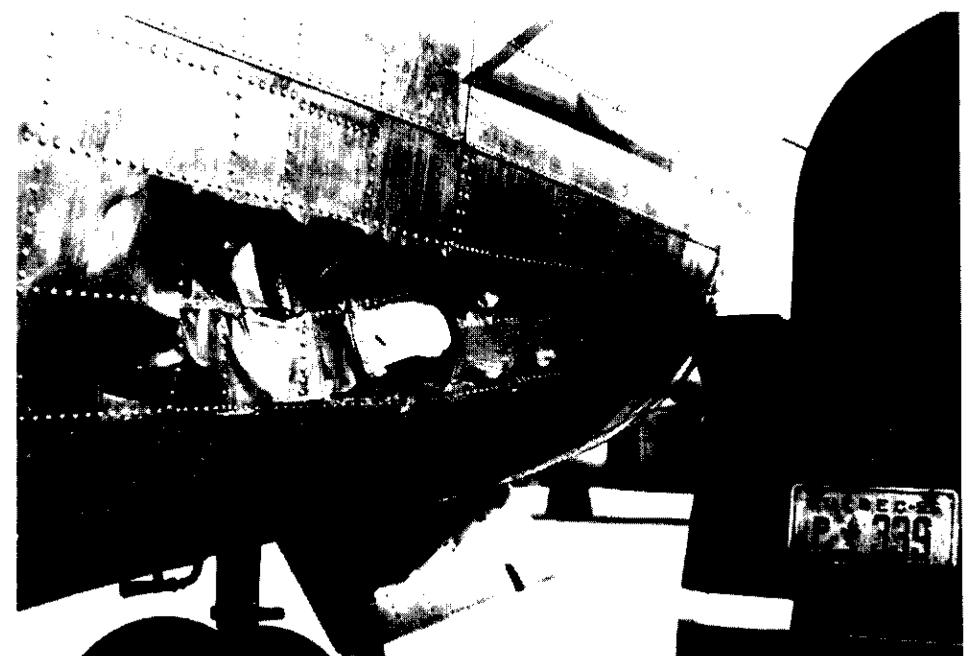
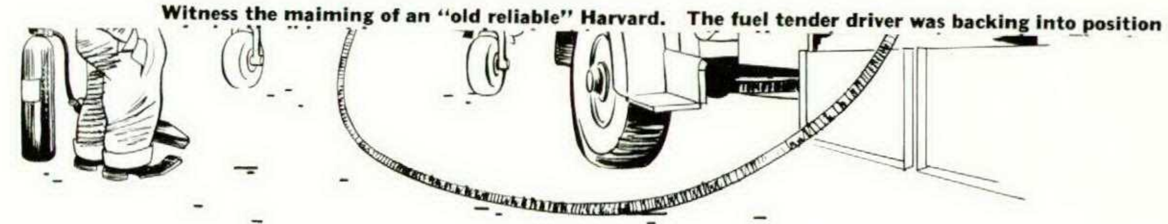


All the Mitchell needed was a tire change. Later, when the aircraft had to be moved to the flight line, the airman on the brakes saw that he did not have sufficient hydraulic pressure for proper brake operation; so he pumped pressure by the hand pump. As soon as the aircraft was moved by tractor, the starboard undercarriage collapsed. The undercarriage lever was in the 'Up' position. Building up hydraulic pressure had released the down-lock, so moving the aircraft caused the leg to fold.

Another overseas Sabre. The towing crew consisted of a driver and a man on the aircraft's brakes. The driver thought he would clear the beam. He didn't—but the disciplinary action taken should assist his thinking in future.

This overseas Sabre was being towed to maintenance hangar. The driver applied brakes but his wheels locked and the mule kept sliding. When the aircraft's brakes were applied, the same thing happened—the Sabre kept going. Then the mule 'Jack-knifed' and hit the aircraft on its port wing. Skid marks of the mule were 12' long, and of the Sabre, 6' long. Disciplinary action was taken against the driver because the CO was convinced that his speed was too great for existing conditions.

Witness the maiming of an "old reliable" Harvard. The fuel tender driver was backing into position to



The tender was marked, but servicing was negligent.

Another pilot and myself were ordered by Operations to do night circuits in an Expeditor. The engines started normally and we were cleared to the intersection. With all temperatures and pressures normal, we proceeded with our run-up. At this time the port engine started running rough and sparks appeared from the exhaust. A cockpit check revealed everything normal, and a switch of fuel tanks yielded no better results. While we were returning to the ramp, the starboard engine also began running rough. After shut-down I notified servicing and asked them to check the tender which had fuelled the aircraft. Sure enough, the Expeditor had been filled with jet fuel.

The fuel tenders were properly marked, but apparently the servicing staff was negligent in taking the proper precautions. Running the engines separately on each fuel tank after start-up will help in determining if your aircraft has been refuelled with the proper fuel.

IMPULSIVE ROLL

Flying a Canuck IV, the pilot was completing the final attack of an air-to-ground gunnery exercise. As he was pulling up, he had a spur-of-the-moment impulse and started into a roll. Finding himself on his back with a low airspeed, he closed the throttles and began to complete the roll. In his confusion he pulled the stick back while still partially upside down, and the Canuck commenced a dive.

To add to the foul-up, the pilot pulled excessive G with his hand on the throttles, inadvertently closing the high pressure fuel cocks. Fortunately he detected this immediately and re-opened the cocks before the engines flamed out. The roll was completed dangerously close to the ground, and the twitching birdman proceeded home with a somewhat pallid complexion.

The recommendations springing from this incident are rather obvious:

- Never attempt low level aerobatics unless you have attained a sufficient degree of competence at a safe altitude.
- Never start an aerobatic manoeuvre unless it has been thoroughly premeditated. In a Canuck IV keep your hand away from throttles (if they are at the "idle" position) when applying high G.

Pilots are reminded that only the AOC can authorize low level aerobatics—and the pilot must conform with ASI 2/22.

The predominating fact about the incident is that the high pressure cocks can be inadvertently shut off. This condition has been suspected in other accidents where "double flameouts" occurred; and the grapevine has reported additional occasions when both engines were accidently stop-cocked. A modification has been recently introduced to eliminate the unsatisfactory pressure cock control and prevent inadvertent shut-off.

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CONTROL LOCK

"While doing a high speed pull-through (350K) with throttle off from 20,000 feet, I had a total loss of aileron boost in my T-33 and the aircraft rolled violently to the right through 50 degrees. The boost then appeared to cut in and out and the aircraft rolled quickly to the left through approximately 140 degrees.

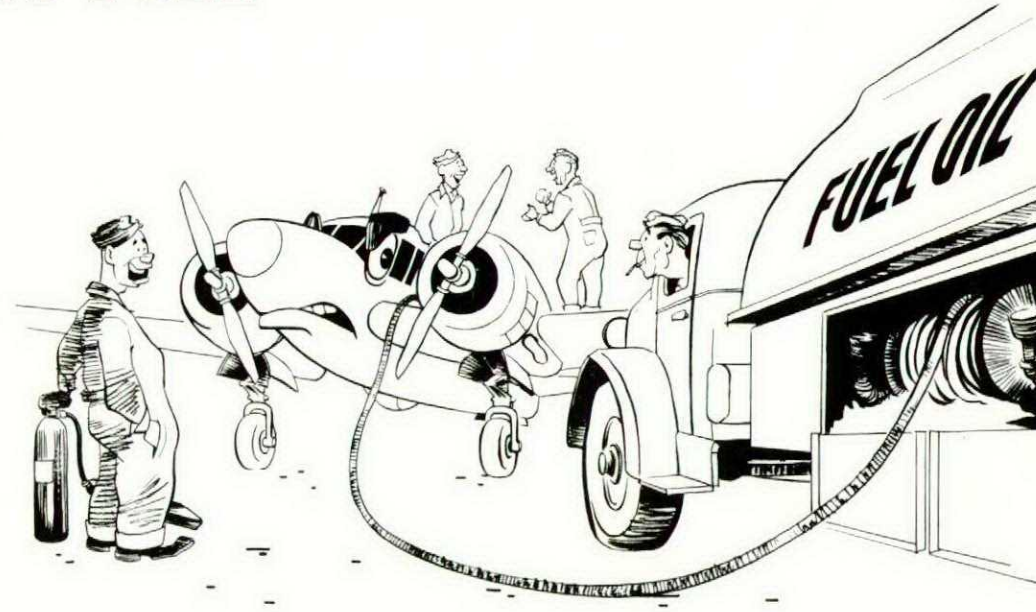
Some of the roll to the left may have been caused by over-correction on the control column when I attempted to recover from the roll to the right. Several intermittent movements were felt on the control column before aileron boost could be cut off. The aircraft was climbed back to 20,000 feet and several turns were practised at low airspeed with boost off, following which a boost-off landing was made at base without further incident."

Technical investigation revealed that the aircraft was fully serviceable. During tests it was again demonstrated that a complete cycle of the dive brakes plus aileron movement with the engine at idle will result in a hydraulic pressure drop to 50 psi. Since the by-pass valve in the aileron boost cuts out at 250 psi, a momentary control lock is to be expected.

During an interview with the pilot it was established that a complete cycle dive brake selection (down and up) had been made with the aircraft inverted and the engine at idle, so that conditions were set up for a momentary control lock.

This problem is not new. Multiple, simultaneous selections (i.e. gear and dive brakes) at circuit height have produced the same effect. The lock is momentary and is more alarming than dangerous. Space your selections of services to avoid control lock.

WRONG FUEL



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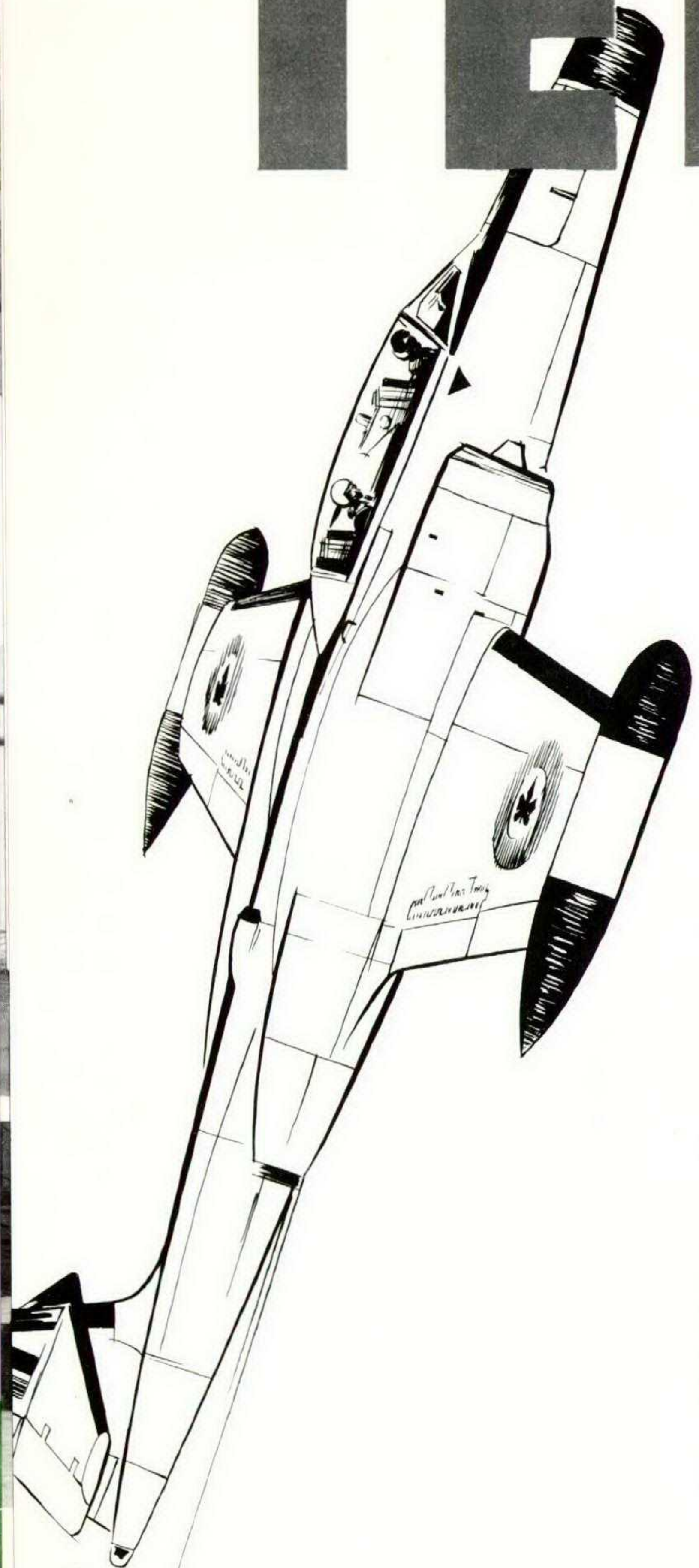
TEN MILES FROM HOME

by S/L W. G. LEECH



SPEEDS and operating ceilings of modern aircraft have now advanced so far beyond the capabilities of even the fittest aircrew that the physical limitations of the human body must be thoroughly understood by engineers, aeromedical specialists and aircrew alike if we are to avoid unnecessary loss of efficiency and life. What are the hazards? how does the human body react to them? and how can they be combatted?

Up until recent times we have been concerned with only a fraction of the 100-mile depth of atmosphere surrounding the earth. Today flight above 50,000 feet is space travel—at least from the physiological standpoint—and the hazards we are encountering in this frontier region are many and varied. Above this height specialized equipment will have to be developed to counteract cosmic radiation, explosive decompression, radiation climate, the now familiar anoxia and many other conditions. In the present discussion we will confine ourselves to anoxia, with special emphasis on our means of preventing it: the partial pressure suit.

Partial Pressure

To understand anoxia, we require a prior knowledge of certain fundamental physical facts about the atmosphere. Air is composed of a mixture of gases (oxygen, nitrogen and carbon dioxide) and other rare elements. These gases are in a constant percentage relationship, each exerting a pressure as though it occupied a given space. This is called the partial pressure of the gas and it can be calculated for any situation if we know the percentage of the gas present and the total atmospheric pressure. In other words, at ground level where oxygen constitutes 20% of the air at a total pressure of 760 mm of mercury, the partial pressure of oxygen is 160 mm of mercury (Hg).

It is upon this last figure that human beings are dependent; for we have been designed to inhabit an atmosphere containing oxygen at an approximate partial pressure of 160. As a pilot leaves his home environment and climbs to a higher altitude, the total atmospheric pressure steadily decreases—and with it the oxygen pressure. To overcome the problem we step up the concentration of oxygen to the pilot. Under ideal conditions this increase prevents anoxia up to 38,000 feet by maintaining the correct partial pressure of oxygen. Beyond that altitude, 100% oxygen at ambient pressure is insufficient to maintain consciousness.

Life Above Angels 38

Above 38,000 feet, then, oxygen must be delivered under positive pressure. In that way, sufficient pressure is added to the ambient to make up the necessary 160 mm Hg. As long as the partial pressure of oxygen (assisted by positive pressure) can be maintained at a 10,000-foot equivalent altitude or lower, the pilot can be assured normal breathing efficiency. Establishing these ideal conditions is not as easy as it sounds; there are human and mechanical problems to be solved first.

With the standard mask, delivery of pure oxygen under positive pressure requires major changes in the mechanics of breathing. Normally the energy required for breathing is expended on the act of inhalation—getting the air in. But when the positive pressure reaches a point 7 mm Hg above ambient pressure, the work load shifts to the breathing-out phase. At an altitude of 45,000 feet—where we require oxygen at 30 mm Hg positive pressure—the work of breathing multiplies 10 times, thereby introducing the fatigue factor. Prolonged breathing at this pressure also throws an increasing load on the entire circulatory system by causing a pooling of blood in the extremities similar to the effects of "G". If sustained long enough, this condition will also cause a loss of consciousness.

Extra Insurance

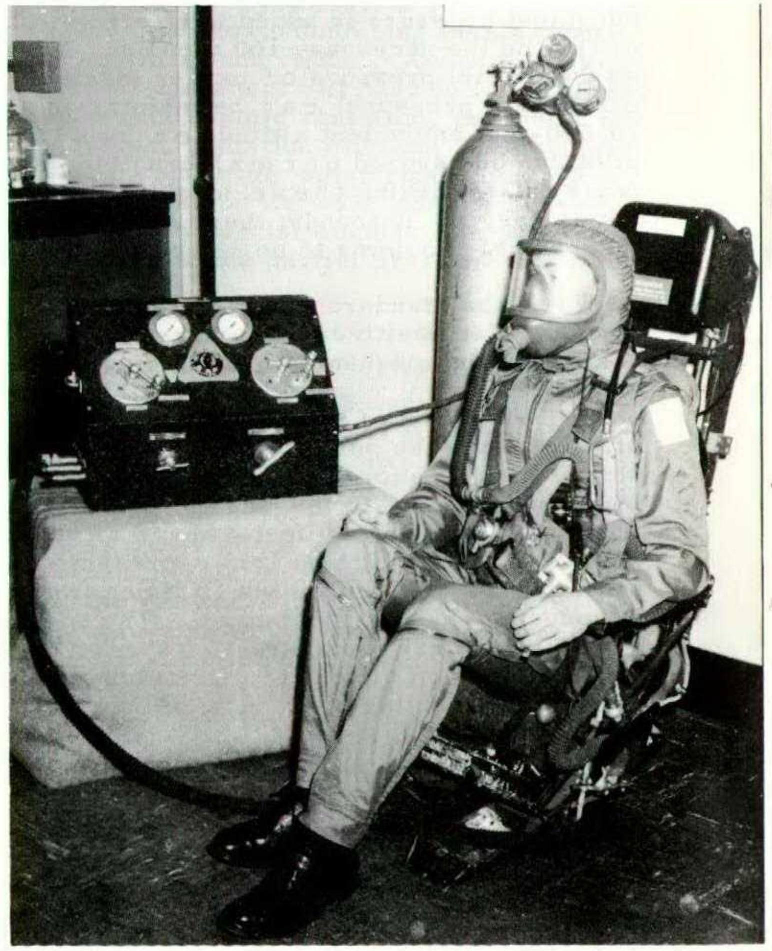
How can we increase the supply of oxygen to the body for extended periods without having to

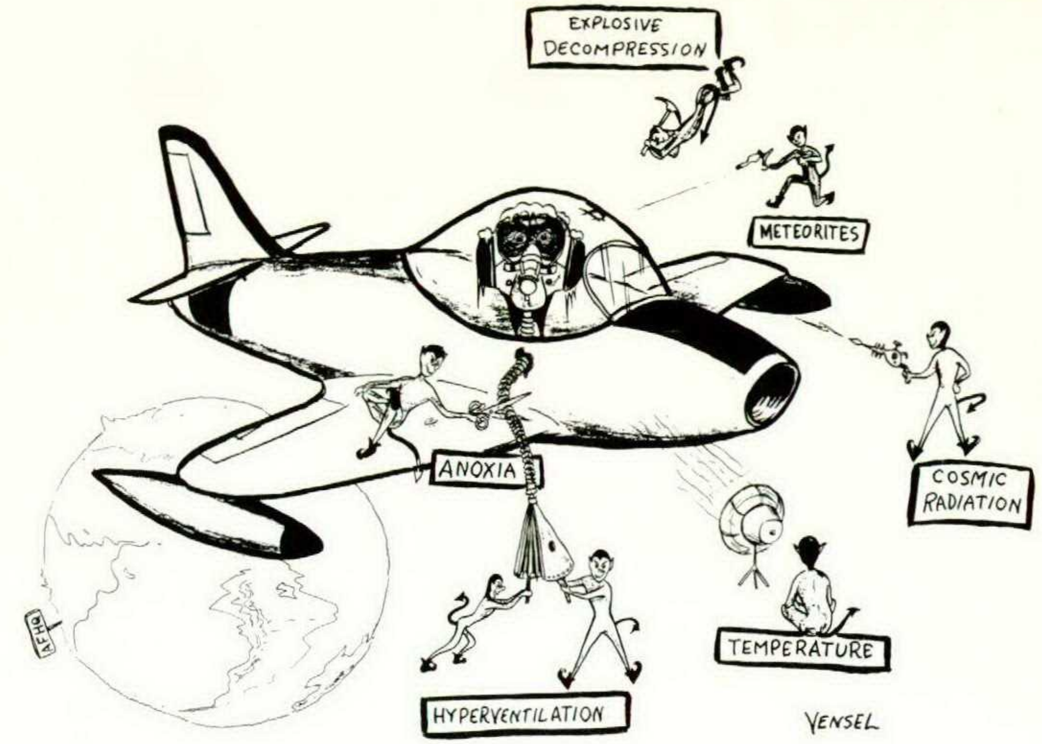
encounter these complications? Obviously the most satisfactory method would be to surround the pilot with an artificial environment having the same characteristics of air at ground level—the pressure cabin. Under normal conditions this solution would be the simplest and most satisfactory. But the engineer cannot guarantee that the cabin pressure in military aircraft—especially fighters—will always be maintained. Flying above 50,000 feet in a pressurized cabin, the pilot is without a worry until his canopy blows off or is pierced by a missile. When that happens he finds himself exposed to the elements without the equipment to protect him. This is where the pressure suit comes in.

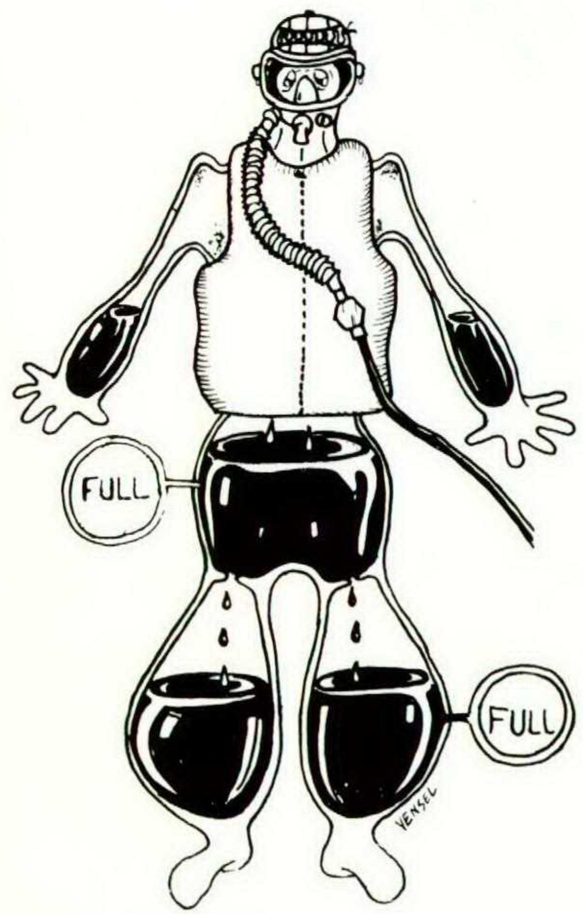
Ideal protection against sudden loss of cabin pressure would be provided by a full pressure suit. Such a garment would have to be large and cumbersome like a diver's suit so that it could be blown up or pressurized to maintain the necessary breathing pressures. But suits of this nature are heavy and bulky, restricting the movements required to fly an aircraft. In the meantime, therefore, we must be satisfied with a partial pressure emergency suit that will serve as a "get-you-down" device only.

Pressure Breathing

Now, what about the behaviour of our standard A13A mask under pressure breathing? The reader will recall mention of the extra effort which must be expended for a pilot to breathe against 30 mm Hg. At the pressures required at higher altitudes, he must use two hands in order to hold the A13A against his face. Because it is impossible to maintain a proper seal, oxygen escapes around the sides of the mask. Hence the need for a special pressure breathing helmet to supply the right seal around the face. Construction of such a helmet is difficult because of the several demands which must be met: comfort, adequate vision and intercommunication, ease of adjustment, and correct breathing pressure for flight above 50,000 feet.







Waistcoat and G-Suit

Pressure breathing up to a positive pressure of 50 mm Hg is considered the safe limit for a pilot who is wearing only a mask. Above this figure there is the possibility of lung damage unless a counter-pressure is exerted against the outer chest wall. This can be achieved by using a form of pressure waistcoat that can be inflated to equal the pressure inside the helmet. The waistcoat also relieves the pilot of most of the effort required to breathe out against the high pressures.

The pressure delivered to the lungs and the outer chest wall is also transmitted to the heart and large blood vessels in the chest cavity. Consequently the pressure in the large veins is increased to such an extent that they are unable to get an adequate supply of blood back to the heart. The result is a pooling of blood in the large veins of the abdomen and legs, accompanied by reactions similar to those experienced in blackout from G. To counteract this tendency the standard G-Suit is employed. It contains bladders in the abdominal, thigh and calf regions that can be inflated to equal the pressure within the helmet. This provides counter-pressure and aids body circulation to function properly.

The combination of pressure helmet, waistcoat and standard G4A suit constitutes our present emergency "get-you-down" equipment. We must emphasize again, however, that this equipment is for emergencies only. Under normal conditions cabin pressure will be provided. In the event of cabin failure the suit will automatically inflate and provide sufficient oxygen and pressure to enable the pilot to remain conscious while descending to an altitude at which he can survive. The vital importance of this additional protection becomes obvious when we remember that loss of cabin pressure at 65,000 feet allows only 10-13 seconds of useful conscious time to a pilot wearing the standard mask and oxygen equipment.

*

Man's restless energy and insatiable curiosity have succeeded in driving him up to a strange, new frontier lying only 10 miles from his back door. No journey ever undertaken by the explorers of history was either so short or so fraught with hazard. But, progress being what it is, there will be no turning back. The logical next step, now that man has reached this realm, is to discover the means by which he may live there in safety. Those who fly today's aircraft are in the forefront of this advance and will be the first to face whatever it is the new unknown holds for the adventurer. Because anoxia is only one of the many problems facing researchers in the field of aeromedicine, the wise pilot will remain continually alert to the hazards he may encounter in flight over 50,000 feet.

THE AUTHOR

S/L W. G. LEECH was born in Chalk River, Ontario. In May 1942 he joined the RCAF, graduating as a pilot in June of '43. From then until his discharge in October 1945 he served at Trenton as a pilot instructor.

After leaving the Service he enrolled at the University of Western Ontario in 1946, attained a B.A. degree and went on to medicine, graduating with an M.D. in 1952. During March of that year he re-enlisted with the RCAF.

Following a year as interne at Victoria Hospital, London, he returned to the University of Western Ontario for a post-graduate course in biophysics. F/L Leech joined the staff of the RCAF'S Institute of Aviation Medicine in September 1954 and has been stationed there ever since.

PXing

LETTERS TO THE EDITOR

Flight Safety Exchange

After reading the article "Fit to Fly" in the July - August '56 edition of Flight Comment, I would like your permission to reproduce it in our Command Quarterly Accident Review, as I think our pilots would benefit greatly from it.

I.G.O. Fenton, S/L
Flight Safety Branch
Royal Air Force

Glad to oblige. — **ED**

More Light

The article by F/L D.L. Snowdon "Light on the Subject" in the September-October 1956 issue of Flight Comment should serve to arouse more interest in an important part of low visibility approaches.

In the August 1955 issue of the USAF's Flying Safety magazine, there appeared an article on approach lighting of considerable interest to all aircrew. The approach lights on a low visibility approach are visible for an average of 12 seconds, during which time the pilot must orient himself with regard to ground, horizon, direction and altitude; so transition from instrument to visual flight in these cases occurs rather suddenly. The fact that the pilot is liable to encounter a minimum of 12 different sets of approach lighting in North America should emphasize the importance of pre-flight pilot briefing.

Comments from other units would be interesting. (The RCAF Experimental High Intensity System, coupled with DOT's L-Shaped Standard Threshold lighting, is favored by this section.) Meanwhile, congratulations to F/L Snowdon and Flight Comment for bringing the subject up.

B.J. Budgeon, F/L
Unit Instrument Check Pilot
RCAF Station Penhold

How about it, readers? Anyone else like to step up to bat? — **ED**

Training Problem

Just about the time you think you've heard them all, someone comes in with a new one. Recently, a VR-31 squadron airman reported that the "voice" tube he found under the seat in an aircraft was out of order. He couldn't talk to the pilot through it!

GRAMPAW PETTIBONE says: I'm glad they passed this discrepancy to the Training Department, rather than to Maintenance.

USN: Naval Aviation News

OVERHEARD IN THE CREW ROOM

"My pride won't let me go past the intersection, even if I have to turn on the castings."

FLIGHT SAFETY PRESENTS

FLYING FOLLIES - PART II | IT CAN HAPPEN TO YOU

14C/2777 | 14C/2664

This double feature has been chosen from a film survey conducted by Training Command. Watch this space for future billings. Films are listed in CAP 428.

Two views of a high speed snow remover at work.

ALL-WEATHER RUNWAYS

FULL-TIME winter runway surfaces are a first requisite of Air Defence Command functions and are now receiving more emphasis from other Commands. Winter ice and snow are two of the major deterrents to this vital requirement, however; and the increasing utilization of high speed jet aircraft has tended to raise the problem of satisfactory snow and ice control to a position of operational prominence. The simplified code of the Boy Scouts—be prepared, and co-operate by being helpful and agreeable—perhaps supplies us with a clue toward overcoming this obstacle, because such a philosophy must underlie any successful snow and ice control program at RCAF units.

For the most part, the onus for being prepared falls upon technical personnel. Arranging and planning for snow removal and ice control is accepted as a CE responsibility, although the actual provision and maintenance of proper equipment and the training of skilled personnel devolves upon the ME branch. On the other hand, co-operation between operational and mobile equipment is equally important since every effort must be made to regulate traffic so that it will neither interfere with snow removal nor compact the snow unnecessarily, and to plan parking in the interests of rapid snow removal.

Although in the final analysis snow and ice should be removed entirely, the weather doesn't always play ball, indicating that flexible schedules and compromises are essential. If a winter program is to be planned with the ideal in mind of keeping the all-weather runways fully serviceable, then there are a number of safeguards which must be adopted:

- Keep runways in continuous usuable condition during inclement weather. Keep the on-wind runway available for use as soon as a storm ends. Remove ice and snow and attend to secondary requirements in quiet periods.

Several essentials come to mind at this point. Readers will certainly be aware of all of them—but their importance justifies repeating them:

- Limit runway snow to a depth which will not hinder operations. Provide at least sufficient traction for control in conditions of either ice or snow.

Snowbanks ploughed parallel to one side of a runway will prevent snow from drifting across its surface.

- Eliminate banks of ice or snow which might damage or hinder aircraft. Remove loose snow, ice or other objects which might be caught up in prop or jet blasts to cause damage.
- Maintain good visibility over snowbanks and at all intersections. Provide over-runs and side extensions for emergencies. Insist on satisfactory drainage.

Snow Removal

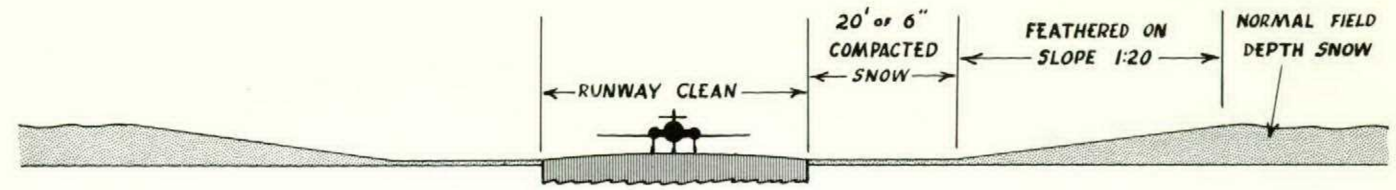
The disposal of snow is a prime consideration because a great deal of ice accumulation is due to the freezing of residual snow. It is therefore important that it be removed ultimately right down to the pavement. The operation ought to start when approximately two inches of snow has accumulated on the runways rather than at the end of a storm, although a depth of one to two and one-half inches should be left on runways for purposes of absorption if rain is imminent. Snow in excess of this depth can then be removed to allow at least partial usability of the runway during such periods.

This chore has been speeded up considerably by the recent introduction of high speed, (30 mph) variable direction, hydraulically operated snow plows which are many times more effective than the older wing plows. It is worth noting that safety belts are used by the crews manning this equipment. Crosswinds, if not anticipated, will hamper snow removal, although any clearance program is usually planned to make use of these winds in the effective movement of snow. Generally plows pile the snow in windrows along the lee side of a runway and blowers load it into trucks or blow it well out to the side with the wind's help.

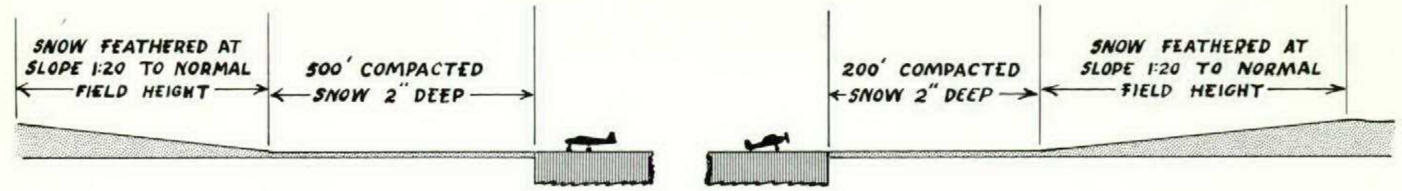
Between snowstorms is the time to complete secondary requirements which include: removal of compacted snow by powered brushes and blowers; compaction and/or removal of snow from runway intersections to provide reasonable visibility; ousting of snow accumulations on small areas between pavements; clearing of snow from around lights to establish a minimum horizontal width of 20 feet beyond the lights of runways containing no more than six inches of compacted snow, and then sloping it upward (at an angle of 1 to 20) to the infield or outfield snow level; completing snow removal on the aprons; compacting and levelling for 20 feet beyond apron limits—or enough to ensure that snowbanks will not foul the wings and tails of aircraft during parking operations; removing snow accumulations and drifts in manoeuvring areas near the hangars; inspecting and improving runway markings such as trees and threshold markings; and, finally, replacing or improving whatever measures have been designed to prevent snow from drifting onto the airfield.

The procedure employed to remove or control snow on runway ends is particularly important. For jet runway ends it is recommended that no more than a few inches of compacted snow be maintained for the first 500 feet, the

Now you see it—now you don't. These before and after shots provide an excellent example of the effectiveness of powered sweeping and blowing.



RUNWAY CROSS SECTION



SIDE VIEW OF RUNWAY ENDS

side width to be the same as for the runways. Because blowers will be required in this area, the first snow has to be rolled under favourable conditions in order to ensure maximum penetration of frost into the subgrade. Subsequent snowfalls can then be removed by the means used on runways, and the thickness of the compacted snow reduced at the same time. Beyond the 500-foot length, snow should be feathered upward to normal field level on a slope of 1 to 20 or more. For the ends of all other types of runways it is recommended that the snow be compacted and plowed for a length of 200 feet from the end of the runway and then feathered to normal field level (the procedure used for regular jet runways).

It is important that channels be kept open for the disposal of water produced by thaws and spring break-up. The present trend is toward sealing the side drains to prevent excessive surface water and sloping the shoulder away from the paved surface to a separate drainage scheme.

All of this extra work between snowstorms should be done as rapidly as possible in order to avoid the almost impossible situations that have arisen so often in the past when storms recurred at short intervals.

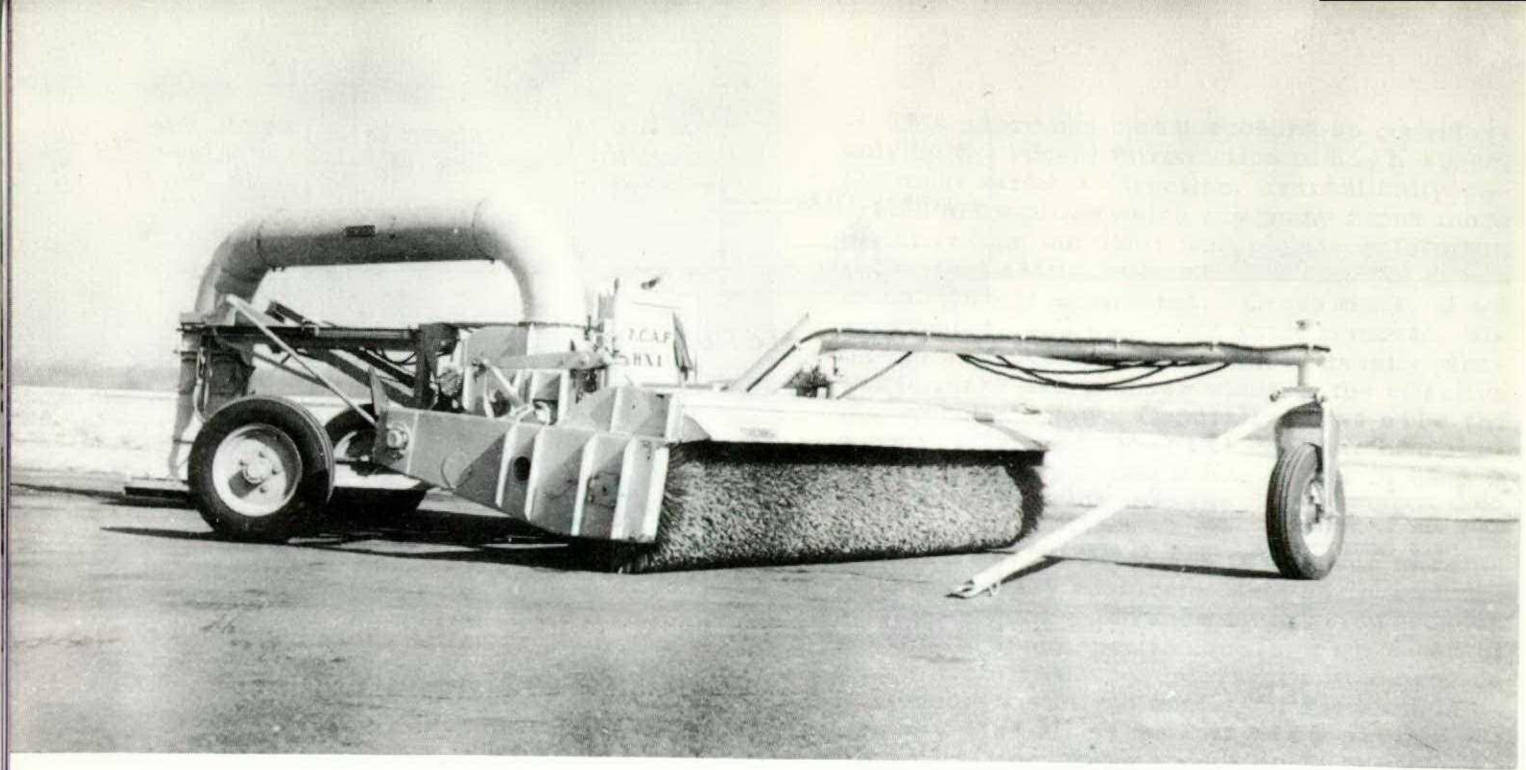
Ice Control

The main sources of ice accumulation are freezing rain and thawing and freezing snow. A secondary source is the sweating of pavement surfaces, particularly during the early spring. This latter type of icing is evidently deposited like dew, and results in a thin slippery surface on pavement that is otherwise dry.

Ice is not easily removed from runways but it is certainly desirable that periods of mild weather should be used to remove accumulated ice and sand with graders and sweepers. Whenever possible, they should be completely eliminated from paved surfaces so that the sand will not build up along the edges and hinder drainage.

It has been noted that light-coloured concrete and white markings on asphalt collect ice to a much greater extent than black surfaces. It is also understood that yellow runway markings accumulate ice to a lesser degree than white markings. Although ICAO (International Civil Aviation Organization) recommends white, there is no objection otherwise to the substitution of yellow. Freshly applied black colour on ice has not resulted in any appreciable improvement in ice control, and there has been no progress with chemicals. Calcium chloride is very slow acting at low temperatures and there is a further objection to its use (even when buffered so that it does not attack iron or aluminum) because of its corrosive effect on magnesium. The only recognized way to remove ice is to grind or scrape it off by a long, laborious process of passing and repassing over the surface using scarifying (toothed) blades and normal grading blades. A trailer that applies flame to runway ice and then covers with sand is still in the development stage.

To make iced surfaces operational, methods for improving traction have been studied. Com-



Power sweeper and blower. The blower and sweeper may be directed to either side.

Snow blower throwing well clear of the runway in order to feather the snow.

Snow blower loading directly from a windrow into a truck.

mendable results have been obtained by utilizing a street-flusher type of distributor spreading 1/100" of water on the ice, and following it immediately by a high speed sander scattering sharp sand (1/2 pound per square yard) on the ice. The mixture freezes, providing a safe, tractive surface.

The RCAF's informal committee on snow and ice recommend strongly that all vehicles used in ice and snow treatment on the runways be equipped with two-way communication facilities so that operators can be warned of approaching aircraft and controlled by the field supervisor. Heated cabs, it is pointed out, would also increase efficiency.

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When the snow season strikes with full force, it will either create chaos for the unit that is unprepared or merely trigger a smooth-running machine that has been set up well in advance to cope with obstacles that would otherwise place in jeopardy the safety factor that is so vital an ingredient of winter operations. The keys to success are two:

BE PREPARED

Keep the anti-winter program on the offensive by planning in advance of trouble.

CO-OPERATE

Regulate traffic and parking for maximum effectiveness of the program during both emergency and quiet periods.

HELP FROM THE GROUND

THERE IS an old saying: "One mistake often leads to another". Sometimes aircraft accidents are caused through mistakes made by the pilot—at other times through mistakes made by ground personnel. But, when both pilot and ground personnel make mistakes together, someone is going to get hurt. That is just what happened in this case: A pilot started with one error which triggered off a series of errors committed both by himself and by people on the ground whose job it is to assist flights in the air.

It all began when the pilot took off in a jet on a long-distance IFR flight to a base which was below limits. The weather was bad and there was little prospect of it improving, although the alternate was up to limits. The trip was uneventful until the pilot attempted a jet letdown at his destination. Normally this would present no problem—except that the weather was "300 feet and 1/4 mile". The pilot knew this, but instead of remaining at height and proceeding immediately to his alternate, he wasted fuel by giving it a try.

Naturally, he missed his approach and had to climb back up and make for the alternate. Unfortunately, along the route he was misinformed by GCI that he might not have sufficient fuel and was therefore advised to divert to another base closer by, where (it later turned out) the weather was even worse—"300 feet and 1/8 mile". The pilot accepted the suggestion, thinking GCI would have more information than himself.

Arriving at his new alternate he unwisely attempted an unpublished letdown at that base. At this point he was not too flush with fuel. To add further injury, the control tower had some telecom unserviceability at the time, and the duty control officer was inexperienced in the use of facilities that were still available for the handling of IFR traffic. On top of that, GCA was unable to make radar contact but attempted to interpolate the pilot's radio compass bearings and vector him over base. The pilot foolishly accepted the directions given him, even though he was aware that radar contact had not been achieved. The end came when the aircraft exhausted its fuel and the pilot was (presumably) forced to bail out over water. Neither the pilot nor the aircraft have been found.

What hurts is that, at the time the pilot was diverted from going to his original alternate, (and even after he had wasted fuel on letdown at the first base) he still had enough fuel to reach not only his alternate but any one of two or three other bases which were open. Even after committing all these errors, he could have been saved if he had been directed to the right aerodrome or if he had carried on to the alternate on his own.

Lack of space does not permit listing all the errors that were made. However, they may be summarized briefly like this: Lack of information at GCI stations on the range and endurance of jets and on the weather at other bases; inadequately-trained flying control personnel; inadequate aircraft control equipment; and the pilot's poor judgment throughout the flight. It hurts when you realize that the omission of almost any one of these mistakes would have prevented a catastrophic ending.

Nevertheless, it was the unfortunate pilot who started the trouble. He made his first mistake when he took off on a shaky weather forecast, and his second when he failed to go to his alternate after learning enroute that his destination was "clagged in".

The loss of the pilot and his aircraft brought to light many shocking weaknesses in our flight control services. We had failed to plan and practise for the provision of prompt and effective assistance to aircraft in distress. Because of the nature of our present operations and the characteristics of jet fighters, in-flight emergencies will continue to occur. In particular, fuel shortage—associated with unfavourable weather and communications failures—is a problem which aircrew will have to cope with for some time to come. And in tight situations, when the remaining fuel is measured in minutes and seconds, the judgment in the cockpit can be expected to be less than perfect. For these reasons, help from the ground must always be readily available.

Until such time as our flight advisory services are improved, every control tower, operations room, and radar station should be prepared—and alert—to provide assistance quickly to the pilot who is attempting to judge the best course of action. The fact that your station flies only piston aircraft, or is below weather limits at any time, does not eliminate the responsibility to provide assistance to an itinerant jet aircraft. To do this effectively, it is necessary for personnel in the various flight services to acquire a knowledge of the performance of all our aircraft—particularly the jets—and to have immediately available the latest weather conditions and facilities at all potential diversion bases. However, the provision for such emergency service requires preparation and constant monitoring.

So that preparation can be made for emergencies and the effectiveness of the organization can be checked, simulated emergencies could be practised to acquaint the ground organization with what can happen. Such practice would make it more competent in emergencies and reduce the chances of serious mistakes being made.

CHECK-OFF CHECK

This command noted the recommendation contained in CNATECHTRACOM Aviation Safety Council Quarterly report to the effect that tower operators use the phrase "If checkoff list is complete, you are cleared for takeoff!" This phrase will be inserted in local tower procedure later.

USN: Approach

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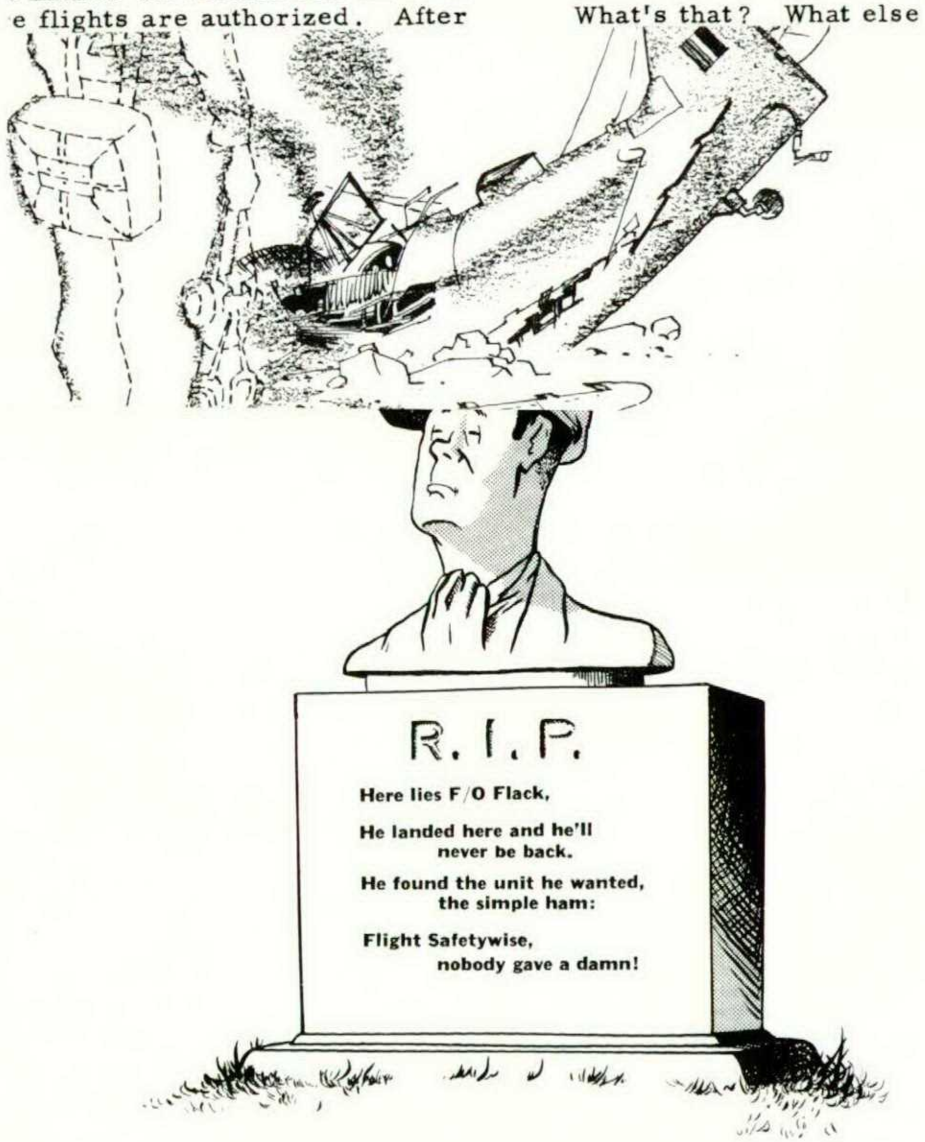

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a sabotage plan for getting snow removal equipment on the runway whenever they want to go flying. The CE Section is equally convinced that all pilots are juvenile spacemen who once in a while, just for the fun of it, land in the undershoot area and knock off their undercarriage either on exposed runway threshold lips or in deep snow. The maintenance people think that pilots are nothing but slave drivers always wanting aircraft serviced immediately; and the pilots are equally convinced that the "plumbers" spend most of their time thinking up special

right aerodrome or if he had carried on to the alternate on his own.

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inspections and modifications just to keep aircraft on the ground.

A real "must" is a station adjutant who keeps all the flight safety literature, accident summaries and analyses securely locked up in his safe (for his eyes only), and station supply people who are reluctant at any time to obtain and issue modification kits. Be sure also to consider the finer points before making your selection. We would suggest that you corner the command flight safety officer over a mug

the jets—and to have immediately available the latest weather conditions and facilities at all potential diversion bases. However, the provision for such emergency service requires preparation and constant monitoring.

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USN: Approach

of suds the next time he comes visiting your way. He is well qualified to give you advice on such matters.

After arriving at your selected station, you should take great pains in choosing the "right" squadron to join. Here again there are a number of things to look for before making a decision. One should be very careful to avoid a unit where new arrivals are given an aircraft check-out. This sort of thing may very well lead to you getting some dual on instrument let-downs and emergency procedures. Some squadrons insist that you pass written tests on POIs, CAP 100, and Command Staff Instructions—all of which is a mighty bind and, worst of all, might prevent you accomplishing your objective. It is much better to pick an outfit that will be sufficiently impressed with the fact that you are wearing a set of wings to get you airborne on your own without any nonsense.

Another significant clue is to steer clear of a squadron that insists on formal and detailed briefings before flights are authorized. After all, if there is any problem about the weather, one can always get Cloudy Joe on the phone and find out if the destination is open or if base is going to close in. (You've got a green ticket, haven't you?) Any details about your formation flight and the manoeuvres to be performed can always be worked out as you're walking out to the aircraft. These two- and three-ring people who insist on giving crews the word every day, checking flight plans and asking ridiculous questions about bail-out drill, ditching procedures and aircraft emergency equipment simply make life miserable for the drivers.

Another easily detected feature which ought to merit your approval is the organization that condones fast taxiing by the drivers airframe. We must admit that it is most impressive to see the "birds" sail down the taxi strip at 30 knots plus, roar into the parking area (dodging battery carts, chocks and fire extinguishers that have been left lying around) and end up with a flourish wing tip to wing tip. It's even more spectacular when the OC hasn't bothered to get the CE people to spread a little sand around ice-covered surfaces. Joining these boys would certainly be your meat.

*

What's that? What else do you have to do? Not a thing, brother—you have it made! Just ask one of your new associates (it doesn't matter whom) to authorize your flights and then get airborne. You'll have your accident and become a dismal statistic. It will be just a matter of time.

Which Way Is Up?

Do you suspect that at some time in your flying career you may have encountered vertigo? What follows below should settle that question in your mind and bring you up to date on the comparatively new subject of "flicker vertigo—or oculogyric disorientation" as it is called in aero-medical language.

VERTIGO has been experienced by pilots ever since they began to fly by instruments. The phenomenon is defined in the dictionary as a "dizziness or swimming in the head." To those who fly, it is known as the sensation of an attitude which does not agree with that indicated by the flight instruments. Most pilots have experienced vertigo; some have had trouble with it; and it is thought to have been the cause of a number of obscure fatal accidents. Recently a different type of vertigo has been introduced to aviation. It is called "flicker verttigo" and has apparently caused nausea and unconsciousness.

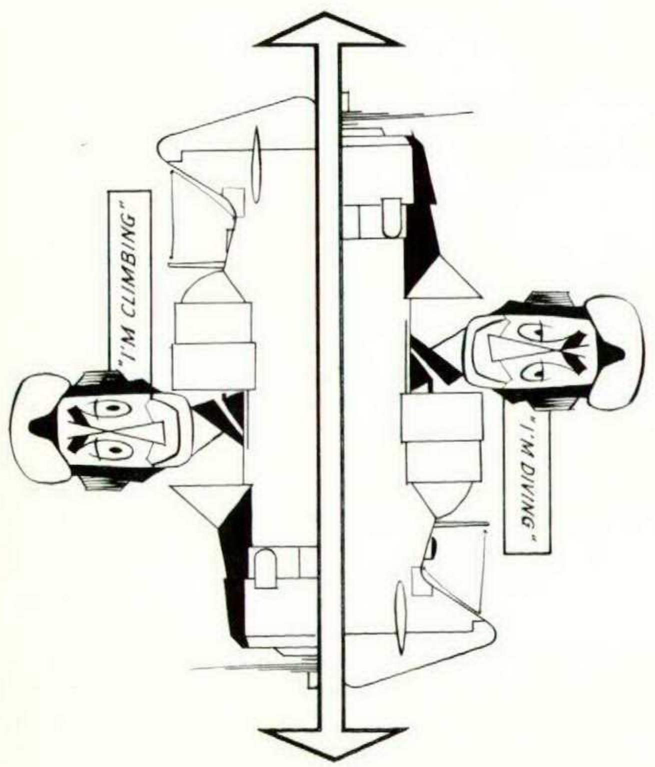
Vertigo

The usual type of vertigo generally produces the same symptoms in everyone: it will cause a pilot to temporarily disbelieve his instruments. This may be brought about by a change in attitude of the aircraft while the pilot is looking at some other instrument or control in the cockpit. He may not sense the change, but on looking back at his flight instruments he has to convince himself that their presentation is correct, despite what he actually feels. Usually this sensation can be overcome in a short period of time. However, if the pilot refuses to believe his instruments, trouble will occur. Such circumstances must be appreciated and guarded against—particularly during instrument approaches in jet aircraft—because time is at a premium and no confusion can be allowed to exist.

Causes of vertigo may vary considerably. Recently it was reported that B-47 pilots experienced difficulty in flying straight and level behind their tankers at night. It appears that a particular formation of "northern lights" gave pilots a false horizon to which they responded by attempting to compensate for what seemed to be a turn on the part of the tanker. Those who recognized the situation were able to overcome it; but recovery of complete control was difficult for those who suffered from vertigo. Consequently there were some failures to refuel in the air when the "lights" were active. The pilots eventually found they could eliminate disorientation by flying away from them. This was a case where two indications of attitude—one via the senses and one through the instruments—did not agree.

There have been fatal accidents in which disorientation by vertigo could well have been the cause. Among the examples on record is the case of a pilot who broke formation in poor visibility. Possibly he lost his outside attitude reference when separation from the leader occurred and then failed to maintain attitude on his instruments. Whatever the reason, his aircraft crashed, seemingly out of control.

One feels strongly that some wrong direction is the proper one.



Vertigo has probably been responsible for a number of other accidents which occurred during landing, during takeoff or overshoot in low visibility, and on dark nights or in whiteout when the transition between visual and instrument flying is intermittent. Once a pilot removes his attention from the instruments temporarily, it may take him considerable time to bring his aircraft under complete control again and to concentrate on the instruments.

To unearth data on this specific phase of the problem the USAF blindfolded experienced pilots in flight on instruments and then placed their aircraft in a slightly abnormal position. When the blindfold was removed the pilot attempted to recover normal attitude. It took an average of 11 seconds to make the recovery. The experiment employed what are probably the best known methods of teaching pilots recovery from unusual positions and demonstrating how susceptible we all are to vertigo. Also, we are left with the impression that the danger lies not in vertigo itself but in the failure to recognize it and to overcome the false impression of attitude.

Flicker Vertigo

The dictionary definition is more applicable to flicker vertigo than it is to the vertigo we have been discussing. "Dizziness or swimming in the head" is the expression we mentioned earlier. Medical writings indicate that flickering light can produce a condition similar to an epileptic fit. When the frequency of the light is critical, reaction varies from nausea to unconsciousness. These symptoms are quite different from those for straight vertigo, and because of the similarity of their names it is possible for the two to be confused.

One case of flicker vertigo involved a pilot who was flying into the setting sun during his approach to land. He became nauseated and very nearly passed out. The symptoms were present during the landing but ceased when the aircraft was turned away from the sun.

A similar incident happened in Denmark. The pilot had been flying at 16,000 feet in a single-engined, propeller-driven aircraft. The flight over, he made a perfect landing and stopped the aircraft on the runway with its propeller turning slowly. The pilot was found unconscious. Lack of oxygen was suspected at first, but since the pilot had landed his aircraft, it was reasoned that unconsciousness must have occurred after the landing. Actually, reflected flashes from the low-lying sun had bounced from the propeller onto the pilot's face at about 12 flashes per second. The critical flicker rate that will have adverse effects on the brain is estimated at between 10 and 20 per second according to some authorities; others say that symptoms may develop between four and 12 cycles per second.

Flicker vertigo occasionally teams up with odd factors to give the unwary pilot a hard time. Strange as it may sound, the flight of a light aircraft in low cloud conditions ended in a fatal crash because the aircraft was fitted with revolving warning lights. Following the accident, tests were conducted with a similar installation on the same type of aircraft and the results proved quite startling. Here is the report as it was published in the May 1956 issue of the USAF's "Flying Safety".

"A test was made under IFR conditions. Both rotating lights were turned on when the aircraft approached scud at the bottom of the overcast. Upon entering each successive cloud tuft in the scud the upper rotating light produced bright red, intermittent, blotchy glares of far greater intensity than could possibly have been anticipated. The sweeping action from left to right introduced a degree of vertigo requiring the fullest concentration possible on the flight instruments to maintain control of the aircraft. The upper light was turned off and the lower light produced a similar result, though to a far lesser degree.

"The aircraft was then pulled up into the solid overcast and both rotating lights were again turned on. The intensity of the glare from the solid cloud increased substantially over what it had been in the scud. The sweep of the upper light from left to right produced an intense bright red revolving glare within the cabin through a continuous arc of about 280 degrees. Simultaneously the lower light produced a contra-rotating glare through a broken forward arc of about 200 degrees. The combined result produced extreme vertigo in a very short time. No individual experiment could be continued safely beyond an interval of 30 or 40 seconds' duration. A number of tests were conducted and in no case was positive control of the aircraft possible beyond the approximate period of its inherent stability."

Obviously the light is dangerous in cloud because of its effect on the pilot. It is most likely that the rotating glare around the aircraft and in the cabin set up a conflict between what the pilot saw on his instruments and what he felt because he was conscious of the revolving glare about the aircraft.

Another experience has been outlined by a pilot engineer whose report is repeated in its entirety because of his interesting comments on vertigo.

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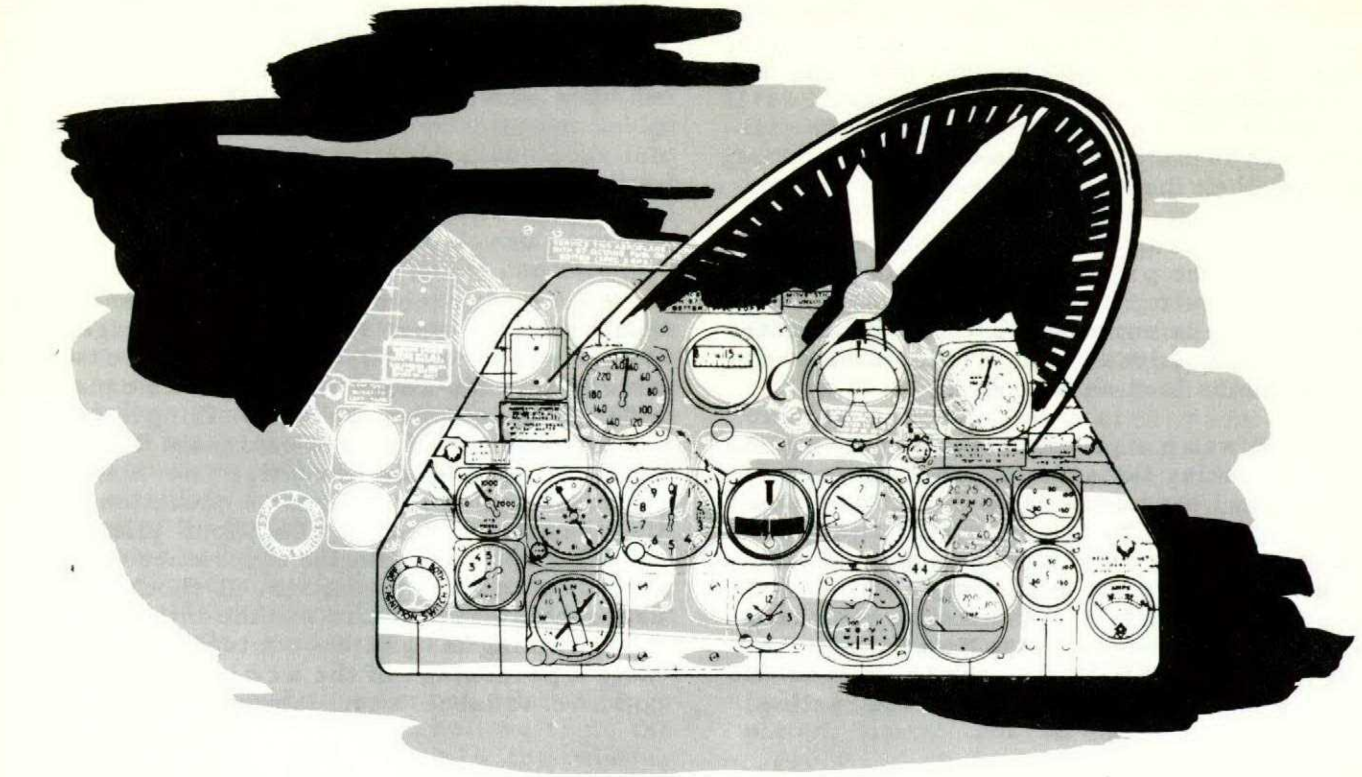
"During a recent flight in the B-26, a condition was encountered in which vertigo could be induced at will. Vertigo is not really rare, but written reports on it seem to be sufficiently uncommon that I thought this firsthand account might be of interest.

"Webster defines vertigo as 'dizziness or swimming of the head'. In aeronautical circles the word usually means a loss of the sense of the true vertical, as well as a turning sensation. Furthermore, vertigo doesn't mean merely that one does not know which way is up; one feels strongly that some wrong direction is the proper one. The feeling isn't vague. It is almost overpowering. Vertigo is apparently affected by vision as well as the other cues to balance.

"A hood and instruments were installed in the B-26 to allow the co-pilot to fly on instruments. The hood was made of thin masonite and consisted of several pieces arranged as louvers, so the pilot (safety pilot) viewed them edgewise and could therefore see out, while the co-pilot viewed them broadside and could not see out. The piece nearest the co-pilot was about a foot in front of his eyes and ended on the right side at the structure separating the back of the windshield from the front of the canopy. This piece was not fastened down tightly. It could and did vibrate with a high frequency (probably engine frequency) and very small amplitude. Furthermore it did not fit tightly against the structure, and light could come in between the structure and the hood piece and shine on the hood.

"When the airplane was headed in a certain direction relative to the sun, sunlight did come past the windshield structure and shone on the hood. If the rays of sunlight were nearly parallel to the plane of the hood piece, the vibration of the hood piece made a flickering pattern of light across the brown unpainted masonite. As soon as the flickering appeared it caused an immediate attack of vertigo. There was no appreciable build-up time required—as is necessary for airsickness, for example. The vertigo could be turned on and off at will by holding the hood piece tight against the windshield structure, which both stopped the vibration and shut off the light. The independent effects of light and vibration were not investigated.

"It seems to me that the vertigo persisted for about one second after the flickering light was shut off, and that the sense of equilibrium remained upset until it came back and settled down, almost with a click, at the end of the second. I thought at first that the hood had slipped and was allowing me to look out and see a hillside rushing by. The vibration and the light on the brown masonite looked like a hillside covered with trees which had not yet gotten any leaves. This impression was all



The instruments appeared to be floating in space.

the stronger because it was known to be a possible one, since the airplane was flying low in hilly country.

"As soon as the vertigo started, I felt very strongly that we were in a steep diving turn to the right. After a short period (perhaps 1/2 to 1 second) of astonishment at such a sudden change in the attitude of an airplane which had been giving me no trouble, I recognized the effect as vertigo and concentrated on the instruments.

"The instruments did not look real; they appeared to be floating in space although they could be read all right. However, a lot of willpower was required to believe them, and a lot of mental effort was required to force myself to mechanically scan and interpret the instruments by direct intellectual effort instead of by habit. The artificial horizon I was using had a 7-degree bank angle error, and I couldn't remember which direction the error was in. I therefore looked across the pilot's horizon instead of the small electric instrument. The vertigo ceased; but it was found by trial that it stopped because turning my head sufficiently to see the other instrument brought it well off to one side. A little investigation showed that it was not possible to see the ground through the crack between the hood and the windshield structure. Yet the impression of ground rushing by remained strong.

"When the source of the trouble was found, I spent a little time turning the vertigo on and off to study the effect. To fly on the heading which put the sun in the proper position to make the light shine nearly parallel to the hood, I had to hold the hood tightly against the windshield structure. We solved the problem in practice by flying in some other direction. A 15-degree change in heading would suffice. It was not just a question of sunlight on the hood. That occurred any time the sun was beside or behind the airplane. The sun had to shine through the crack nearly parallel to the hood to allow the vibration of the hood to modulate the light. I considered the possibility that the light was shining through the propeller disk and was being modulated by the propeller blades, but the angle was wrong, making this impossible.

"The most remarkable thing about this experience was the strength of the erroneous impression as to the airplane's attitude. It took real will-power to toss out that impression and concentrate on the instruments. I have about 320 hours of instrument time and have given considerable instrument instruction, and I am familiar with the more common forms of loss of equilibrium. For example, there is the slight loss of orientation during recovery from a steep turn on instruments, when one thinks the airplane is turning the other way and the nose is going down. There are also the "leans", when the pilot gradually begins to think a wing is down. He continues to fly by instruments, but gradually leans his body to one side, and may actually reach quite ludicrous angles if the cockpit is big enough. He suddenly realizes he is leaning and recovers with a start, feeling rather foolish.

"A third example, which occurs rather often, gives the pilot a vague feeling that the airplane is doing something foolish, although the feeling is not strong enough to interfere seriously with his flying. The feeling may persist for as long as an hour.

"There was no possibility of shaking the head or blinking the eyes to break up the false impression I have been describing, because the source of stimulus was still there and started the vertigo going again immediately. As I pointed out in the beginning, vertigo is not rare, but this was by far the strongest case I have experienced—or even heard of. Furthermore the ability to turn the vertigo on and off as easily as with a switch was interesting."

From the foregoing it would appear that the combination of sunlight and the vibrating masonite panel produced an illusion of tree-covered hills passing by. In effect, the impression given the pilot by this distracting illusion did not agree with the attitude indicated by the instruments.

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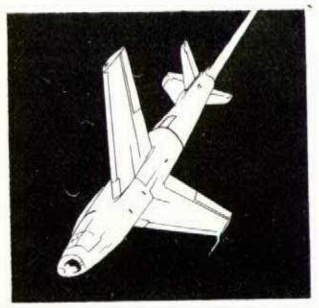
We might conclude from the evidence that, whatever the type, vertigo can be dangerous. It does not have to be, however. Pilots who have been made aware of vertigo, its cause and effect, are equipped to do something intelligent about the hazard if it ever confronts them. The artificial production of vertigo for classroom purposes could be useful in an educational way. Under safe, controlled conditions pilots could come face to face with the experience of having a "mental tumble" in the air. It should even be reasonable to speculate that the introduction of such training might have a tendency to eliminate a percentage of the accidents we are forced to label "unexplained" or "obscure".

Accident Resumé



What's Buzzin' Cousin?

During a manoeuvre at high altitude the pilot noticed that one of his ailerons was "jumping up and down", so he quite rightly aborted the exercise and returned to base where technicians found that an aileron hinge bracket was broken.

Materiel failure? Well, of course! What else could it be? But thereby hangs a tale.

The OC took the matter a little further and determined that the same pilot flew the aircraft on the previous sortie. On that trip this "Quiver-Quilled Plummet" had belted down from 40,000 feet to 1,800 feet ON THE JUDDER ALL THE WAY! Thus the sins of the fathers were visited—for once—on the fathers! Similar failures have ended more disastrously in the death of the pilot.

Now we all know that buffet is something to be avoided, at least for any prolonged period. We also recognize that it can occur at high speed or low speed. Basically it is a violent airflow fluctuation or break-away and can be precipitated either by shock waves at high speeds or a simple slow stall. In either case it is likely to impose quite a strain on hinged flying controls, which will vibrate or flutter madly in the disturbed airflow.

The T-33 provides a good example of this. Who has not, at some time or other, watched the ailerons like a rabbit watching a snake while a clued-up type demonstrated "aileron buzz" to us? In the T-bird it can be readily recognized in the cockpit by a feed-back into the control column. We feel it, recognize it, and promptly take action to get out of the buffet condition.

When we move to irreversible controls we lose some of that cockpit awareness, since there is no feed-back. Thus we get little advance information; and often the first indication is a fairly heavy airframe buffet. Again, this in itself matters little—provided we recognize it as a warning, and change our flight condition to get out of the buffet region. Should we ignore the warning and "press on", then the ailerons and elevators are liable to be going at it harder than a rock'n'roll session, even though the cockpit controls seem unaffected.

Sabre pilots have experienced aileron hinge failures, and those who don't believe that the tail is just as vulnerable should try twisting their necks to take a peek the next time that telltale shudder sets in!

Nobody is saying you should never hit the buffet zone; but when you do, use it as an indicator and back off at once. Remember that buffet is a stall warning, and that a high performance fighter at the stall is for the birds—"sitting duck" birds, that is!

Ice Jam

During a routine training flight the pilot had set course on his first leg at an altitude of 43,500 feet when suddenly he noticed that aileron movement was restricted. After some exertion he was able to break the port aileron free; but stick movement to starboard was impossible.

After loosening the port aileron, he noticed that the controls would not return to the neutral position but stopped increasingly more to the left so that greater amounts of starboard rudder had to be applied to maintain direction. Suspecting icing of the controls, the pilot kept moving the aileron control to try to prevent its freezing solid. Each movement resulted in its stopping farther to the left until no more movement was possible. The controls then froze solid, and the only way the pilot could keep the Sabre straight was by reducing power and holding on right rudder. He finally declared an emergency and skilfully completed a forced landing at base. As the landing run was completed, partial aileron control was regained.

Examination of the aircraft revealed that a large quantity of water had accumulated under the cockpit floor. At altitude, ice had formed immediately behind the rear fuselage bulkhead in such a manner as to block aileron movement. This incident could easily have become a serious accident. Protect the aircraft from rain and ensure that vulnerable areas are drained regularly.

Correct The Approach

The "old sweats" tell us that a good landing starts in the circuit. That there is more truth than poetry in this statement is indicated by the following accident.

The pilot had returned to base to complete his assigned exercise by practising circuits and landings. After completing two touch-and-go landings he was cleared for a third—this time flapless. Ahead of him was another T-33 which was also cleared for a flapless touch-and-go landing. In the words of the pilot, "The flapless landing aircraft was ahead of me and quite close. I was close to the runway and my airspeed was low, so I applied power." His aircraft continued to sink and hit hard in the undershoot area, breaking the starboard undercarriage strut as shown in the accompanying

The aircraft hit hard, breaking the undercarriage strut.

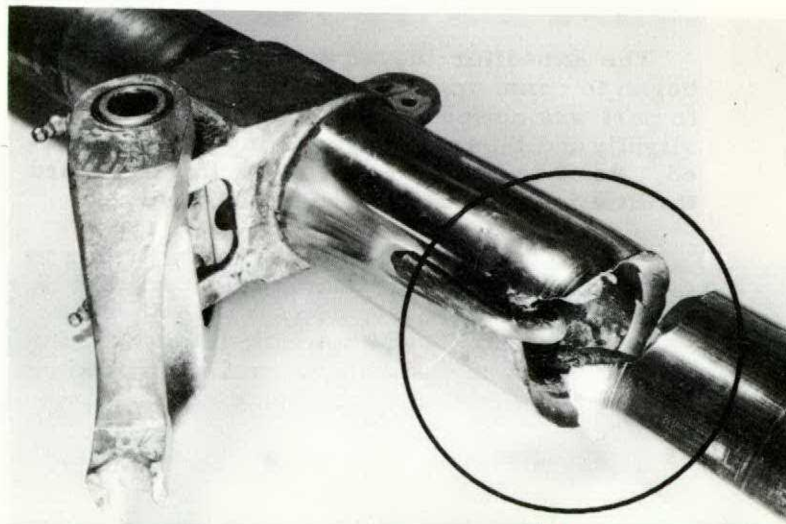


photo. The T-33 was seriously damaged before it came to rest.

By positioning himself too close to the aircraft ahead, the pilot set himself up for just what happened. Instead of being able to concentrate on a safe approach to the runway he was concerned about his nearness to another aircraft. The result was a broken airplane. The pilot was lucky it was no worse; but a decision to go around early in the approach would have kept him out of trouble.

Another Blocked Control Column

In the Sep - Oct 1955 issue of Flight Comment a Near Miss was reported under the title "Blocked Control Column". It concerned the case of a T-33 in which the pilot's seat pack had rotated in the seat bucket so as to cause the bailout oxygen bottle to jam the control column. A new case has been reported in which the circumstances are sufficiently similar to justify repeating the warning.

The instructor involved states that his student made too slow a recovery from a left-hand spin which had been started at 25,000 feet. Because he failed to centralize the rudder soon enough, the T-33 flicked into a violent starboard spin, nose tucking under 30 to 50 degrees past the vertical. The student in the front seat slid down so that his seat pack moved ahead and jammed the control column fully forward and to the left. After considerable difficulty it was centralized, but still in the fully forward position. Under these conditions the instructor was able to stop the spin although the aircraft remained in a steep dive. The student finally managed to adjust his seat pack and recovery to level flight was completed at 8000 feet. The aircraft was damaged when minus 4G was applied during the emergency.

An insufficiently tightened lap belt permitted the student's seat pack to rotate forward. This accident therefore emphasizes again the extreme importance of ensuring that the lap strap is tightened before shoulder straps are tightened and adjusted.

Control Or Confusion?

Two qualified pilots were authorized for an instrument flying exercise with the captain occupying the right hand seat. After all checks were completed the pilot started his takeoff run.

The Expeditor moved straight until the tail began to come up, at which time a slight swing to port was noticed. The pilot over-corrected slightly and then a stronger swing to port started. As it developed he closed the starboard throttle in an attempt to regain control.

The captain then got into the act by trying to take control without so advising the pilot. He shouted to the pilot to close both throttles, which was done. The captain then lowered the tail and kept full starboard rudder on, hoping that the locked tail wheel would help in maintaining direction. By this time, with both pilots on the controls, the confusion was complete; and as the Expeditor returned to the hard surface in a skid, the port undercarriage collapsed and the aircraft slid to a stop.

Examination of wheel marks on the runway showed that considerable brake had been applied during efforts to regain control; but with two people trying to accomplish the same objective
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impossible to dete
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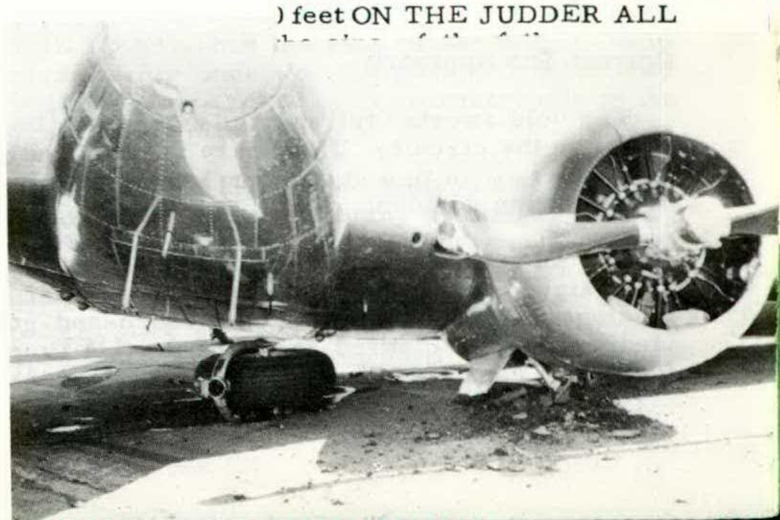
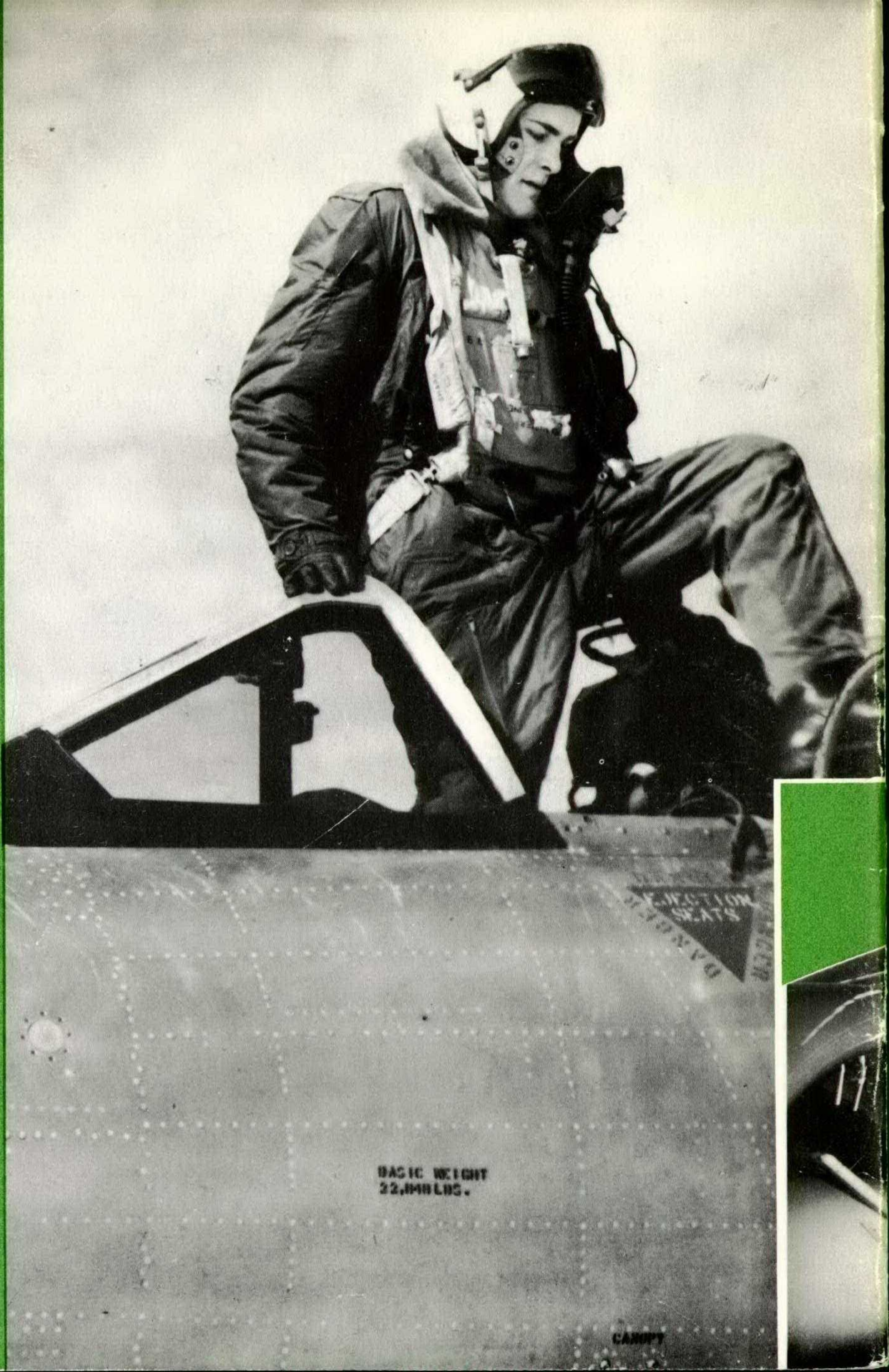


QUIVER-QUILLED PLUMMET

Or Hotroccus Intrepidus. A swift, sleek, high flying bird whose favourite sport is diving at excessive speeds, often at other, lesser birds. Has been known to shed wing-tip and tail feathers whilst at play, and even to take the game to the extreme of breaking bones or of complete self-destruction. A booming sound sometimes betrays its presence to a casual observer on the ground. Wings and tail occasionally give off a buzzing sound when at play.

BIRD WATCHERS' CORNER


EJECTION SEATS
BASIC WEIGHT
CANOPY