FLIGHT COMMENT

MAY · JUNE · 1957

FLIGHT COMMENT

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

MAY · JUNE 1957

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OFFICIAL INFORMATION

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

S/L W. G. RICHMOND

S/L RICHMOND was captain of a Canso on a ferry flight from St. Johns, P.Q. to Winnipeg. Following takeoff from a wet runway he had the undercarriage cycled three times to allow drainage and prevent freezing of the locks. One refuelling stop was made, at which time the undercarriage operated normally.

On arrival over Winnipeg a down-selection was made but the nose wheel failed to extend although the nose doors opened and the nose wheel unlocked. At this time the undercarriage hydraulic pressure registered 1150 psi. An up-selection was made and, after the locks had engaged, another down-selection was tried. This time the nose doors opened and locked but the nose wheel remained up and locked. Emergency procedures were instituted, but again the nose wheel failed to extend when the undercarriage was cycled. Next, the emergency lowering lever was fitted to the ratchet mechanism; but the full force of two men failed to move the nose wheel, and hydraulic pressure still indicated 1150 psi. A careful visual inspection revealed no mechanical break, so the captain presumed that the sequencing had failed, thus placing full pressure on the wrong side of the jack.

S/L Richmond then ordered the starboard engine shut down, after which he bled off the hydraulic pressure by pumping the brakes. When the hydraulic pressure had been reduced to 500 psi, emergency lowering was possible and the nose gear was forced down and locked. The starboard engine was then started and the landing completed.

S/L Richmond's thorough knowledge of his aircraft enabled him to diagnose the trouble. By stopping the starboard engine, from which the hydraulic pump is driven, he was able to get the wheels down for the landing. This is a case where superior knowledge of the aircraft system and careful analysis of the symptoms enabled the pilot to overcome a malfunction. Had he not been able to do this, considerable damage to the Canso's hull might have resulted.

HOT WEATHER TAKEOFFS

S/L O. B. PHILP

EVERY SPRING it is undoubtedly true that "a man's thoughts turn to what he's been dreaming about all winter." In the case of red-blooded Canadian pilots these thoughts probably encompass such things as vacations complete with sunburn, golfing and how to break a hundred, fishing and that "big one", and (no, we haven't forgotten) cherchez-ing la femme.

How many of these pilots have given more than a passing thought to the effect summer temperatures have on the takeoff performance of jet aircraft? We suspect that their number is few and that even those few may not fully understand the reasons behind the problem. What follows here, then, is an attempt—without the use of astounding mathematical formulas—to explain why high temperatures increase takeoff distances.

Performance of our aircraft during the spring months is not greatly affected because the change in temperature from winter to spring is generally so gradual that we are easily lulled into a false sense of security. As summer approaches, this change is no longer gradual but rises sharply, and such calamities as aborted takeoffs become commonplace. Pilots making their weary way back to operations and the wrath of their squadron commanders can be heard growling remarks like "I had a loss of power" or "It wouldn't accelerate" or "The nose wheel wouldn't lift" or "It just wouldn't unstick."

What is the reason for this apparent loss of power? The general answer is "a malfunctioning engine." The engine is at fault, all right, not because of a malfunction but because of atmospheric conditions which play a vital part in the performance of any engine, and especially the jet engine.

To understand aircraft performance, a few facts about the properties of the atmosphere and how they vary are necessary. The chief physical properties of the atmosphere which affect aircraft performance are temperature, pressure and density. Because these properties are always varying, a standard set of conditions, known as the International Standard Atmosphere, is used. Briefly the International Standard is as follows:

Temperature

The temperature of the atmosphere at sea level varies from place to place and from day to day but the average value is 15°C (59°F) which is taken as the standard sea level temperature. As we rise above sea level, the temperature lapse rate is 2°C (3.56°F) per thousand feet up to approximately 36,000 feet. Above this altitude the temperature remains fairly constant at minus 57°C.

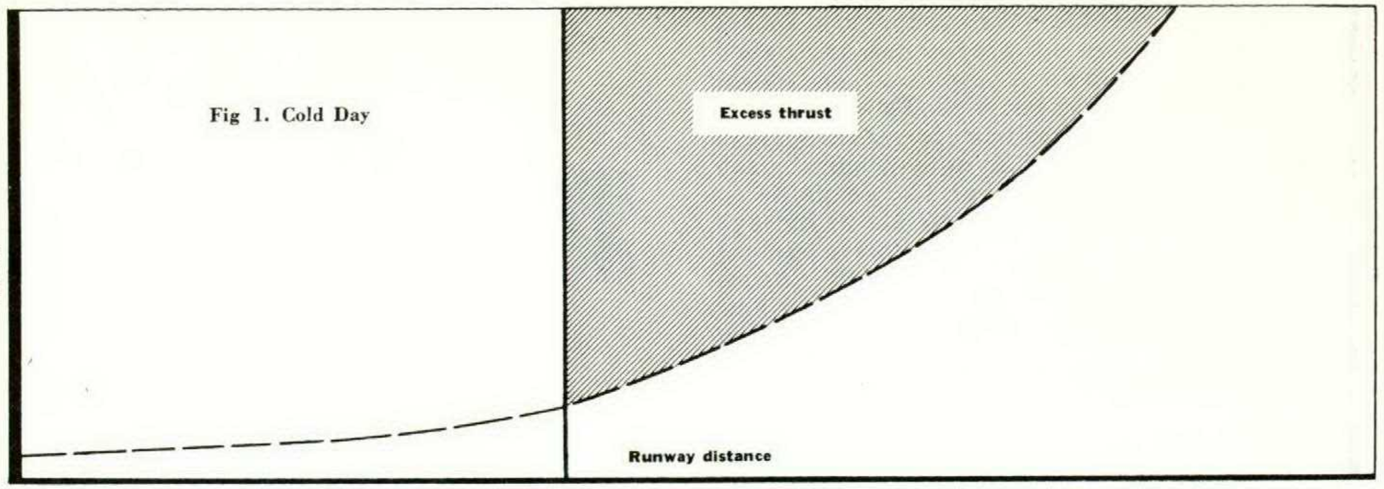


Fig 1. Cold Day

Pressure

The pressure of the atmosphere at sea level is measured in pounds per square inch (or inches of mercury) and reflects the force of a natural column of air from the limits of the atmosphere acting on a predetermined area of the earth's surface. The average value of atmospheric pressure at sea level is 29.92 inches of mercury (14.7 pounds per square inch). Pressure decreases with increased altitude; at 18,000 feet the pressure is approximately one-half of sea level pressure and at 28,000 feet approximately one-third.

Density

The density of the atmosphere at sea level is measured in pounds per cubic foot. Air, like all gases, is compressible; and the atmosphere near the earth's surface, because it is supporting the weight of the upper air, is compressed and has greater density. The average sea level density taken as the standard is .077 pounds per cubic foot.

For most pilots these "standard conditions" are somewhat mythical because they are rarely encountered; and hence their aircraft seldom perform exactly as stated in the book for any given conditions. These variables can, however, be corrected to standard. When this is done, the book is right—amazing as it may seem—for standard conditions.

The takeoff run of any aircraft, and particularly jets, is dependent upon air density which, as pointed out, varies with atmospheric conditions. Density Altitude (defined as "the altitude at which air of a given density exists in the standard atmosphere") which also depends on temperature and pressure, becomes a factor that must be considered. It is a comparison of existing atmospheric conditions to standard conditions and can be computed by correcting the atmospheric pressure adjusted to standard pressure for existing temperatures.

Thrust produced by a jet engine, like the lift of an airfoil, varies directly with the density of the air; and therefore the density altitude affects an aircraft's takeoff run. It follows that the mass flow of air through the engine is affected, with the mass decreasing as the density decreases—the result being a corresponding loss of thrust. Therefore "high ambient air temperatures" cause increased density

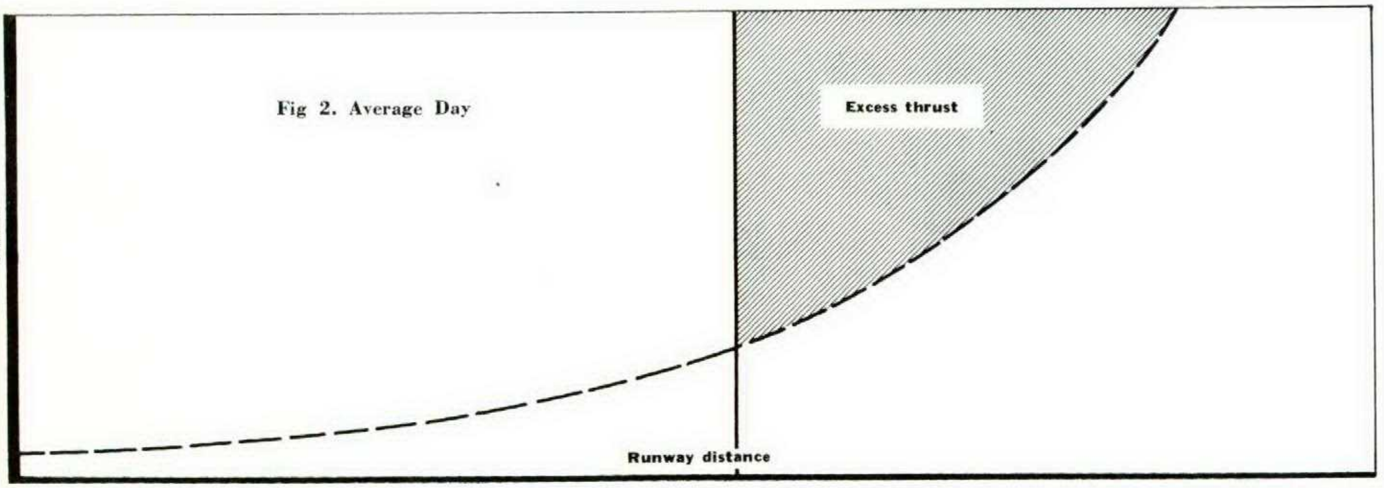
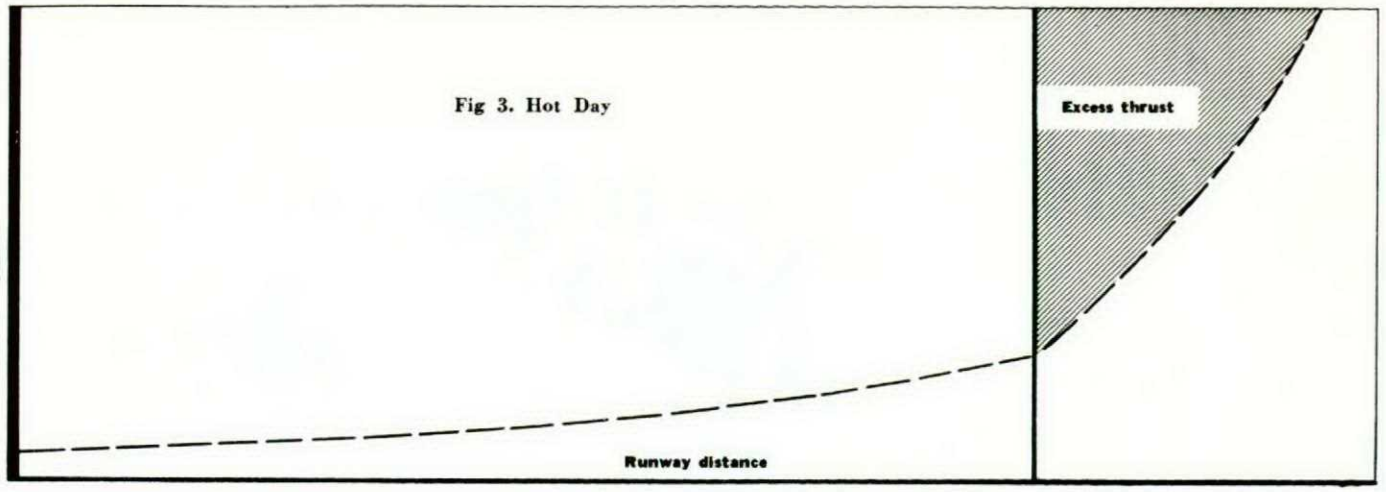


Fig 2. Average Day



altitudes, decrease in thrust and increased takeoff runs.

Airspeed indicators, as you know, operate on pitot pressure which is also dependent on air density; therefore the indicated takeoff speeds and stalling speeds are the same for any density altitude. However, the true speed or groundspeed required to produce enough lift for takeoff will increase with an increase in density altitude because the lift of an airfoil varies with the air density which varies with temperature.

It has been shown above that temperature and density are factors important to pilots. But how important? We have said that when the ambient temperature is high the thrust is low, and generally speaking, for each 5°C (10°F) of temperature above standard, the thrust of a jet engine is reduced by approximately four percent. Conversely, of course, when temperatures are below standard, thrust is increased—but this doesn't present a critical condition except that acceleration is faster and care must be taken not to exceed the gear-down maximum speed. The accompanying diagrams illustrate the comparison between cold, standard and hot day takeoffs. From them we can obtain a Rule of Thrust: Each 5°C (10°F) increase in temperature above standard increases the length of a takeoff run by 10 percent.

As for density altitude, a decrease of one inch of mercury or an increase in temperature of 8.3°C (15°F) will increase thrust approximately three percent. Hence, for each 1000-foot rise in density altitude, a 10 percent increase in takeoff distance should be expected.

After all this talk, the main point is still the fact that the hotter it gets the longer the takeoff run is going to be and the slower the initial acceleration after lift-off. If you are committed to take off on a hot day, remember that the thrust is decreased and the takeoff roll is increased. Don't pull the stick back too soon. Don't get the nose too high in lift-off or you will be attempting to fly on the wrong side of the power curve. And don't expect rapid acceleration. Remember these points and you won't be explaining to the "Old Man" why the crate wouldn't come unstuck.

THE AUTHOR

S/L O.B. Philp was born in Vancouver, B.C. In 1941 he joined the RCAF and served in England, India and Burma during World War II. From the end of the war until 1951 he was employed in various duties, being stationed in Europe, CJATC Rivers, and RCAF Station Sea Island.

In 1951 S/L Philp attended the Empire Test Pilots' course at Farnborough, England. Returning to Canada in December of that year he was transferred to CEPE Rockcliffe where he served as a test pilot, holding the position of Chief Test Pilot from 1954 to 1956. Since September 1956, S/L Philp has been attending the RCAF Staff College course in Toronto.

THE IMPORTANCE OF REPORTING

Periodically complaints are received about the amount of work involved in completing reports on accidents and incidents. Some of the complaints are received verbally, others via the grapevine and still others through official correspondence. One may exclaim: "This is straightforward enough. We found and fixed the trouble. Why make out a long, detailed report?"

To answer the objection, here is an example of how a report can help to prevent accidents. Recently, problems have been encountered in the Canuck control system. In some cases bail-outs were necessary and aircraft were destroyed—as was any evidence that might have been instrumental in determining the cause of control malfunction.

A review was made of the Canuck control story, and it included going back over all the various reports that had been received on cases involving control trouble. One case recorded an incident where the elevators jammed in flight. The pilot was able to free the controls only by exerting great pressure on the control column. Just as he freed the controls he heard a loud report. Later, nothing could be found that would cause such a malfunction. However, a D14 describing the incident in detail was submitted. When it was decided recently to have a further look at this aircraft, it was found to be in storage.

Close inspection of the control system was made, and this time the cause of the trouble was discovered. A stop bolt and lock nut for the elevator controls near the navigator's seat had fallen out and jammed the controls. The pressure exerted on the control column by the pilot had forced the bolt out and onto the floor. It had lain there nearly eighteen months and had been missed during the inspection which followed the incident. A second inspection revealed just how sensitive this area was to foreign material, and it also turned up a deficiency in the design of the stop bolt installation.

(A special inspection was raised on the system in all Canuck aircraft and a number of foreign articles as well as loose stop bolts were found. When another incident of stiff controls was reported, investigation of this same area revealed that a three-inch socket wrench extension was fouling the system. A full report of the incident appears in the Near Miss section of this issue under the title "Jammed Elevator Control". —**ED**)

The fact that a unit reported an occurrence of sticking controls, even though it was temporary, enabled the Air Force to eventually track down the hazard. By doing so, a critical area has been found; and subsequent modifications and special inspections for foreign objects should preclude any more accidents arising from the same cause.

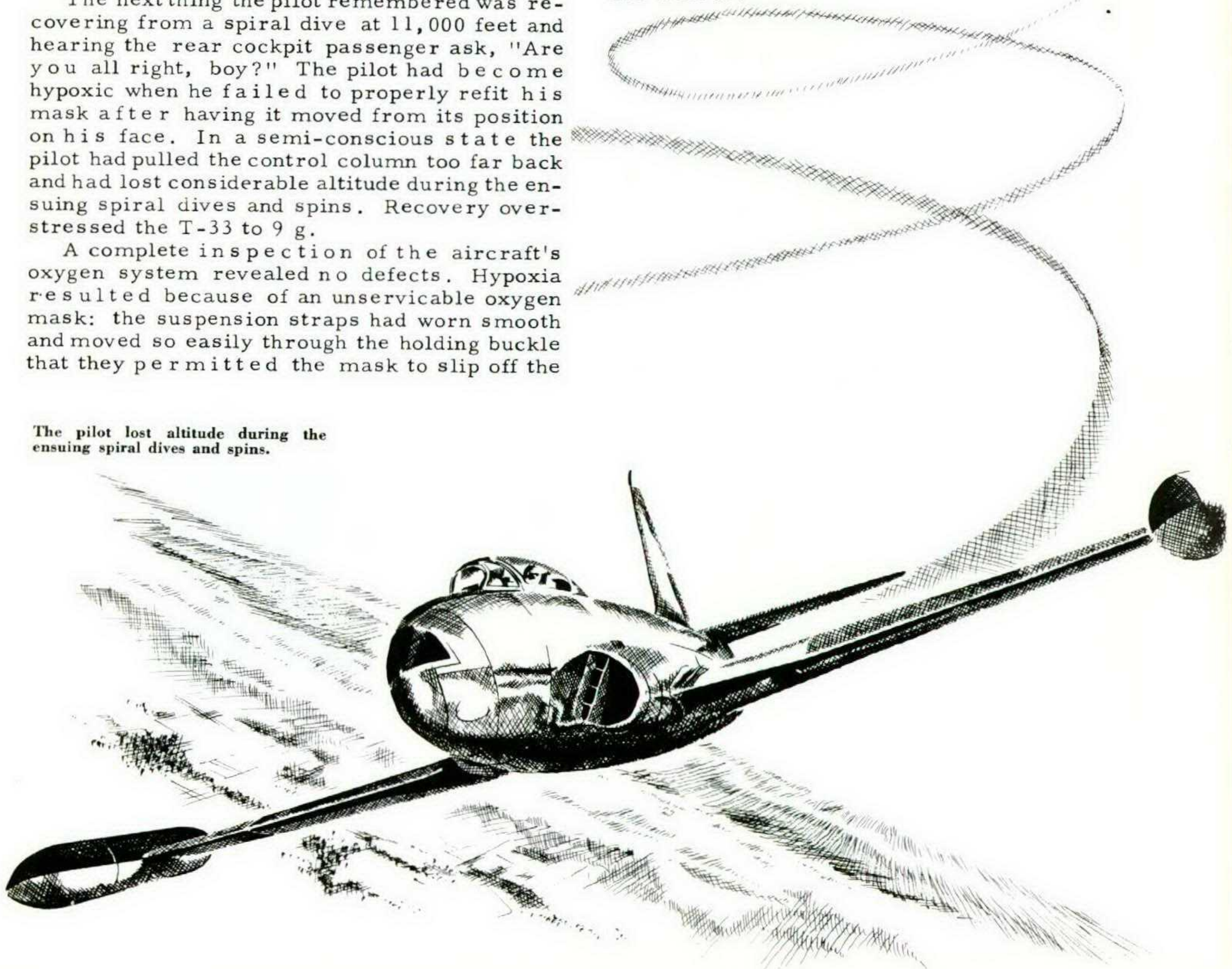
Now then, even though the original occurrence might have seemed trivial to some, the report on it was certainly most worthwhile. Bear this example in mind when you start to complain about the amount of paper-work involved in an accident or incident—no matter how trivial it may seem at the time. Ensure that you do your part in making out complete reports. Conscientious reporting of minor incidents can save both lives and aircraft.

WORN STRAPS

The pilot of a T-33 was on a night cross-country flight at 34,000 feet. As he leaned forward to read the fuel flow meter, his oxygen mask was pushed upwards on his face. After readjusting the mask, he continued the fuel consumption check.

The next thing the pilot remembered was recovering from a spiral dive at 11,000 feet and hearing the rear cockpit passenger ask, "Are you all right, boy?" The pilot had become hypoxic when he failed to properly refit his mask after having it moved from its position on his face. In a semi-conscious state the pilot had pulled the control column too far back and had lost considerable altitude during the ensuing spiral dives and spins. Recovery overstressed the T-33 to 9 g.

A complete inspection of the aircraft's oxygen system revealed no defects. Hypoxia resulted because of an unservicable oxygen mask: the suspension straps had worn smooth and moved so easily through the holding buckle that they permitted the mask to slip off the pilot's face during normal head movements. The pilot should have had the worn straps replaced. The safety equipment section can and should check your oxygen mask regularly; however, as with all safety equipment, the final responsibility for its condition remains with the wearer.



The pilot lost altitude during the ensuing spiral dives and spins.

JAMMED ELEVATOR CONTROL

Flying a Canuck, we were on a night cross-country exercise with a letdown scheduled at another station. The flight proceeded normally until the letdown was made. During a rapid descent (speed brakes out, 65%, 270k) the elevator controls seemed to "freeze" in position and considerable pressure was required to level off. The letdown and overshoot was continued with a more gentle descent and we proceeded back to base as flight-planned.

On arrival, a simulated circuit was carried out at height and several attempts were made to duplicate the condition encountered earlier. It was found that the condition re-appeared when the aircraft was in a fairly steep dive.

We noted the following points about the aircraft during flight:

- Airspeeds normal for the descents and well clear of the pole
- Hydraulic pressure normal throughout
- The auto-pilot was used during the flight but disconnected normally
- The "feel" of the controls was similar to that of auto-pilot engagement
- No stickiness of controls on the ground.

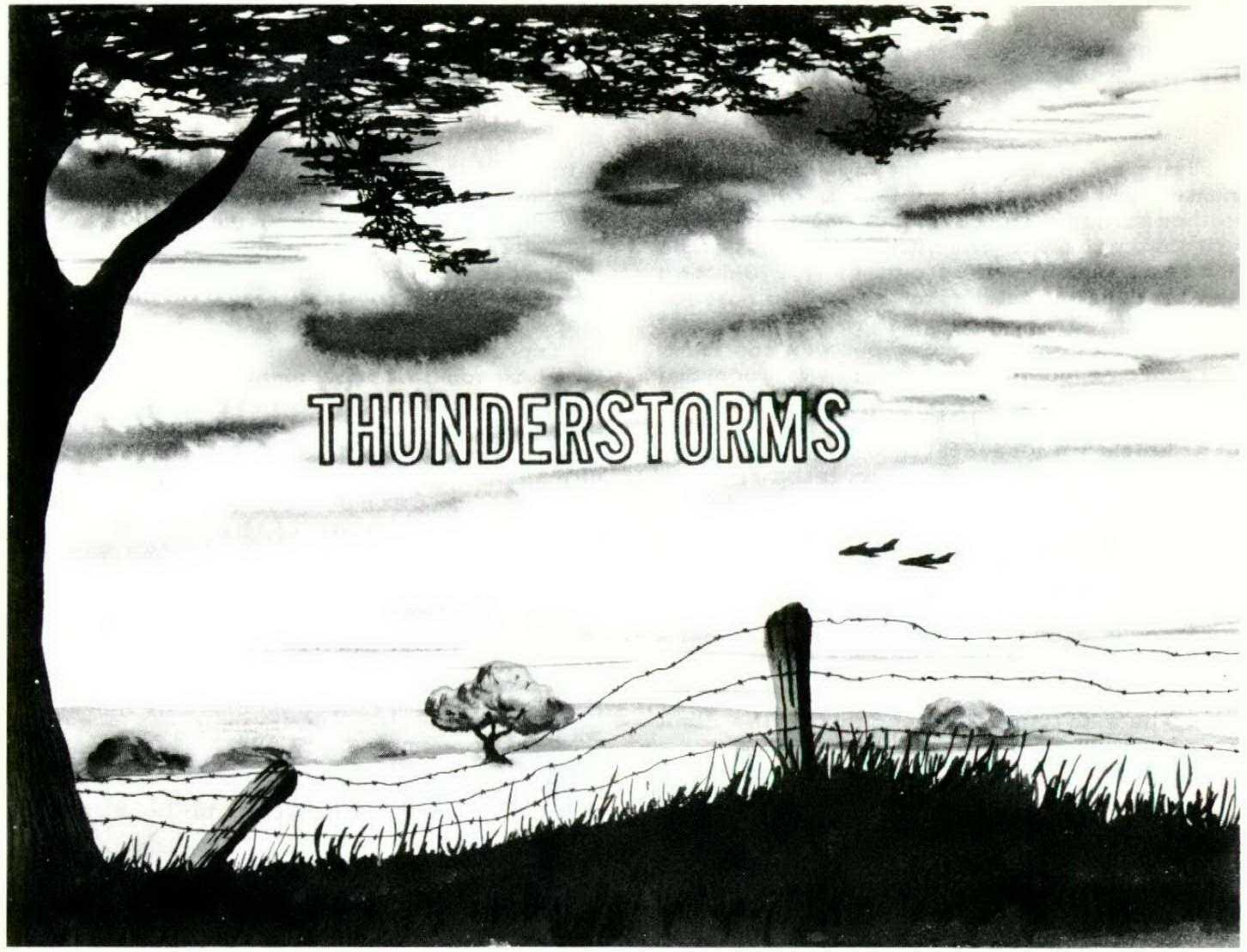
The investigating specialist's comments on the incident were as follows: Upon returning to base the pilot reported this restriction in flying control movement and the aircraft was quarantined. An inspection of flying control runs revealed the cause of elevator control interruption in flight: a three-inch-long socket wrench extension was found lying within the navigator's right-hand console, positioned laterally at the foot of former number eight. The extension was so located that any nose-down change in the Canuck's attitude permitted it to roll forward. Immediately forward of this "roll path" are located the elevator quadrant and elevator control rod assembly. Beneath the latter could be seen, quite plainly, a series of abraded and scored paint areas on the console flooring, indicating that the extension had been trapped beneath the control rod.

Experimentally the elevator controls were kept in constant movement and the extension was rolled gently forward. As was anticipated, the control rod assembly caught upon the extension and jammed the control column just aft of neutral so effectively that a two-handed pull produced no further movement. Subsequent fore-and-aft rocking of the control column eased the extension out of position and freed the controls.

The FSO commented that the situation was serious enough to have caused a fatal accident if the socket extension had assumed a position where fore-and-aft pressure on the control column would produce no elevator movement whatever. During flight, fortunately, this situation was only temporary and the controls could be freed by a slight jiggling of the control column and a change in the aircraft's attitude.

Carelessness on the part of one technician was the cause of this near-accident. However, because the situation is not new, it is felt that more emphasis should be placed on the warning that foreign objects in aircraft are dangerous—and definitely intolerable. Technicians must not leave wrenches, pliers and other tools in aircraft. They must be convinced somehow that what they think is a mere trifling detail is actually a threat to a man's life and a potential aircraft writeoff. The tradesman who loses a wrench in an aircraft and says to himself, "I'll look for it after coffee break," is a menace.

Photo of the three-inch-long socket wrench extension found lying within the navigator's right-hand console.



THUNDERSTORMS

MAURICE HARDMAN
Staff Officer, Meteorology
Maritime Air Command

ONE BRANCH of meteorology in which knowledge has increased markedly during the last few years is that concerned with large cumulus and cumulonimbus clouds. A stimulus to research has been provided by the fact that these clouds are the source of uncomfortable and, in some cases, dangerous flying conditions. An understanding of their structure and mechanism enables us to make an estimate of the extent of these adverse flying conditions and to outline procedures which will help to minimize their effects. For this reason and for the satisfaction of curiosity concerning these colourful inhabitants of our atmosphere, an attempt has been made here to describe and elucidate them with special emphasis on the conclusions reached from the research done in recent years.

This research was conducted separately and independently in the United Kingdom and the United States at about the same time; hence the fact that the conclusions reached in each inquiry were broadly the same tends to confirm their validity. Our account will draw extensively from these inquiries without attempting to differentiate between them or to separate the new information from what was already known.

How They Develop

Both large cumulus and cumulonimbus clouds begin as small cumulus. A relatively small number of these will continue to grow into large cumulus and then into cumulonimbus. Greatly helping such growth is the process of amalgamation whereby several small clouds unite to form one large cumulus with a diameter of one to five miles and tops approaching 15,000 feet. Large cumulus clouds may then develop into a cumulonimbus composed of several cells at various stages of development, with comparatively dormant areas of cloud lying between.

Development of a thunderstorm appears to go through three stages: a cumulus stage, a mature stage, and a dissipating stage. The cumulus stage is characterized by rapid growth, updrafts and the absence of precipitation. A cross-section of this stage is shown in figure 1. Note that updrafts exist throughout the entire cloud, reaching their maximum strengths near the top of the cloud with velocities as high as 50 feet per second. The basic cause for the updrafts is simply that the cloud is warmer than its environment—and the greatest difference between the temperatures in the cloud and those outside of it are found in the areas of greatest updraft speeds.

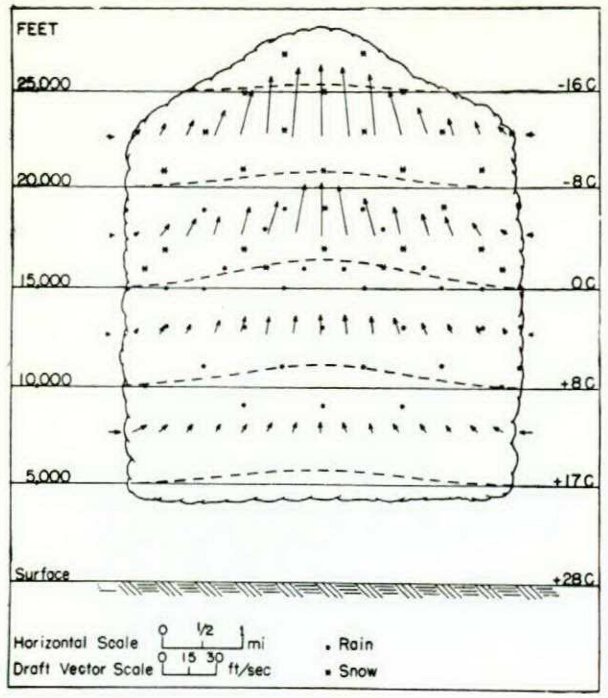


Fig 1. The cumulus stage.

Another point worth noting is the "entrainment" of the surrounding air that takes place. Because of friction and pressure differences between the air in the cloud and the air around it, some of the latter air is entrained into the updrafts. This effect—also illustrated in figure 1—lessens the temperature contrast between the cloud and its surroundings and decreases the relative humidity in the updrafts.

When a thunderstorm has developed to where its top is around 25,000 to 30,000 feet and its base about six miles in diameter, it enters the second or mature stage—as shown in figure 2. The mature state is characterized by the onset of precipitation and downdrafts as well as by the development of maximum turbulence and various electrical phenomena. The key to these latter elements is to be found in the presence of precipitation which we will now discuss briefly.

Precipitation

The theory of precipitation is another branch of meteorology in which much work has been done in recent years; but it seems that, in the case of cumulonimbus, the formation of precipitation is in accordance with the classical theory of Bergeron—at least in part. According to Bergeron's theory, precipitation results when ice crystals drift down from the upper portion of the cloud and enter a region containing supercooled water droplets. Here they grow at the expense of the water droplets until they become sufficiently large to fall through the cloud and eventually melt and reach the ground as rain. The reason for the growth of ice crystals at the expense of water droplets is simply that the equilibrium vapour pressure over ice is less than that over supercooled water at the same temperature. In a volume of air containing both ice crystals and supercooled water droplets, the vapour pressure adjusts itself to a value between the two equilibrium pressures so that the air becomes unsaturated for water but supersaturated for ice.

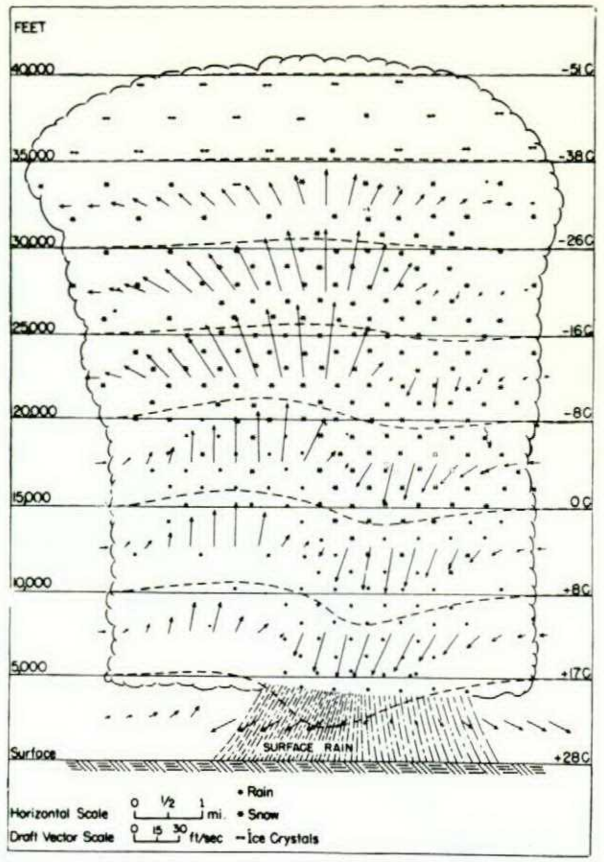


Fig 2. The mature stage.

There are many unsolved problems connected with the initial appearance of ice crystals which we cannot discuss here; but from the broad outlines given above, it should be possible to appreciate the essential features of the mature stage.

Cumulus Phase

During the cumulus stage, the cloud builds to well above freezing level. At first the water droplets do not freeze; but eventually some do change into ice crystals. When this happens, a marked change is seen in the appearance of the cloud top. Instead of remaining well defined and solid, it becomes diffuse and tenuous; and an anvil—caused by the spreading-out of the air as it reaches a stable environment—begins to grow. Soon after, by the mechanism described in the previous paragraph, precipitation makes its appearance.

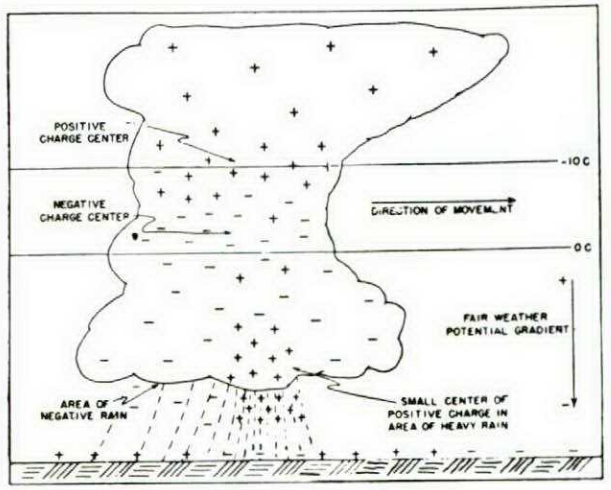
Mature Phase

The downdrafts which are so characteristic of the mature stage actually seem to be formed by precipitation. When the rain becomes sufficiently heavy and concentrated to drag the surrounding air down with it, it turns the up-currents into down-currents. This air brought down by the rain is kept cool by the continuous evaporation of water into it from raindrops. When it reaches the surface it brings a sudden temperature drop. The out-spreading of the downdraft over the ground may be accurately traced both by the accompanying squall and the fall in temperature.

It is interesting to note that this outflow of cold air from a mature cell occurs below 2000 to 5000 feet and that above these heights there is convergence. A look at the diagram of the mature cell reveals that some updrafts persist in the lower part of the cloud, and that they may be quite vigorous.

Lightning occurs in the mature stage of cu-nim development. With the formation of thunderstorms a striking change in the electrical potential gradient of the atmosphere becomes apparent. In fair weather this potential gradient is relatively small (about one hundred volts per metre), the earth having a negative charge with respect to the atmosphere. The difference between this situation and the distribution of charges in a cumulonimbus cell is immediately apparent on studying figure 3. It will be noted that, generally, the top of the cloud is positively charged and the bottom negatively charged. The earth's surface is therefore positively charged, except in the area of heavy rain where there is a negative charge. Some of the lightning discharges are confined to the cloud alone—concentrated in the strong gradient between the charge centres—and some occur between the cloud and the ground.

Fig 3. Charge distribution in a thunderstorm cell.



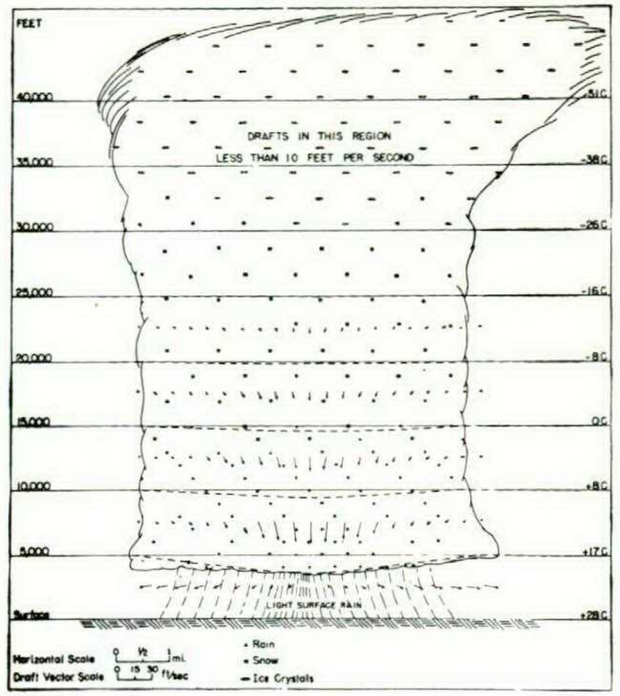


Fig 4. The dissipating stage.

Dissipating Phase

Following its mature stage, with characteristics described above and lasting usually from 15 to 30 minutes, the cu-nim cell enters the final stage of its existence, the dissipating stage. The downdrafts expand in area until they cover the whole cell, turbulence declines, and precipitation gradually stops. The cloud soon dissipates from below, leaving only scattered remnants at middle and high levels. Quite often a fresh cell will develop in the region if there are two fully developed cells fairly near. Converging cold outflows from these adjacent cells force up the warm surface air, thereby triggering off the process all over again (figure 4).

*

While a great deal still needs to be added to our knowledge of thunderstorms, there is no doubt that the information outlined here represents a considerable advance. Used intelligently by flying personnel it should enable them to make a reasonably precise estimate of the potentially dangerous features of a cumulonimbus, thereby materially reducing the risk and discomfort of flying through these clouds.

RCAF: Navigation Bulletin

Investigation and YOU

ONE PURPOSE of a flight safety organization is to recognize situations or conditions which can cause an accident and initiate corrective action before they do. Unfortunately this is not always achieved, and accidents do happen. When one does occur, it is essential that we investigate thoroughly to determine the causes. The knowledge gained will prevent similar accidents in future if we use it to correct deficiencies in supervision, training methods, flying techniques, instructions, orders, materiel and maintenance practices.

How Vital is a D14?

Personnel in the field apparently do not appreciate fully the importance of the D14 (Report On Aircraft Accident Or Aircraft Incident); all too often those received at AFHQ are not as complete as they should be. Our hope is that this article will enlighten personnel on the subject and lead to the preparation of more comprehensive reports in the future.

It is neither desirable nor possible for a DFS specialist to investigate every accident and incident; nor is it necessary to have a formal Board of Inquiry on each one. Only a small percentage of accidents are investigated in this manner. On the other hand, a D14 is required on every accident and incident that occurs in the RCAF. Command and Group Headquarters and the Directorate of Flight Safety depend on the information contained in these reports to analyse correctly and assess approximately 90 percent of our accidents and incidents.

When you remember that the knowledge gained from the investigation of accidents forms an important part of any accident prevention program, you can appreciate what a large contribution the field can make to such a program—for instance, in the correction of design and maintenance faults. This contribution will vary in direct proportion to the initiative and thoroughness displayed by those responsible for investigating accidents and preparing the reports.

How is it Used?

What use is made of a D14? The appropriate headquarters employs the information in the following ways:

- To determine the primary and contributing causes of an accident
- To initiate corrective action based on the individual accident
- To provide basic data for statistical analysis.

The regular and frequent analysis of data on all accidents and incidents, and of selected occurrences, is a means of measuring trends in operational efficiency—and, in particular, any changes that are taking place in our standards of safety. Accident cause factors which require unusual measures and the attention of senior officials are so obtained. Contributing factors not apparent as such in the investigation of an individual accident are often brought to light by the analysis of selected cases. Similarly, an analysis of carefully selected accidents and incidents sometimes enables the determination of the most probable cause of an otherwise completely obscure accident. It is obvious, therefore, that the collection and compilation of accident and statistical data is an essential task of headquarters staffs. The value of this work, however, will depend to a large degree on the accuracy and detail of the information provided in the D14.

Most often misconstrued section of the D14 is paragraph 9. In most completed reports, the remarks appearing there are confined to those of the CTSO, whereas the findings and opinions of specialist officers who should have been called upon to assist in the investigation are missing.

The majority of accidents, for example, are attributed in part to human error by the operator. These errors are neither made on purpose nor (in most cases) due to the operator's carelessness. It is thus essential that the reason be determined. A pilot's failure to lower the undercarriage before landing may have been due to the after-effects of a degree of hypoxia or hyperventilation during the flight, or fatigue from too much strenuous flying, too little sleep, mild poisoning by carbon monoxide, contaminated oxygen, "gyppy" tummy or what have you. Does the pilot's mask fit? Where and when did he last eat? These and many other matters must be investigated by the M.O. and reported in the D14.

Occurrences involving the control of aircraft require similar observations and deductions by the SFCO in para 9 of the D14. Undershoot accidents and collisions with snow banks and other aircraft are examples. Para 9 should also include statements by the Medical Officer in cases of hypoxia or hyperventilation, and by the SFCO on approach accidents.

Remarks of specialist officers, flight commanders and others appearing in the pertinent paragraphs should be conscientiously and intelligently completed. All too often, remarks by the technical or specialist officer merely give a factual statement of damage to the aircraft or malfunction of a particular part, without relating this to the pilot's statement and without voicing an opinion as to whether the malfunction (or damage) occurred prior to or as a result of the accident, or whether it was in any way a contributing factor. The mere words "technical failure" serve no useful purpose unless the part or parts are identified and the nature of the failure outlined. Where applicable UCRs have been submitted or are to be submitted, copies should be attached to the D14 to save valuable time.

Similarly, the remarks of the Commanding Officer (in para 12 of the D14) are expected to: reconcile the information provided by the other specialists; pin-point, where possible, the various cause factors involved; and make pertinent recommendations for corrective action. All too often this paragraph contains such comments as "accident due to inexperience—pilot error." A statement like this serves no useful purpose since it implies that such accidents are not preventable and that no useful recommendations can be made—which is seldom the case.

In cases where a Board of Inquiry has been convened on an accident, the person filling in the D14 will often write "see Board of Inquiry" instead of including the pertinent details right on the D14. Again this is an unsatisfactory procedure because there is a considerable delay between receipt of a D14 and receipt of the findings of a Board of Inquiry.

Needle for Shutter Bugs

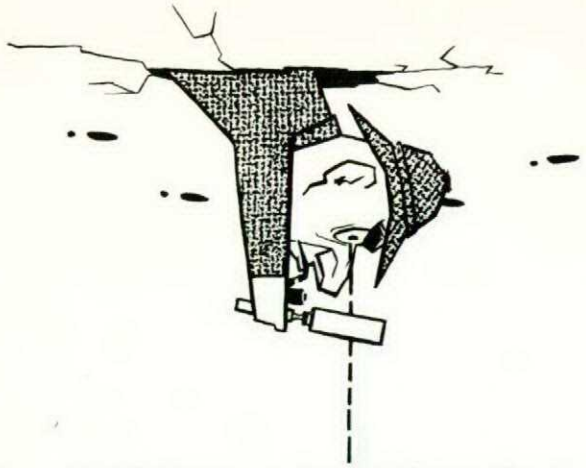
Now a few words about photographs. It has been said that one picture is worth a thousand words—and this was never more true than when applied to an aircraft accident. If it is at all possible to obtain photographs, they should be forwarded with the D14. One unit has made it a regular practice to send in sketches of the crash location, showing such details as the aircraft breakup path. Accurate measurements—not flawless art—are the important factor. But, artwork or photographs, they're more than welcome.

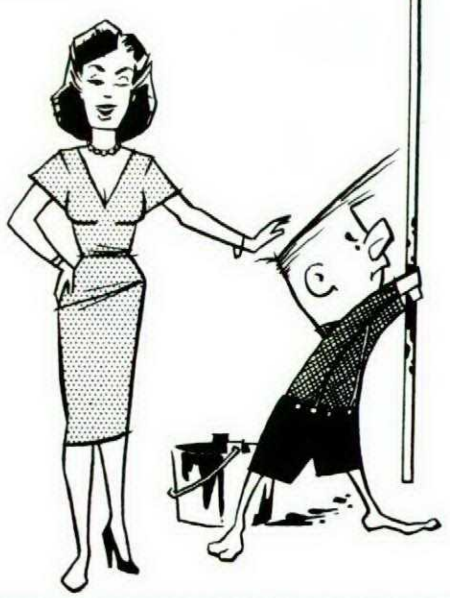
Speed a Virtue Here

Time is of the essence in accident prevention. The directions on a D14 include a request that the report be forwarded within seven days. Obviously, the sooner a report is received and analyzed, the sooner corrective action can be taken. If all the necessary information is not immediately available, attach a statement on what is missing and send it along later when the material becomes available, making a cross-reference to the D14. If there is too little space in any of the sections, just add your own appendices. Cross-refer to previous similar accidents whenever possible; and if UCRs have also been submitted previously on similar accidents, attach copies. By these means, considerable time may be saved in processing the case. To summarize, then:

- Forward the report within seven days
- Information not immediately available should be forwarded as quickly as possible under a covering letter, cross-referring to the D14 number
- Supply all statistical data requested in the D14, plus any other information which you consider pertinent, including UCRs
- Supply photographs or sketches if at all possible
- Each responsible officer should fill out the applicable paragraph, thus making his contribution to flight safety.

The only accidents which constitute a complete loss are those that have been subjected to inadequate investigation and reporting. When such duties devolve upon you, ensure that the principles and practices of flying safety are not diminished by your failure to investigate thoroughly and report in detail.





SCRAP HEAP
VS
QUARANTINE

Faulty material is the suspected cause in many RCAF accidents and incidents. However, it frequently happens that these material failures cannot be satisfactorily explained by either the investigation equipment or procedures available to field maintenance personnel.

When a failure of this type does occur, the only step field personnel can take is to submit the failed sample (or a portion of it) to HQ for Quality Control Laboratory investigation. The lab's job is to determine if the item or sample meets specifications—and also what caused it to fail. This process necessitates the running of many tests, some of which require the destruction of the sample being tested. If the submitted sample is of adequate size, then these tests may be carried out without difficulty. However, if it is too small to permit the required number of tests, then further samples must be obtained from the unit.

In cases where a complete component forms the original sample, there is nothing further that can be done. In cases where only a small portion of the failed item was sent in as a sample, the unit can be asked to supply additional portions. Unfortunately there have been instances when the originating unit was unable to fulfil this request. The reason in all cases have been the same: the failed item was consigned to the scrap heap after the original sample was taken, and investigation into the quality of the material came to an abrupt end.

Field units should realize that laboratory tests can only be made when the sample submitted is large enough to work on. When only a sample of the failed item is sent in for laboratory examination, the remainder should be quarantined either until disposal instructions are issued or a completed laboratory report on the original sample is received.

Adherence to this procedure will ensure that the best possible use is made of the test facilities available. In addition, no one will be in the embarrassing position of having to reply to a request for further samples with "Sorry, we threw it out."

Automatic Release

S/L E. D. HARPER
F/L L. POLLOCK

GETTING SAFELY OUT of an aircraft in emergencies is a problem that has grown steadily in magnitude over the years. In today's high speed fighter aircraft, real difficulty has been encountered in attempts to provide crews with a means of escape in all emergency situations.

Development of the ejection seat supplied a reliable method of evacuating an aircraft but left unsolved such problems as oxygen lack and air blast, both of which could easily render aircrew incapable of getting away from the seat or manually operating the parachute.

To overcome these (and other) obstacles, new features were continually added to the basic ejection seat to make all post-ejection functions fully automatic. To date, the Martin-Baker product is the most advanced and efficient seat in use. Certain versions of it now permit safe ejections from ground level—not yet standard procedure. Most other types of ejection seats in service today do not have the automatic features of the Martin-Baker. The Gregory-Quilter (or G-Q) Parachute Company of England has designed and built devices which can be attached to these seats, and to the parachutes, to make them function automatically. Presently the RCAF's Central Experimental and Proving Establishment is conducting trials at Uplands to test the functioning of these devices.

The Automatic Harness Release

The first item of interest is the automatic harness release mechanism which is shown assembled in figure 1 and partially dismantled in figure 2. Figures 3 and 4 illustrate the method of attaching it to the Sabre and T-33 seats. This release mechanism requires the use of a Z-type harness, as shown in figure 5, and an arming lanyard attached to the floor of the aircraft. As the seat travels up the rails, the lanyard withdraws the arming pin from the

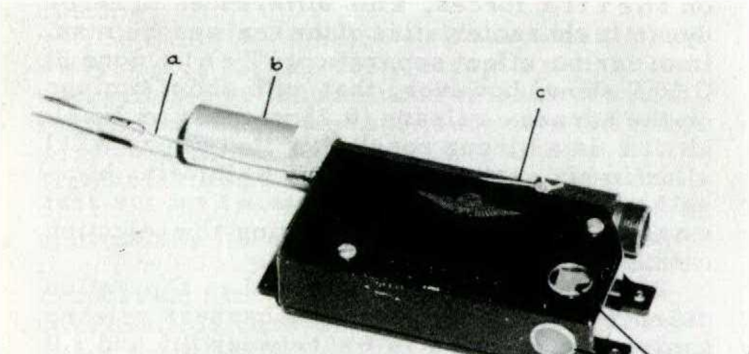


Fig 1. Assembly of G-Q automatic harness release mechanism. (a) arming wire (b) barrel end-cap (c) arming wire safety thread (d) inspection windows, showing hammers in cocked position.

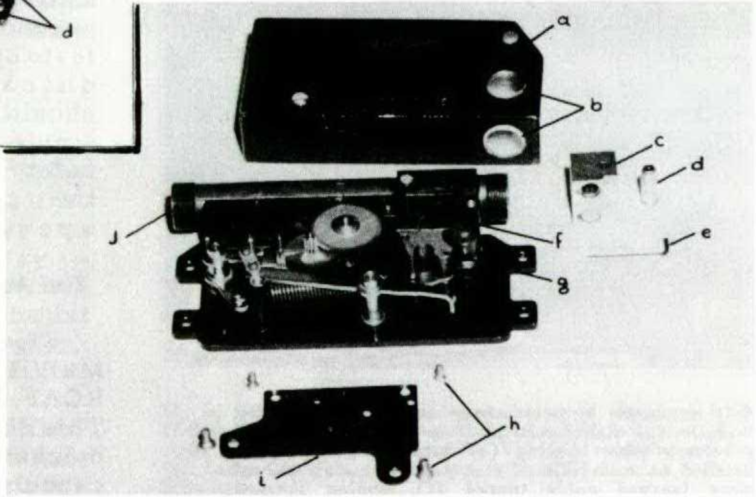


Fig 2. Partially dismantled G-Q harness release mechanism. (a) cover (b) inspection windows (c) breech block (d) .22 calibre (rim fire) blank cartridge (e) breech block locking pin (f) breech (g) firing hammers (h) top plate securing screws (i) top plate (j) barrel.

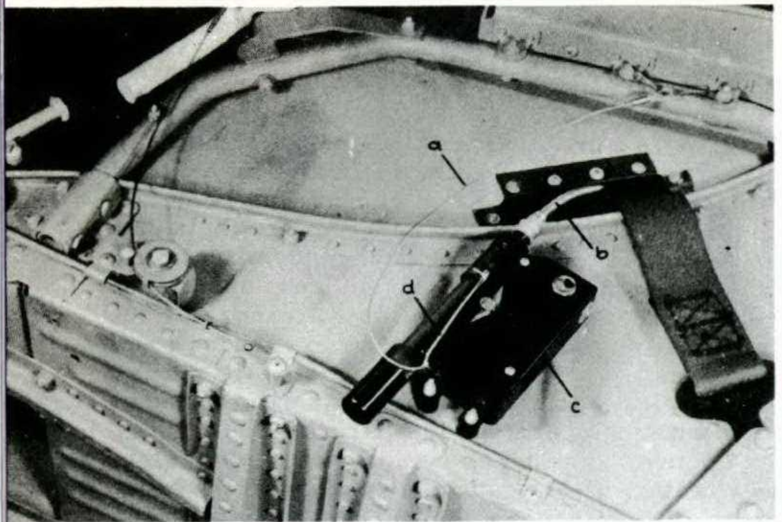


Fig 3. G-Q automatic harness release mechanism installed on Sabre seat. (a) arming lanyard (attaches to port console of aircraft) (b) release cable housing (c) harness release mechanism (d) safety thread.

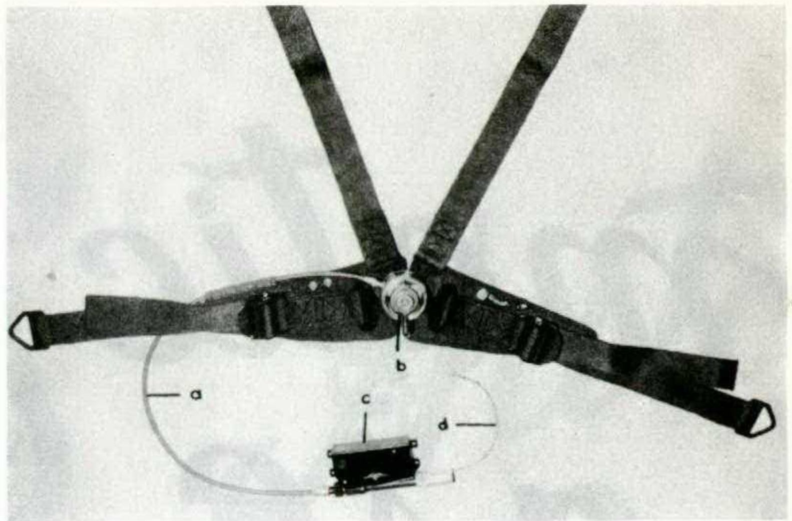


Fig 5. "Z" type harness fitted for automatic operation. (a) release cable housing (b) "Z" box in closed position (c) G-Q automatic harness release mechanism (d) arming lanyard.

release mechanism. After the pre-set time delay has elapsed, a striker fires two 22-calibre blank cartridges. The gas pressure they generate forces the piston and attached cable to move down the barrel, thus operating the Z-box. Tension on the harness then causes the straps to fly clear and permit separation of the man from his seat. Once the Z-box has been operated, a pawl engages to lock it in the "open" position. (To disengage the pawl, the entire unit must be dismantled later.)

An extra safety feature in the device is the use of two cartridges when one supplies more than the required force. Each cartridge contains a five-grain charge of black powder and supplies a pressure of 2410 psi (350 lbs) to the piston. When the two are fired together, they supply a pressure of 5660 psi (810 lbs). A force of approximately 160 lbs is required to operate the Z-box when it is being subjected to a 10-g load.

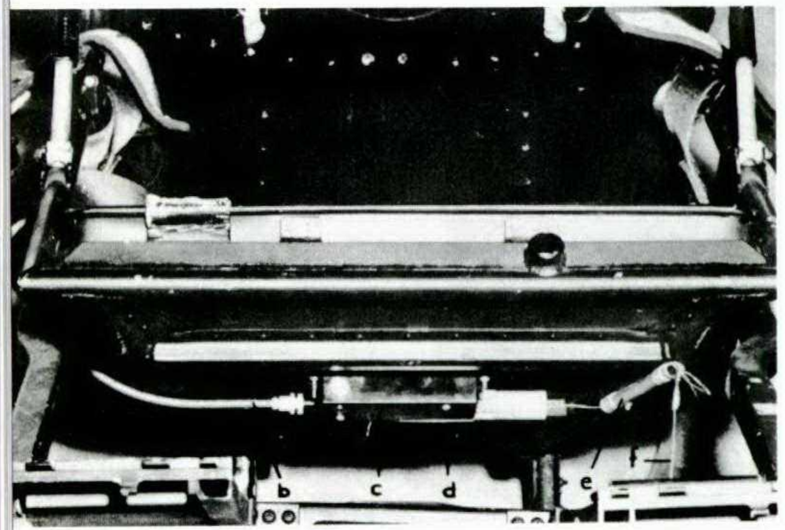


Fig 4. G-Q automatic harness release mechanism installed on T-33 seat. (a) right-hand lap-strap c/w modified "Z" box (b) release cable housing (c) harness release mechanism installed on underside of seat pan (d) safety thread (e) arming lanyard guide tunnel (f) arming lanyard (attaches to floor of aircraft).

The timing of this event is important. Theoretically, the harness should be released as early as possible since the whole system relies on inertia forces, and differences in aerodynamic characteristics of the seat and the man, in order to effect separation. Tests done at CEPE show, however, that with short timings on the harness release (0.25 seconds or less), there is a strong possibility that a man will slide in his seat during ejection, injuring himself or damaging his parachute when the seat rotates forward after clearing the ejection catapult.

There have been occasions when separation did not occur at once. The best harness release timing has proven to be between 0.5 and 1.0 seconds. With settings of 0.5 seconds, RCAF tests have demonstrated that separation is both quick and positive at all speeds. If anything should hinder the separation forces (for example, the seat pack jamming in the seat or the safety harness fouling on the parachute harness) the user must provide assistance. At high speeds, separation is almost immediate.

The Auto-Rip

Figures 6, 7, 8 and 9 show the auto-rip Mk VII device and method of installation in the RCAF standard Irvin flexible back parachute. This device is the same as the harness release mechanism except for the addition of an aneroid capsule. If the parachute is above the pre-set barostat altitude when the arming pin is pulled, the timer will not be activated. However, when the pre-set altitude is reached, the timer functions normally, the parachute commencing to open automatically in four seconds. Below the barometric setting the timer operates immediately. Since the arming wire lanyard is attached to the safety harness lap strap (figure 10), it is essential that separation from the seat occur to provide automatic parachute opening.

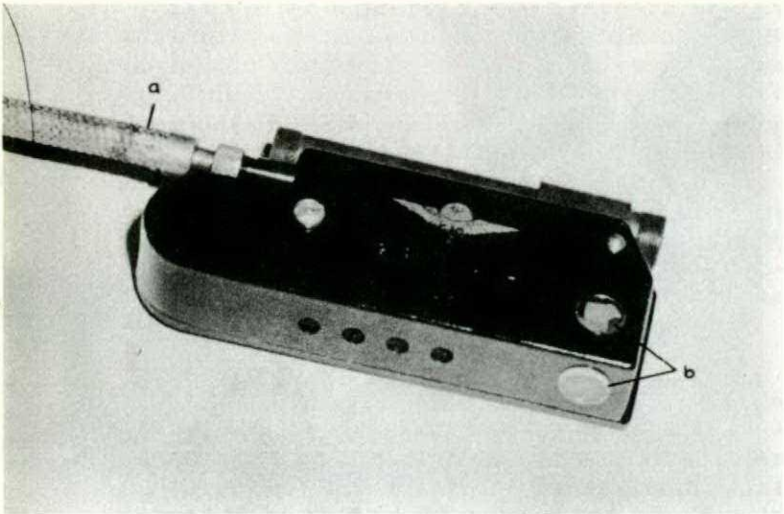


Fig 6. G-Q auto-rip Mk VII assembly. (a) arming wire housing (b) inspection windows, showing hammers in cocked position.

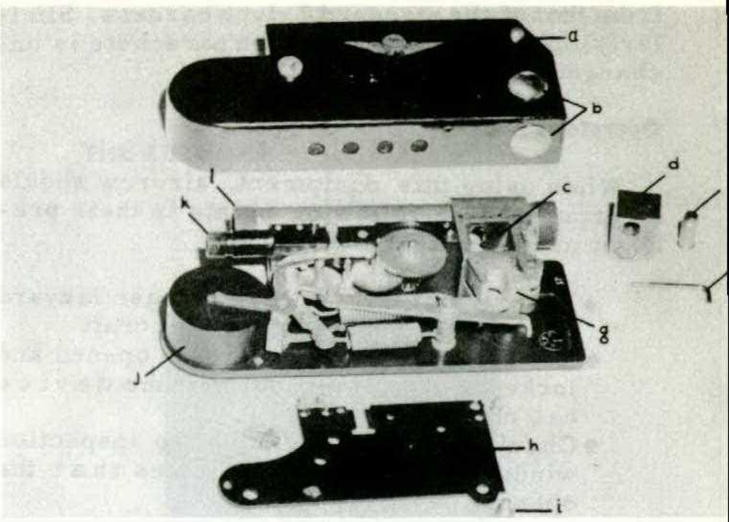


Fig 7. Partially dismantled G-Q auto-rip Mk VII assembly. (a) cover (b) inspection windows (c) breech (d) breech block (e) .22 calibre (rim-fire) blank cartridges (f) breech block locking pin (g) firing hammers (h) top plate (i) top plate securing screw (j) barostat (k) arming wire tunnel (l) barrel.

The RCAF has selected a barostat altitude setting of 12,000 feet, except as otherwise necessitated by mountainous terrain. The setting can only be altered and checked on the bench with an altitude chamber. For a free fall to 12,000 feet and a time delay of four seconds on the auto-rip, the parachute is fully deployed at approximately 11,000 feet, thus bringing a man to a level where parachute opening shock is reasonable and where the effects of anoxia and cold are less hazardous. At the same time it gives sufficient terrain clearance for average Canadian conditions and provides ample time for manual operation, if required.

Time Delay

Establishing a suitable parachute time delay is a complex problem because two incompatible aspects must be considered. For extremely low altitude ejections a very short time delay is mandatory, whereas for high speeds sufficient time delay is required to allow the parachutist to decelerate to a speed at which opening shock will be neither injurious nor fatal and at which parachute failure will not occur.

With its four-second time delay, the RCAF has effected a compromise that permits a safe ejection from as low as 300 feet above ground. However, because of various other factors, ejection is not advisable below 400 feet. The four-second delay allows sufficient time for safe ejection at all normal operational speeds for the T-33 and Sabre, although the opening shock associated with a high speed ejection at 12,000 feet will be rather severe. This delay also precludes the possibility of a collision between the man and his seat.

Manual Operation

Despite the fact that an automatic device has been fitted, the pilot still has complete manual control of the safety harness release and parachute. The method of operation is unchanged

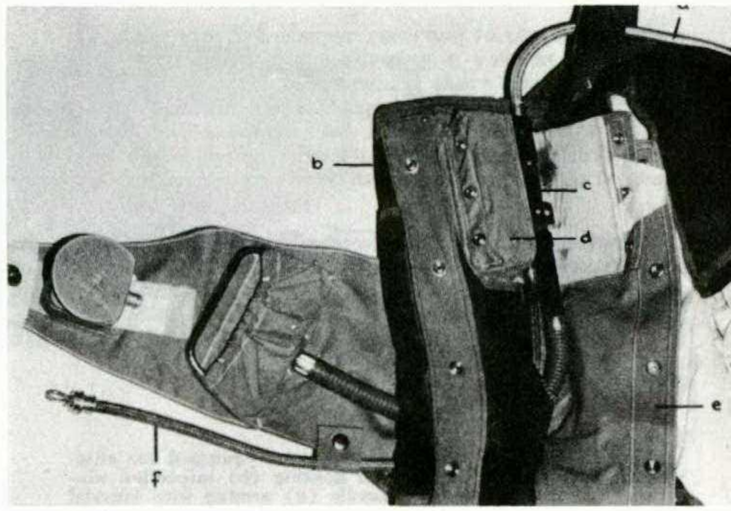


Fig 8. G-Q auto-rip Mk VII installation in Standard Irvin 24-foot parachute. (a) rip cord housing (b) left-hand parachute flap (c) G-Q auto-rip Mk VII (d) retaining pocket (e) cover flap for auto-rip installation (f) arming lanyard housing.

from that of the standard Z-type harness. Similarly, manual operation of the parachute is unchanged.

Operator's Checks

When using this equipment, aircrew should incorporate the following points in their preflight and postflight checks:

- Ensure that the harness release lanyard is properly secured to the aircraft
- Ensure that the Z-box can be opened and locked manually—proof that the device has not been fired
- Check the parachute auto-rip inspection window. The red tab indicates that the opening device is cocked
- Ensure that the auto-rip arming lanyard safety shear wire is unbroken
- Attach the auto-rip lanyard to the appropriate lap belt and clip the lanyard housing into place (see figure 11)
- At the conclusion of the flight unhook the auto-rip arming lanyard before releasing the safety harness.

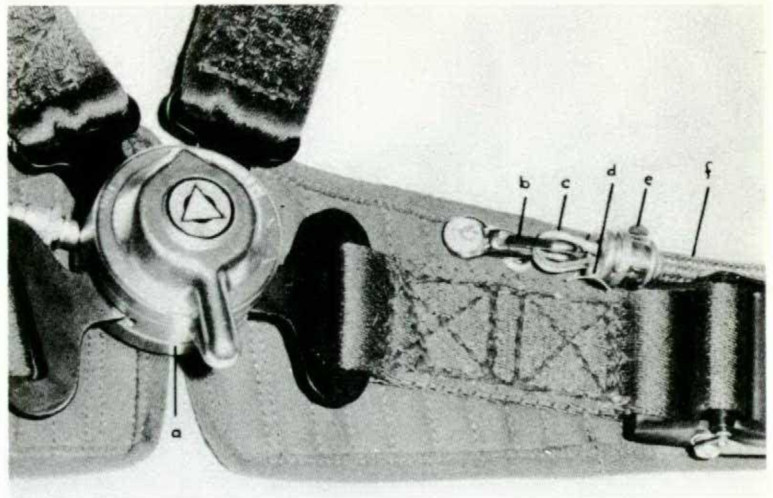


Fig 10. Arming assembly for automatic parachute operation. (a) "Z" box in closed position (b) arming lanyard snap hook (c) parachute arming lanyard (d) safety shear wire on arming lanyard (e) spring clip for retaining arming lanyard housing (f) arming lanyard housing

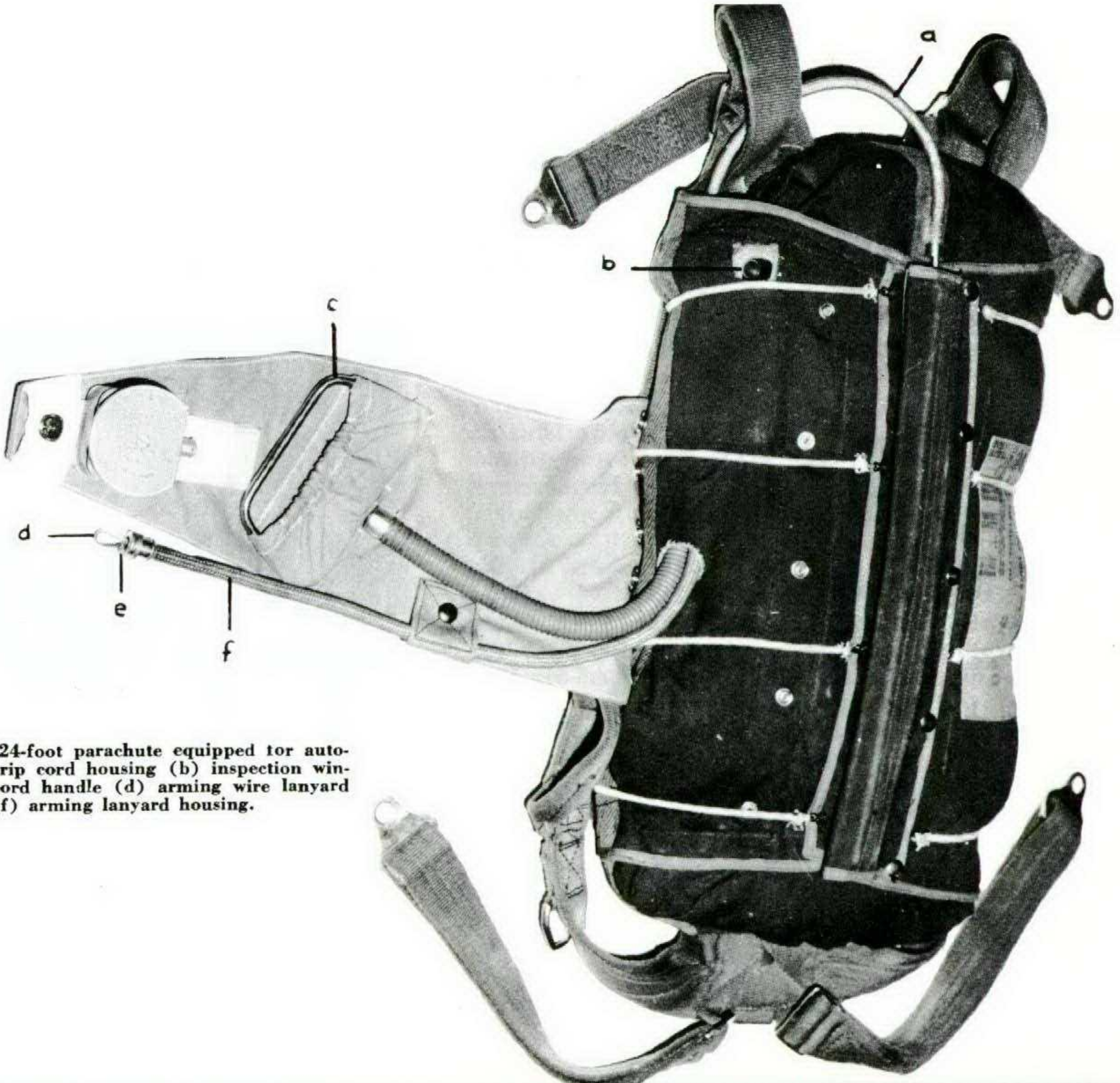


Fig 9. Standard Irvin 24-foot parachute equipped for automatic operation. (a) rip cord housing (b) inspection windows (c) manual rip-cord handle (d) arming wire lanyard (e) safety shear wire (f) arming lanyard housing.

Since the auto-rip arming lanyard shear wire breaks when a force of approximately 20 pounds is applied to the lanyard, care in the handling of parachutes will be necessary to preclude unintentional firing of the opening device. In turn this will protect the individual from that feeling of unkempt confusion experienced when returning an armload of loose nylon to the safety equipment section. As implied by the last point listed above, the result of improper postflight technique can be just as startling.

*

The addition of these automatic devices to the present Sabre and T-33 equipment represents a marked improvement in the safety factor for aircrew. In actual tests the equipment has proved to be extremely rugged and completely dependable. Consequently the utmost confidence can be placed in its reliable operation—within the limits we have outlined.

THE AUTHORS

S/L E.D. Harper was born in Saskatchewan. Following graduation from high school in 1942 he joined the RCAF, received his pilot's wings at 3 SFTS Calgary in 1943, took a general reconnaissance course at Summerside, and then went overseas. There he joined the RAF Bomber Command and started operations shortly after "D" Day, later transferring to 635 (Path-finder) Squadron.

After the war S/L Harper returned to Canada where he was retired in 1945. Following a year at UBC he re-enlisted in '46. He then spent a short time on flying control at Trenton before moving on to NWAC "K" Flight Edmonton where he commenced a three-year course in Arctic flying. From there he went to Sea Island where he instructed in the winter and flew Cansos in the Arctic during the summer.

In 1951 S/L Harper attended the USAF Experimental Test Pilot School at Edwards Air Force Base, California. Ever since graduation he has been employed as a test pilot with the National Aeronautical Establishment and CEPE, Rockcliffe.

F/L L.B. Pollock was born in Yorkton, Sask. He was graduated from the University of Saskatchewan in 1949 with a B.Sc. degree in civil engineering. He joined the RCAF in 1950.

After graduation from 1FTS Centralia, Ontario and 1PGS Macdonald, Manitoba in 1951, he served with tactical fighter flight at CJATC Rivers, Manitoba. In June 1953 he was transferred to the Suffield Detachment of Central Experimental & Proving Establishment and was mainly associated with the napalm and rocket trials being conducted by the Defence Research Board.

Transferred to Rockcliffe in 1955, he has served since then with CEPE's jet flight, chiefly as project engineer and pilot in connection with T-33 seat ejection trials.

PXing

LETTERS TO THE EDITOR

Flaps and Bellcranks

"The Otter Flap" (Flight Comment, Nov - Dec 56) reminded me of some information that may or may not be useful. While I was working out at CEPE Namao in the summer of '54 one of my duties was minor and major inspections on a float-equipped Otter aircraft. The aircraft ferried men and freight from Cold Lake to Primrose Lake in Alberta and was usually fully loaded. While checking the flap mechanism I found that the bellcrank had what looked to be a small crack on it. After removal from the aircraft it was found that the bellcrank could be flexed and that the crack was much worse than I had first suspected. Failure of this part in flight would have been disastrous because it would have knocked out the flap system, and probably the aileron system in one wing.

The crew chief was to have submitted a technical failure report on this bellcrank but it may have been lost or misplaced. At the time of this occurrence (1954) the bellcranks were being made from magnesium. Naturally I am curious to know if there is any further evidence of this bellcrank failure.

D. V. Hutchings, Cpl
6 Repair Depot, Trenton

A check with Air Materiel Command reveals no record of any reports of failures of this component. However, the accident inspector who wrote the article to which you refer has assured us that this bellcrank was not concerned in the cases discussed in his article. — **ED**

Vertigo and Vibration

The article on vertigo in the Jan - Feb 57 issue of Flight Comment brought to mind two situations which I have encountered many times. The description of "flicker vertigo" suggests to me that I may have experienced variations of this phenomenon (related to vibration frequencies) in some aircraft.

In the Oxford 5, Anson 5, Expeditor and Mitchell aircraft I have often encountered an uncomfortable condition during takeoff, at about the time when the props reach maximum rpm. The effect is induced by a most unpleasant noise and vibration which appears to penetrate the body from head to toe. In the worst instances the result is a transient feeling of muscular weakness and momentary numbness, accompanied sometimes by a slight physical pain in the ears from the intense noise. The sensation lasts only a few seconds until pitch or power changes are made, but concentration of vision well forward of the aircraft and deliberate muscular tension seem to help overcome the unpleasantness.

In the case of the Anson, the vibration involved the complete instrument panel to such an extent that it became totally unreadable and produced a semi-hypnotic vertigo unless one's vision was directed away from it until the vibration ceased. With the advent of jet aircraft this difficulty is no doubt on the way out; but I always make a point of guarding against it even though it happens only under certain specific conditions.

The second baffling experience has occurred to me only in Dakota aircraft. After sustained level flight, and upon entry into a steady descent at slightly higher than cruising airspeed, with the aircraft trimmed in a hands-off condition, I have several times sensed a feeling of acceleration and deceleration along the fore-and-aft line. Magnitude of the forces is minor, and a complete oscillation takes about two or three seconds. Real or imaginary, I have even found myself rocking back and forth in "response" to these forces! I find it difficult to believe that an aircraft the size of a Dak is capable of acceleration and deceleration along the fore-and-aft line at a rate I would estimate at about 20 or 30 cycles per minute. This experience has occurred in clear weather as well as in "clag", and in no case has there ever been a disturbance of my vision—or any other manifestation of vertigo.

Are my experiences of any significance? Have similar occurrences been reported before? I would be interested in your reply.

A. D. Pearce, S/L
Directorate of Program Control
AFHQ, Ottawa

We are planning to run a further article on the subject of vertigo and related disorientation phenomena in a not-too-distant issue of Flight Comment. Perhaps at that time we will be in a position to answer S/L Pearce's queries. Meanwhile we'll turn to our readers for help. Any similar experiences? Any explanations? Anyone want the floor? — **ED**

New Pub

We recently received a copy of 1 Air Division's Quarterly Accident Summary for Jul - Sep 1956. Needless to say we enjoyed looking over the product of a fellow-publisher. In addition to an interestingly written synopsis of accidents for the quarter, there was a review of incidents for the same period, notes on spins, flap damage and fatigue, and a brain-teasing quiz for pilots. Congratulations to your hard-working staff. The customer is getting a lot for his money. — **ED**

FLIGHT SAFETY PRESENTS

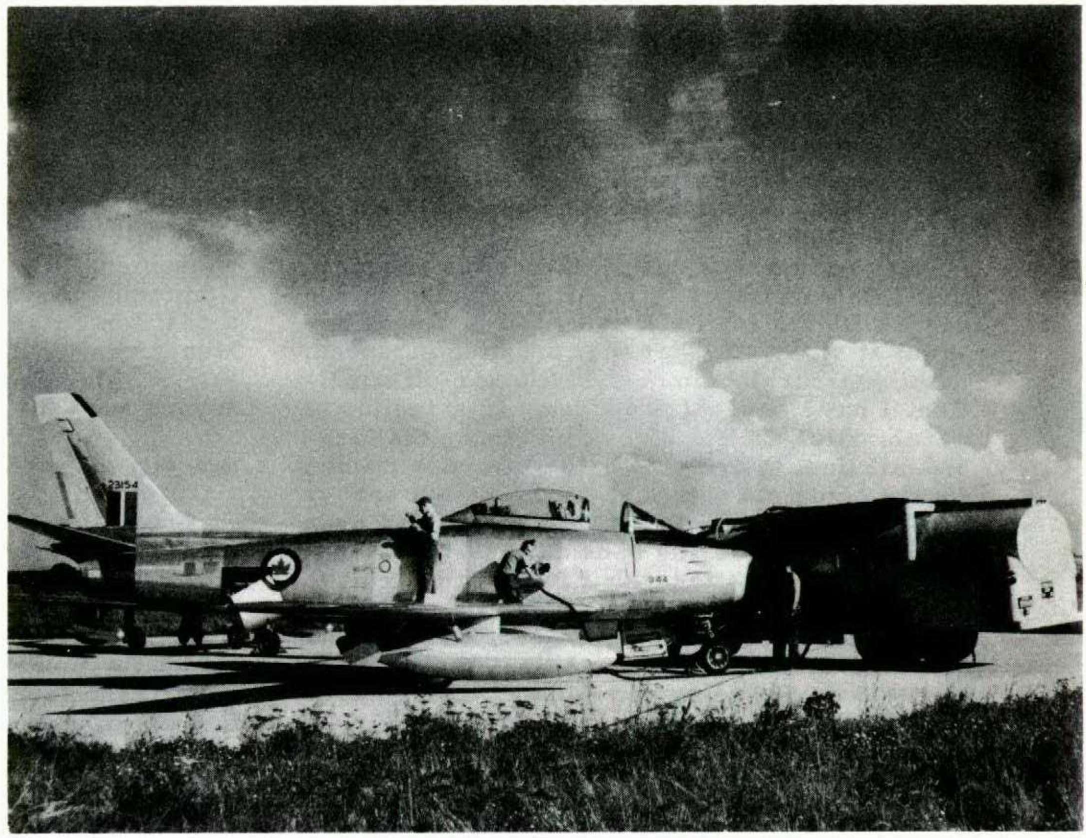
TIMBER LANDING
14c/2041

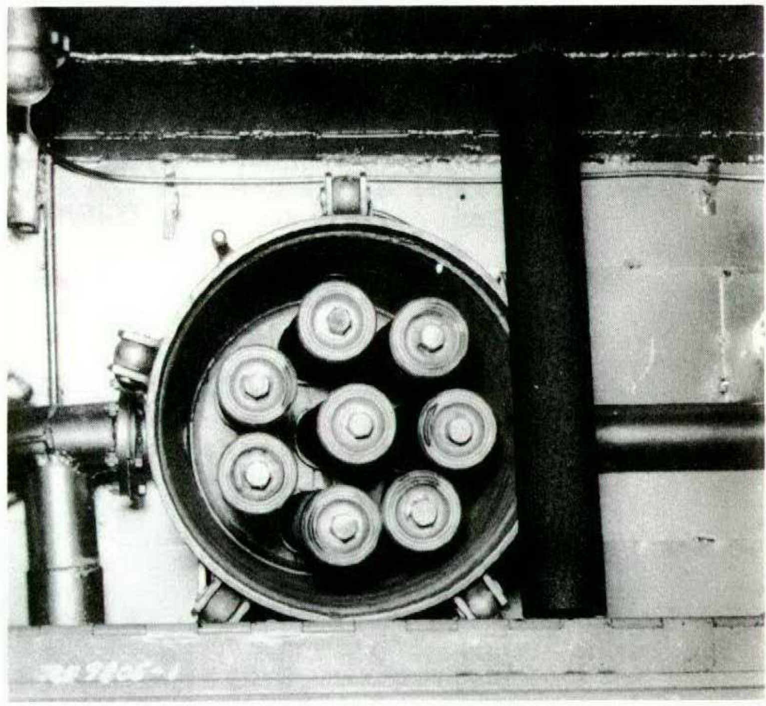
EMERGENCY ESCAPE
14c/2783

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.

KEEP IT CLEAN

Directorate of
Maintenance Engineering





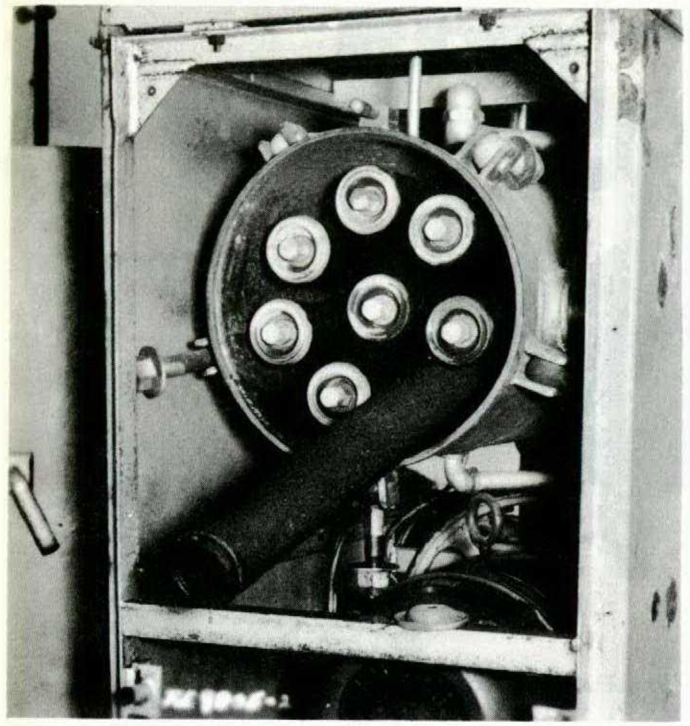
Clean filter in a fuel tender.

CONTAMINATION OF aviation fuel by water and solid particles has always been with us and no doubt always will be in some degree. The problem these days has actually intensified because jet engine fuel controls are much more sensitive to contamination than are the carburettors of piston engines. Maintaining the precise fuel flows required by a modern jet calls for much closer tolerances between engine components.

There are several other factors which help to make the problem more difficult. Jet fuel is a much better contamination-carrying agent than is gasoline. It has a greater affinity for water than gasoline has, and it also takes longer for microscopic solid particles to settle out of jet fuel. When you add to these items the fact that fuel is flowing through the jet system ten times faster than it is through the piston engine system, the sum total is trouble.

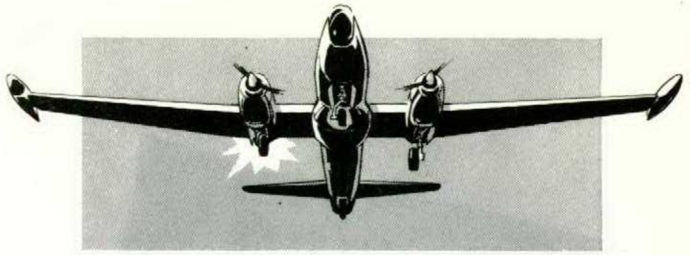
Filtering is the main method of contamination control: filters on delivery in and out of bulk storage, filters on the refuelling tenders, and filters in the aircraft. Filters which were adequate for piston engine fuel systems are inadequate for jet fuel systems. A combination of the increased fuel flow of a jet system and the contamination-carrying properties of jet fuel yield roughly forty times more contamination flowing through the jet fuel components than through the piston engine fuel components. To make matters worse, a greater percentage of this much larger amount of contamination must be removed because the jet system cannot accept the same amount of residual contamination as its piston counterpart. It follows, therefore, that filter systems for contamination control in jet fuel systems are critical components of the system and must be carefully handled and maintained.

Dirty filter in a fuel storage tank.



The reader would probably be interested in knowing what sort of accident can happen when fuel contamination is not controlled. The accident in the accompanying photograph was caused by salt water in jet fuel. This contamination, plus poor emergency procedures on the part of the pilot, resulted in complete loss of the Sabre. The fuel had been contaminated in bulk storage and nothing was done about it before transfer to the aircraft. Investigation revealed that the problem was not restricted to one aircraft or one fuel tender; one other Sabre had its fuel system badly contaminated; and of the ten fuel tenders on the unit, only two were free from foreign material.

If proper fuel handling methods had been followed, this accident would not have occurred. The best way to keep fuel clean is to prevent contamination from getting into it in the first place. There is little hope of providing pure fuel to aircraft if proper inspection methods are not followed. Filters will retain their serviceability only when they are inspected and replaced as required. In other words, the filters will do their job only as long as maintenance personnel are doing theirs.



PERSEVERANCE

Recently a somewhat unusual undercarriage failure tested the resourcefulness of the captain of a Neptune. The captain, F/O R.M. Campbell, was giving conversion instruction to another pilot at Summerside. On the first circuit, when the "undercarriage down" selection was made, the nose and port main wheels extended properly but the starboard wheel did not. The "Barber Pole" was showing in the starboard undercarriage position indicator and the unsafe light was on.

The captain tried all normal and emergency methods but the most that could be accomplished was the partial opening of the wheel well door. It was also noted that the wheel did move a little during the selections, indicating that it was being released from the up-locks.

F/O Campbell made numerous unsuccessful attempts to lower the gear by applying g-loads with the undercarriage selector in the "down" position. He was also advised by technical personnel to investigate the possibility of a hydraulic lock in the starboard up-line. After a fitting had been slackened it was decided that the trouble was probably mechanical rather than hydraulic.

The Neptune was then diverted to Greenwood where the Lockheed technical representative inspected the starboard wheel well while flying in another aircraft. He confirmed that the main wheel mount was moving a little but could give no advice other than that the pilot continue applying g-loads.

The captain next put the aircraft into another dive and delayed the "undercarriage down" selection until the moment when maximum g was applied. This combination was sufficient to dislodge the wheel and a safe landing was made. The flight time was four hours and 25 minutes. Technical investigation revealed that a bolt had failed and allowed the wheel door up-lock to rotate to a position which obstructed the downward travel of the starboard wheel mount.

F/O Campbell is to be congratulated on his persistence and ingenuity. A wheels-up landing would have caused serious damage to the Neptune. The pilot's conduct in this emergency is an example of the professional approach to flying that goes such a long way towards eliminating accidents.

LOVE THAT EGGBEATER

The following was acquired (after the fashion of travelling salesman stories) by a DFS accident inspector during a visit to a helicopter factory.

The helicopter is an amazing assortment of nuts, bolts, rotors, push-pull rods, irreversibles, longitudinal collective differential quadrants, swash plates, wobble plates, gimble rings, cuff and trunion assemblies and other gadgets too humorous to mention. All of these are welded, riveted, bolted or sewed together to make a single machine capable of flight. In fact it is capable of flight in any direction—backwards, forwards, sideways, up, down, and even standing still. Standing still is known as "hovering". This comes in handy for those who like flying but have no place to go.

One of the more necessary components is the engine. This unit is expected to start with ordinary fuel, change it to BTU, the BTU to BMEP and the BMEP to RPM. The RPM is then transmitted through a series of shafts and gears to the main rotor blades which are responsible for the frantic egg-beater motion characteristic of the beast.

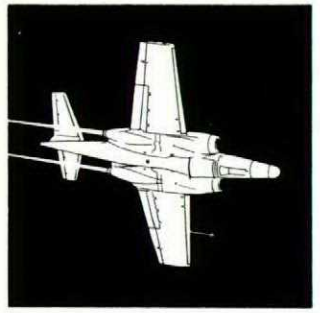
The engine has several important parts. Among these are cylinders. A cylinder is a long hole covered on one end with a plate full of smaller holes containing valves. The holes admit air, fuel—and sometimes water and carelessly misplaced tools. The other end is closed with a plug called a piston. This is free to move up and down and would come out altogether if it were not fastened to a connecting rod. The connecting rod, too, is important because it is responsible for converting your BMEP to RPM. Without it you would be left with BMEP, which no one knows how to use up to now.

The power of the engine is measured in horsepower. (Why? Who knows. It's often difficult to get a self-respecting horse within 70 yards of one of these machines.) Anyway, it's better to rely on instruments the electrical men have invented. They indicate power in amps, volts or kilowatts, depending on the individual whims of the designer. With a little imagination these values can be converted to horsepower.

Starting the "thing" requires some knowledge, steady nerves and a certain amount of bravery. First, make a careful check of all your instruments. This gives you a little self-confidence and adds prestige in the eyes of the onlookers. After everything has been checked—and only then—it is safe to start the engine. If everything is as it should be, there will be considerable noise and you will start to shake and tremble. This is a sign that the engine has started.

When your audience has returned, synchronize your eyeballs and look wisely at the instrument panel, noting pressure and RPM. Before you forget, check the flight controls. This is important even though the controls quite often do not perform the function for which they were designed. It is embarrassing to get in the air and find these items not working properly—or just not working, period. Once airborne you are on your own, astride a brute that, like a bumblebee, looks as though it won't fly—but does anyway and to Hell with it.

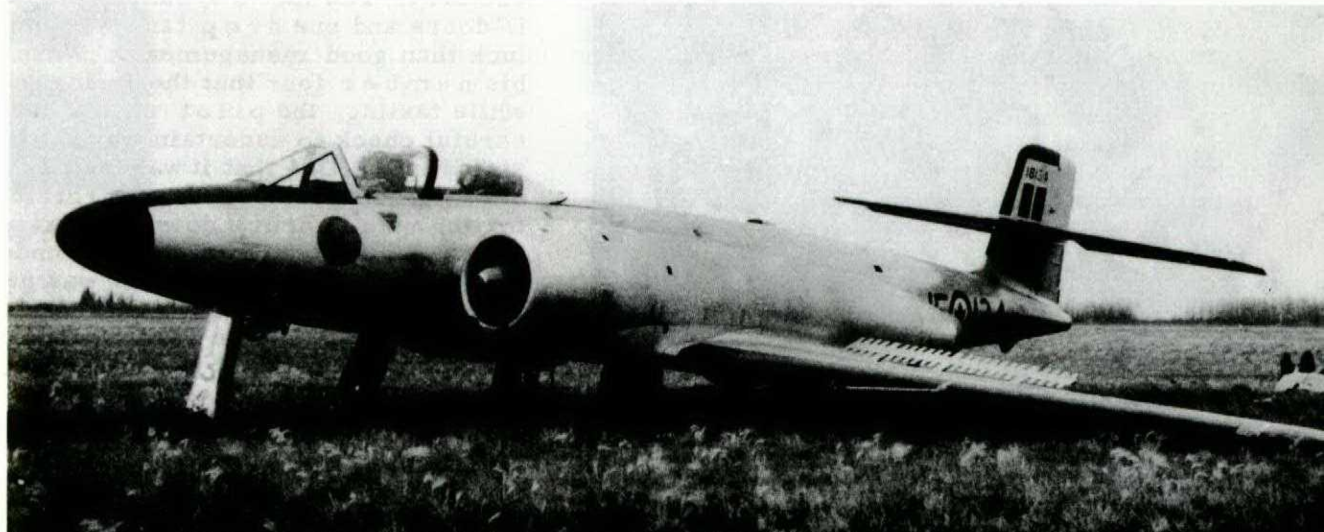
Accident Resumé

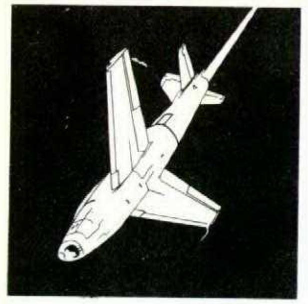


Speed Brakes

The pilot was making a descent following a night training mission when the Canuck's canopy and windscreen panels misted up. Inadvertently leaving his speed brakes extended throughout a rather steep approach, the pilot attempted to round out the aircraft but it stalled and struck the runway heavily. When application of power failed to keep the aircraft airborne, he closed the throttles, and the Canuck came down on all three wheels. As soon as brakes were applied, the port undercarriage fractured.

Restriction to vision through iced-up side panels certainly presents a problem to the pilot trying to land an aircraft. Possibly pre-occupation with the problem caused this pilot to forget to close the speed brakes. It has been confirmed repeatedly that, at normal approach speeds, the hold-off is practically nil with those speed brakes out.



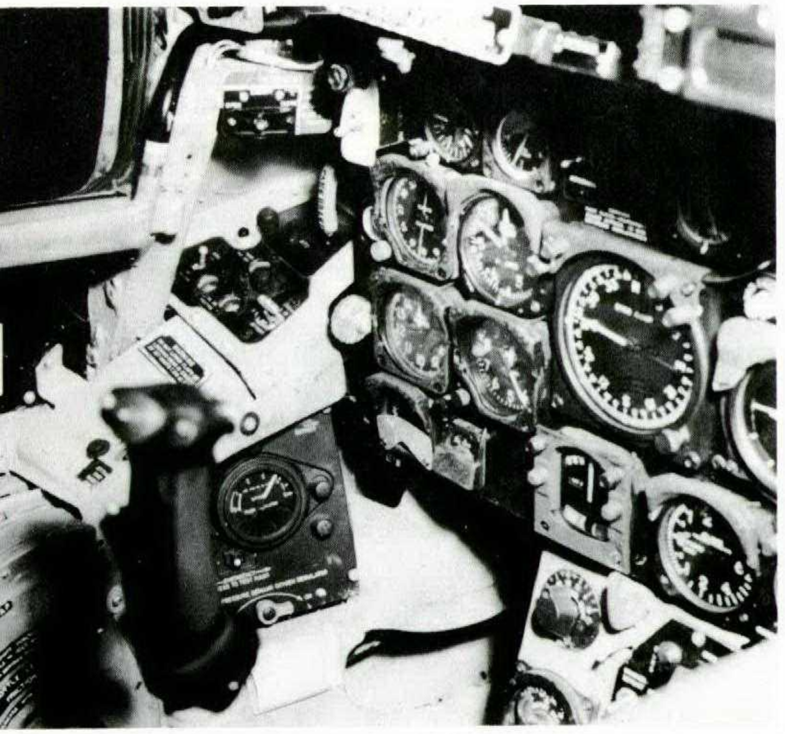


Still It Happens

At various times since retractable undercarriages first came into use, pilots have found themselves deep in wheel trouble. The inadvertent retraction continues to plague us.

On completion of an exercise the pilot returned to base for a normal approach and landing. Almost immediately after touchdown, the landing gear folded and the Sabre finished up on its belly in a "B" category crash. Eyewitness reports confirmed that the undercarriage was down on the approach; yet, in spite of the pilot's insistence that he had not selected "undercarriage up", the selector was found to be in the "up" position after the accident. Furthermore, when the aircraft was raised, the gear was found to operate properly.

In his statement to the Board of Inquiry, the pilot admitted that he was in the habit of selecting "flaps up" as the nosewheel was being lowered to the runway on the landing run—using the wet, slippery runway technique no matter what the runway condition. This was contrary to squadron policy which requires that the aircraft be turned off the runway before flaps are raised. The Board could only assume that the pilot had raised the undercarriage handle by mistake.



The selector was found to be in the "up" position.

Raising the flaps early in the landing run is a recognized means of increasing braking action on a wet runway, but it is a technique which should be reserved for that special purpose and not applied indiscriminately.

It Pays To Check

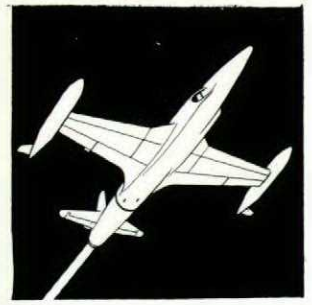
A formation of four Sabres was being taxied to takeoff position when number four informed the leader that the lead aircraft's D-doors were still down. Believing that the D-door switch in the wheel-well was in the wrong position, the leader elected to continue with the flight.

During the takeoff run, number one raised the nosewheel slightly at about 125 knots, felt a slight bump (which he attributed to roughness of the runway) and continued the takeoff. At about 50 feet above the ground he reached for the undercarriage lever and found it in the up position. (The bump mentioned earlier had obviously been the result of hitting the runway when the undercarriage began to fold as the weight came off the gear.) The flight was completed with no further trouble after a check by a wingman disclosed no apparent damage.

The Accident Report Form D14 was incomplete on many points and left the reader to assume numerous conditions which were not clarified. It appeared that the undercarriage lever was up when the pilot entered the cockpit and that he failed to check it. But what about his wheel-well check and the D-door switch? On the D14 these queries were left to the imagination.

The pilot's failure to check the position of the undercarriage handle on his preflight set the stage for what could have been a serious accident. The fact that damage was confined to D-doors and one drop tank was more by good luck than good management. When warned by his number four that the D-doors were down while taxiing, the pilot should have made a careful check to ascertain why. Also, it was stated in the D14 that it was unusual for line crew personnel to permit an aircraft to continue taxiing with D-doors down without warning the pilot. The question of how the undercarriage handle got into the up position was never satisfactorily answered. But the disciplinary action taken will probably be a future reminder to the pilot of the value of careful and complete checks.

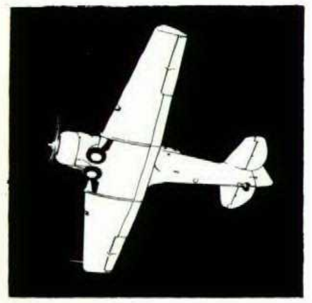
This case should serve as a warning to the pilots of all types of aircraft that it does pay to check. It also highlights a definite need for care and accuracy in the preparation of D14s. If the D14 is complete, many lessons can be learned.



How Not To

The instructor found that his student persistently neglected fuel checks. He was in the habit of letting the fuselage tank drain down too low, and then had to be reminded to switch tanks. Deciding to teach the student a lesson on this exercise, the instructor said nothing when fuselage fuel became low in the circuit, hoping that the T-33 would be up to 7000 or 8000 feet before a flameout occurred. However, the engine flamed out just after the overshoot was initiated. The instructor took over immediately and climbed the T-33 to 600 feet while the student tried a relight. It was unsuccessful, so the instructor tried from the rear cockpit with no better result.

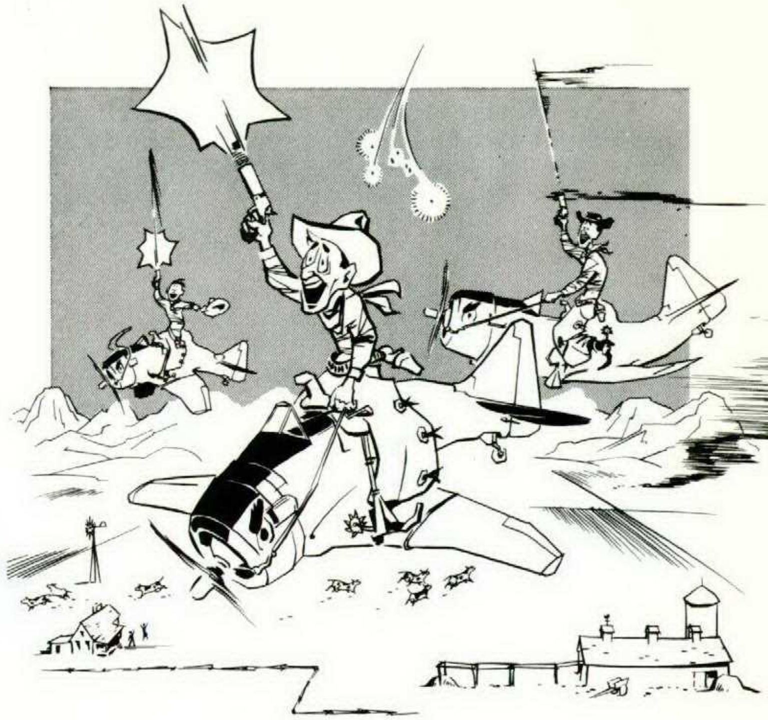
The T-33 was forced-landed with very little damage. The instructor's means of impressing the student with the necessity for regular fuel checks was too drastic. Again, it is necessary to know how far to let a student go before taking corrective action. And nothing is to be gained by waiting too long.



Trigger-Happy?

Three Harvards were being ferried to a maintenance depot when the pilots indulged in some unauthorized low flying in formation. During this part of the flight two of the pilots, for reasons known only to themselves, each fired a Very cartridge. Because the aircraft were low, the charges were still burning when they hit the ground; and one of them set fire to pasture land. Before the fire could be brought under control, it had burned off some 30 acres of grass.

Pilots are urged to remember the boy who cried "wolf" and to save those signal cartridges for the real emergencies for which they are intended. Tests have shown that signal cartridges fired from a height of even 900 feet will still be burning when they hit the ground. A reprimand and a $75.00 fine will probably remind these pilots not to be either trigger-happy or pyromaniacs.



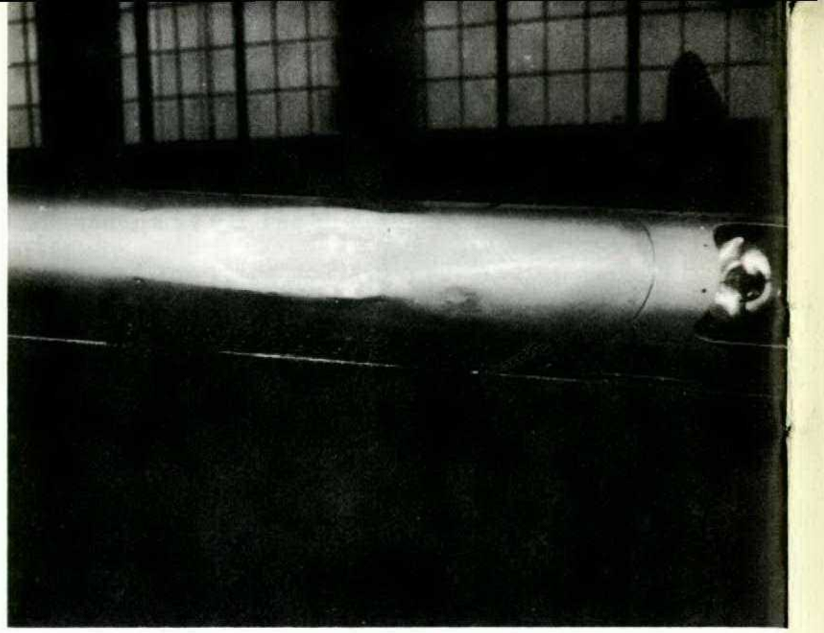
Scratched Wing

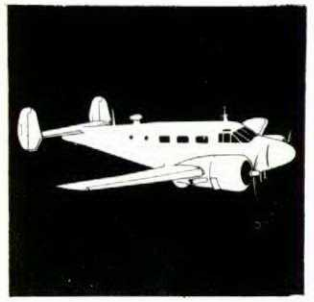
The student pilot was authorized to practice takeoffs, overshoots and aerobatics in a Harvard. He decided to try an unauthorized practice forced landing and claims to have misread his altimeter and descended to an extremely low altitude during the first 180 degree turn of the procedure. Upon taking overshoot action he elected to remain at this dangerously low altitude, which was estimated to be approximately 50 feet, while he attempted to gain sufficient speed to effect a fast climb. Apparently the reasoning behind this decision was to prevent people on the ground from obtaining the aircraft number.

During a low pass across the field, or at the time the pull-up was initiated, the Harvard's starboard wing struck an unknown object (suspected to be a tree), causing rib fractures and a large dent on the leading edge. The pilot continued his climb, returned to base, landed and entered the damage in the L14. He then entered a report of low flying in the Low Flying Record in the Control Tower, giving engine failure as the reason. Later, during questioning, he claimed misreading of the altimeter and poor lookout as the reason.

The student delayed reporting the accident personally to someone in authority in spite of having talked to the duty pilot when he landed. It was approximately two and one-half hours later that he called at the home of his course director and reported that a "large scratch had been made on the starboard wing". From the student's report—and before seeing the aircraft—the course director was of the opinion that the scratch described did not warrant an accident investigation report. The photograph shows the extent of the "scratch".

This "Hedge-Hopping Thrill-Seeker" was more fortunate than many in that he is still alive. He is, however, no longer flying.



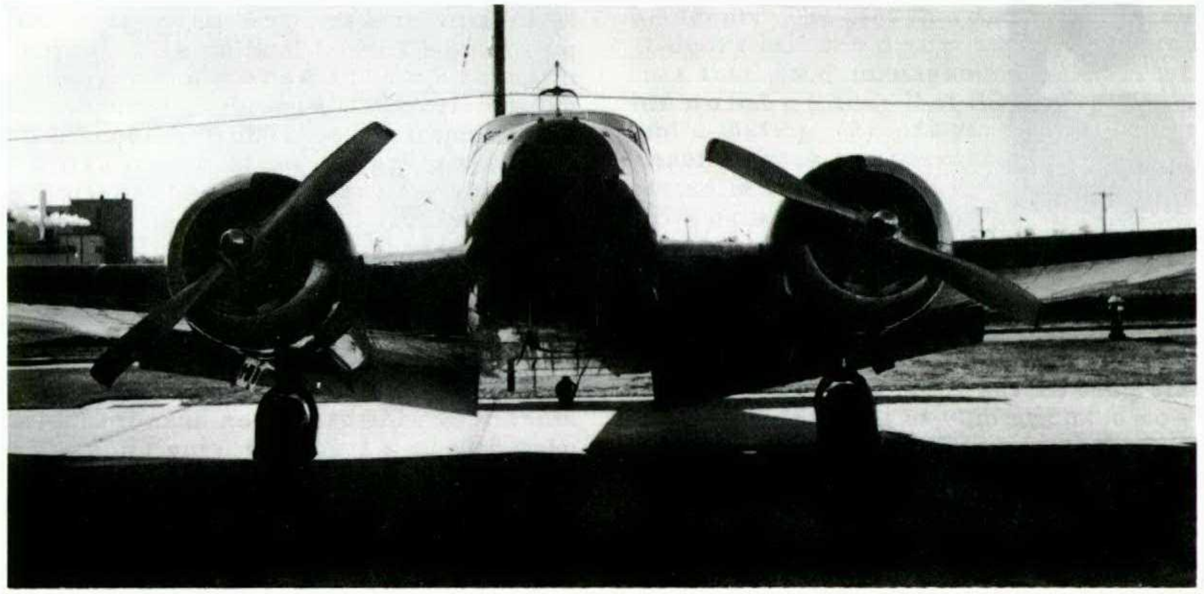


Pills, Pilots And Prescriptions

By continuing medication beyond the period prescribed by the medical officer, a pilot found himself involved in an accident. The medicine should have been used up on the day prior to the flight. In actual fact the pilot took the final tablet on the morning he was to fly.

The flight was without incident until it came time to land. The pilot made what he thought was a normal approach but it resulted in a bad bounce. Instead of going around again, he tried to salvage a bad landing by checking forward on the control column. The next time the aircraft hit the runway it stayed down—but at the expense of a pair of damaged propellers.

It was the opinion of the medical officer that at the time of the accident the pilot would still have been under the influence of the medication he had taken, and that his ability to land the aircraft was impaired by the drug. Aircrew personnel are only taking unnecessary chances if they mix pills and planes. Follow the medical officer's directions as to the frequency and duration of any treatment prescribed.



ALL-NIGHT THRASHER

Or Avis Inebrius. Fortunately, in the worst condition, a somewhat rare species, but isolated cases of complete destruction are known to have resulted. Others, not so far gone, have scared themselves into sobriety, at least for flying. However some may still be seen by the careful observer. May be recognized by bleariness of the eyes and unsteadiness of the extremities—often characterized by shaky takeoffs and landings. Closely related to the Long-Winded Bar-Beater.

Call: WHOTHEHELLSHADTOOMUCH?

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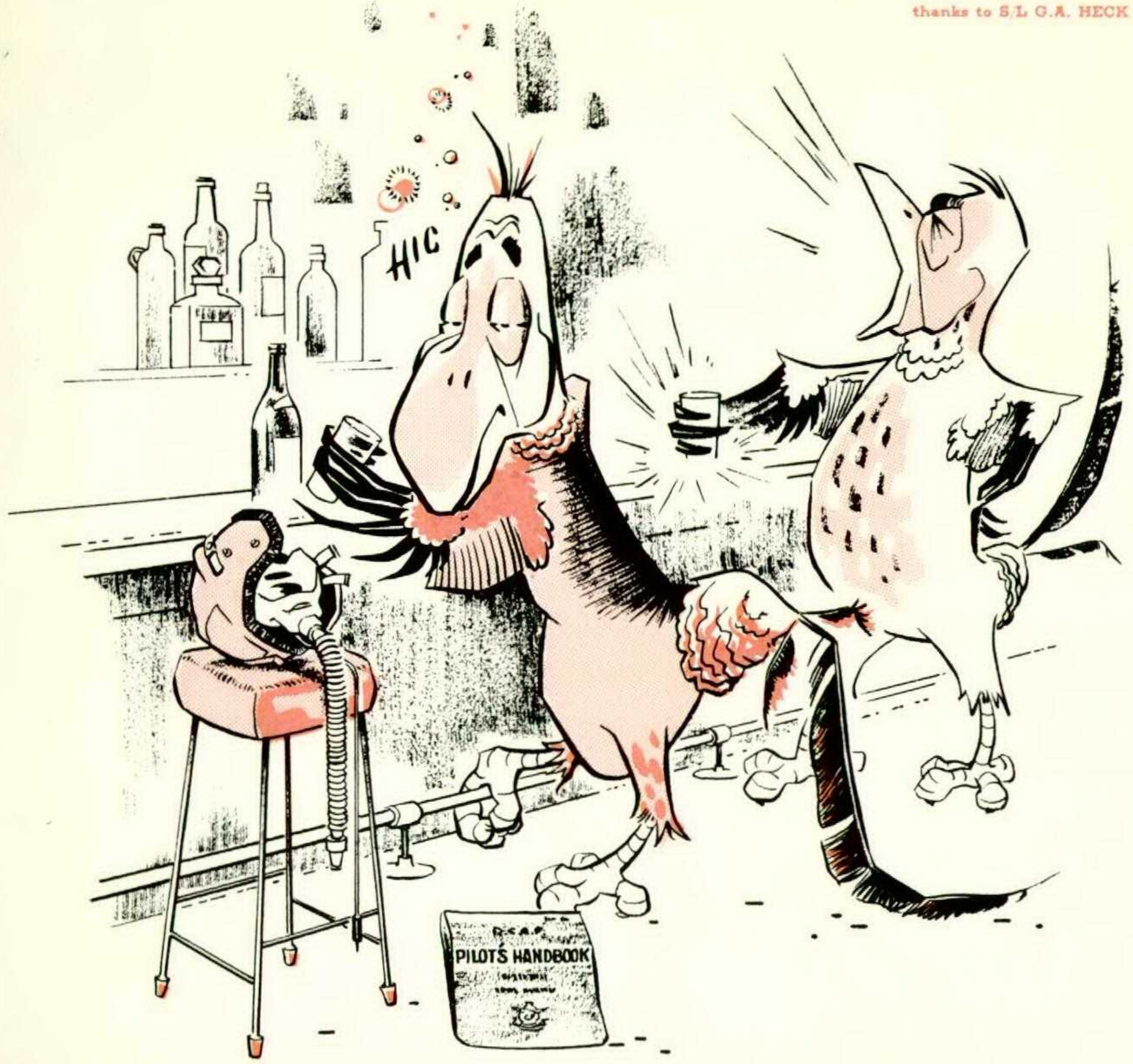
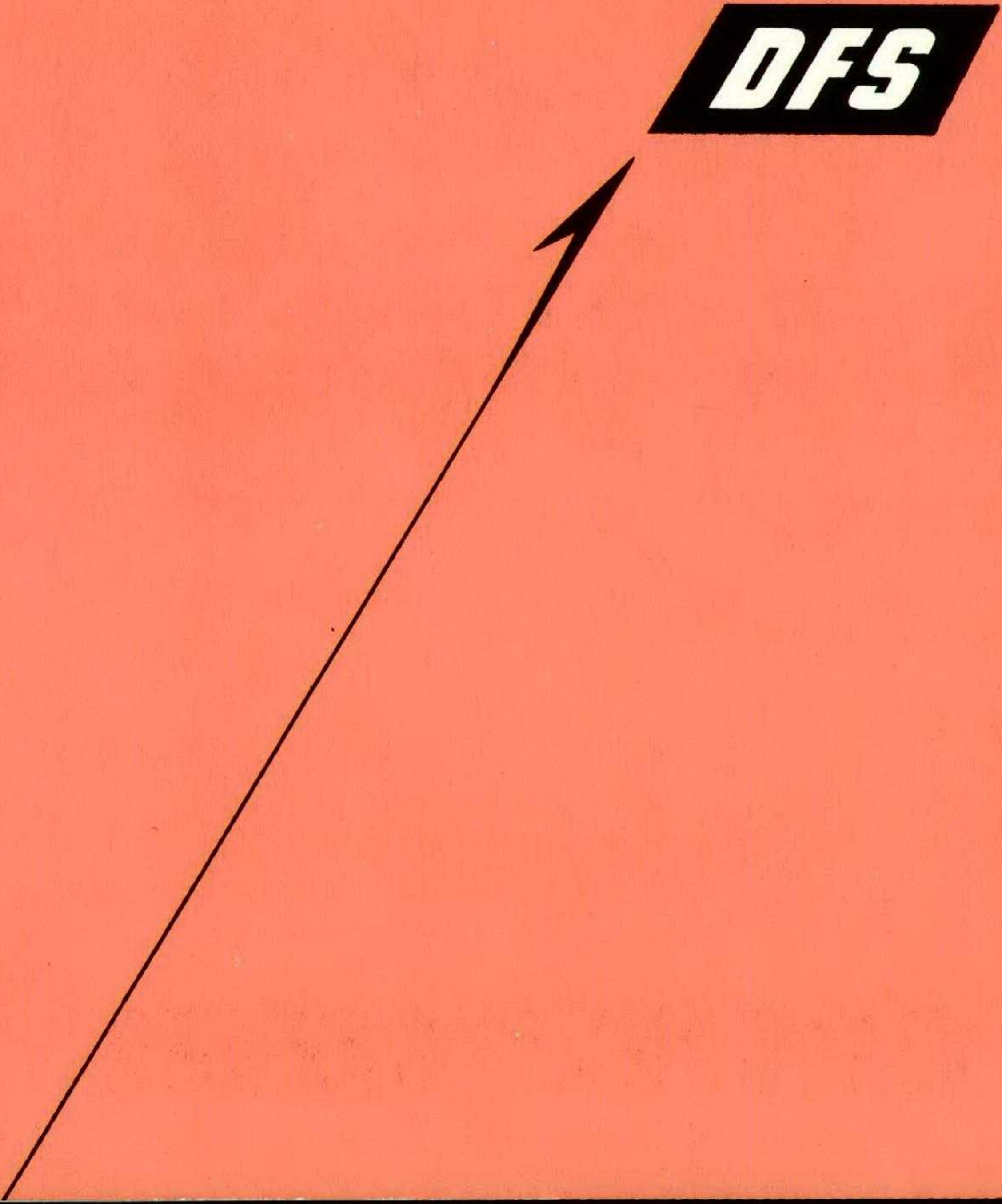


BIRD WATCHERS' CORNER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