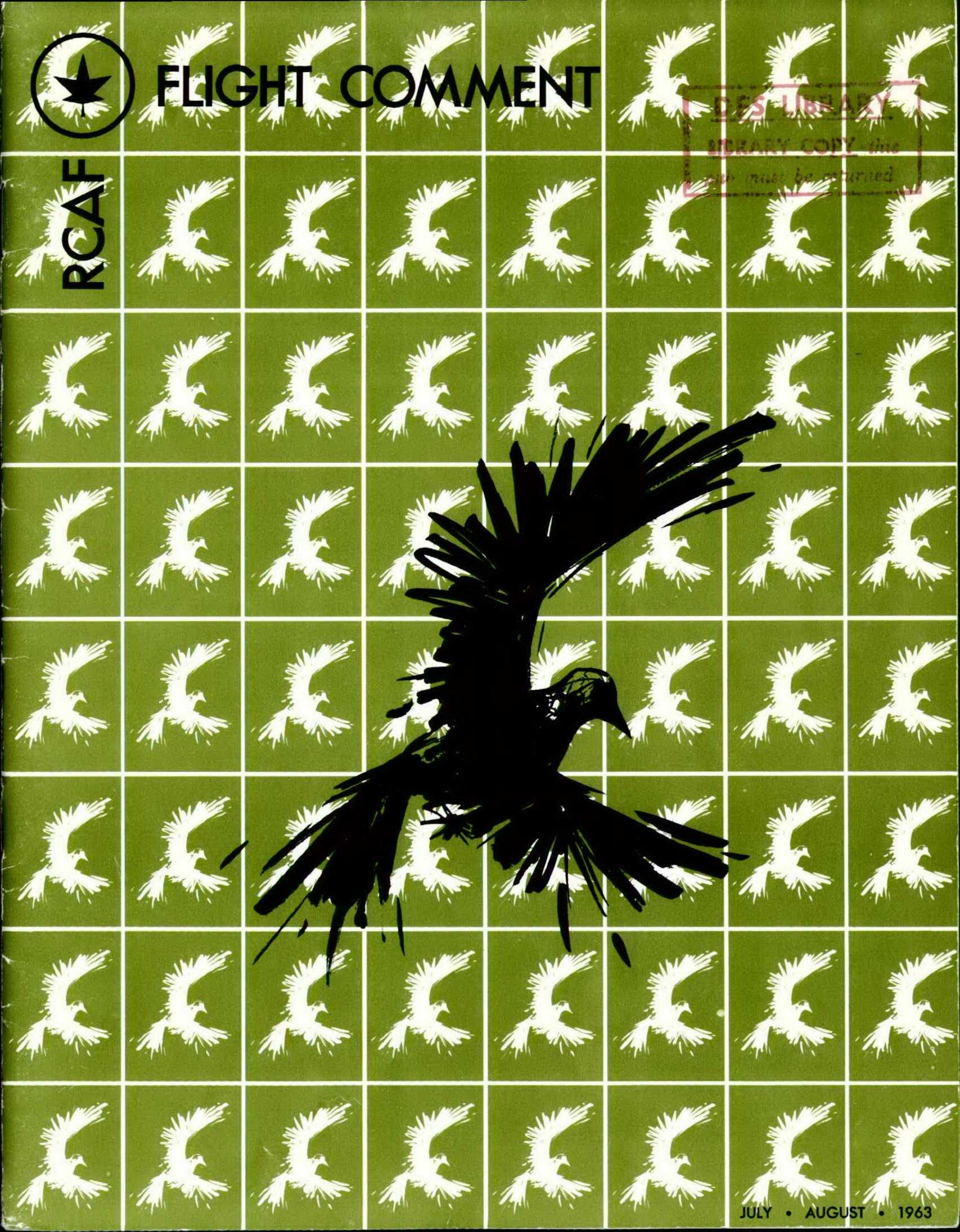
RCAF

FLIGHT COMMENT



JULY • AUGUST • 1963

FLIGHT COMMENT

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CONTENTS

Articles

Features

ROYAL CANADIAN AIR FORCE
DIRECTORATE OF FLIGHT SAFETY

Much has been written about aircraft accident causes in the RCAF. Sometimes the significance of this written material becomes lost in the unending competition with other attention-demanding information. Statistics for the past three years on accidents involving aircrew error reveal two facts which I would like to inject loudly and clearly into the ear of every aircrew member of the RCAF. These are the two facts:

DISOBEDIENCE OF ORDERS WAS INVOLVED IN MORE THAN HALF OF AIRCREW FATALITIES.

DISOBEDIENCE OF ORDERS WAS INVOLVED IN AT LEAST HALF OF AIRCRAFT WRITE-OFFS.

These many instances of disobedience of orders varied from a lack of diligence in the performance of vital checks to an absolute and wilful disregard for regulations. Oftentimes "just this once" is enough. The record proves it. One can only assume, when viewing the record, that some personnel are determined to impress others with their skill in handling aircraft, or to die in the attempt.

Aircrew! Flying regulations are our inheritance, purchased with the labour, the pain, and even the life of our predecessors. If you permit juvenile instincts to seduce you into ignoring this priceless benefaction, then it may be said of you:

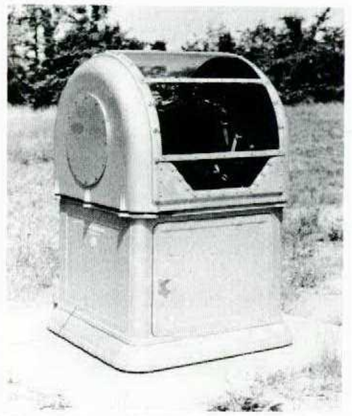
"He wasted our aircraft"

"He squandered his life".

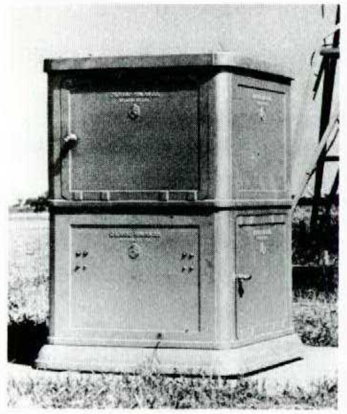
A.B. SEARLE, GROUP CAPTAIN
DIRECTOR OF FLIGHT SAFETY

Electronic Weather Observing Aids

Mr. B.V. Benedictson
SMetO
Stn Comox

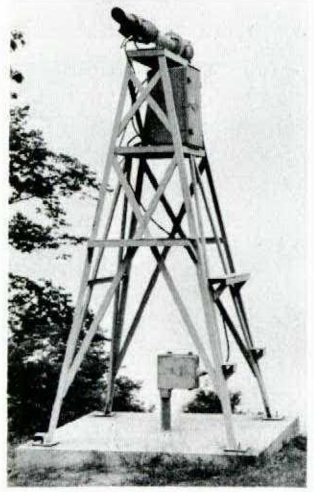


Ceilometer Rotating Beam Projector



Ceilometer Detector

Transmissometer Projector



Transmissometer Detector

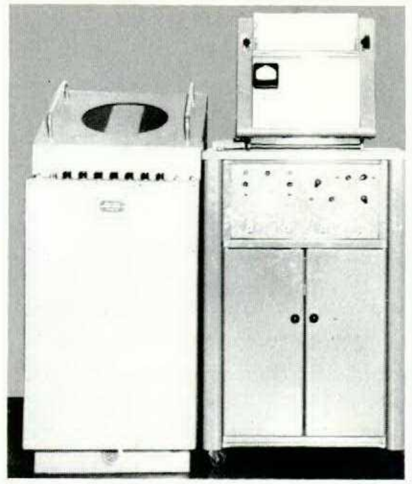
Installations of ceilometers and transmissometers at most of the major airfields in Canada are expected to provide aircrew with reliable and timely reports on ceiling and visibility. The instruments are sited to measure these important meteorological parameters in the area of primary concern to landing aircraft—approach and touchdown zones. In addition, to ensure prompt observation and reporting, their recording components are located at the observer's work position in the Met Office. They are to provide a continuous display of ceiling and visibility changes.

Up to this time the methods used to measure ceiling and visibility had shortcomings, especially in considering the requirements of high speed jets. The main problem centered on the currency and reliability of reports. The currency depended to a degree on time available to the Met observer to make periodic checks. During periods of change there was a built-in delay between the arrival of the change; the recognition, measurement, recording, and finally reporting. This processing time seriously limited the number of observations which could be taken. The weather picture may have changed considerably from the time the observation was made until the report is requested by the pilot. The ceilometer and transmissometer will now give up-to-the minute measurements.

The official observing site often far removed from the critical approach touchdown zone compounded the problem, particularly in cases where marked changes in topography exist in the vicinity of the airport or where there are strong urban or industrial influences. Under these conditions the Met observation may represent weather at the official observing site only, and it was not necessarily representative of the defined runway area.

The Ceilometer provides accurate day and night measurements every six seconds. For all practical purposes this is equivalent to a continuous reading of cloud height. With such an abundance of readings it is possible to observe variations of change in ceiling height from one measurement to the next, and with practice, the character of the cloud base can be inferred.

There are four major components in the ceilometer instrument assembly. They are the rotating beam projector, and a fixed detector located in the approach zone of the airfield. The display components in the met office consist of a cathode-ray tube indicator and an electronic recorder. The basic principle involved in making a cloud height measurement is one of triangulation. As the projector rotates from 0° through 90° it paints the cloud in the field of view of the detector with modulated (chopped) light. The detector is tuned to this modulated frequency. In other words, the detector sees this modulated light on the cloud base once for every sweep of the projector from horizon to zenith. The angle of the projector at the moment when the detector senses the chopped light on the cloud base determines the height of the ceiling. If the angle is large, the ceiling is high, and if the angle is small, the ceiling is correspondingly low. When an amplified cloud signal from the detector is fed into the cathode-ray tube, it causes an electron beam running up the face of the tube to widen momentarily. The point at which the beam widens corresponds to the angle of the projector at the moment when the projector beam moves along the cloud directly above the detector. This display of cloud height on the cathode-ray tube (CRT) can be read directly in feet. As the intensity of the modulated light imposed on the cloud decreases with increasing cloud height so will the indication on the CRT be less for high than for low clouds. Below 5000 feet the indication is quite strong so that cloud heights in the range of interest to pilots on final approach can be accurately measured. All readings from the CRT are preserved on the facsimile recorder which runs in phase with the CRT.

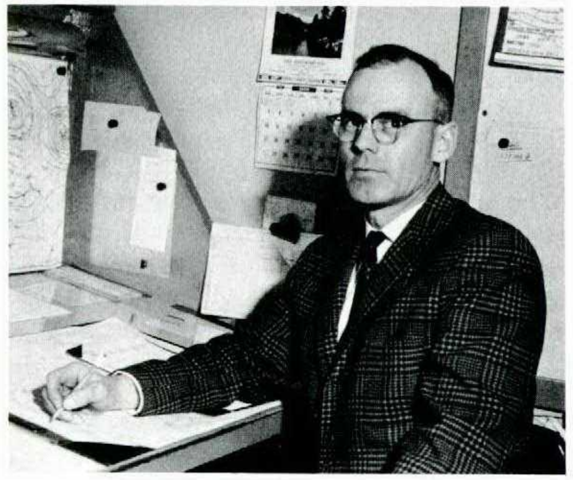


CRT Indicator and Electronic Recorder

When the equipment is first installed, the light from the projector can create a distraction to pilots executing an approach at night under low celing conditions. After a brief period of familiarization, however, it has been found that aircrew usually adjust to the condition and it no longer is a point of concern. If this adjustment does not ensue, it may be necessary to relocate the instrument or modify it to operate on energy beyond the visible spectrum.

The Transmissometer provides a sensitive measurement of visibilities in the area where it is installed, and is a better indicator of trends than those obtained by periodic visual observations. It is designed to provide measurements of visibilities in the range between 250 feet and 2 miles. For visibilities greater than this, the indication of trends is generally good but the accuracy of the visibility measurement decreases with increasing visibility. In

B Verne Benedictson is Senior Meteorological Officer at Station Comox. He has served in the same capacity at RCAF Stations Gimli and Namao. During the war from 1943—1945 Mr. Benedictson was a forecaster at RCAF Stations Claresholm, Portage la Prairie and Rivers. In 1945 he moved to the DOT Forecast Office at Regina where he stayed for five years.
Mr. Benedictson is a graduate of the University of Alberta and received his Meteorological training at the University of Toronto.



the higher visibility ranges visual methods for measuring this element are still considered the best.

The Transmissometer Set consists of a projector and a receiver located in the area of interest, and an indicator-recorder in the weather office. The projector directs a light beam toward the receiver. The amount of light reaching the receiver varies with the density of the obstructing medium in the path between the two instruments. A reading proportional to the amount of light incident on the receiver is electrically produced on the indicator in the Met office. To provide a record of these visibility measurements, a trace of the readings is produced on the recorder.

Present zoning regulations prohibit siting the projector and receiver immediately alongside the runway. It is thus necessary to locate these instruments up to 800 feet to one side of the touchdown area. It is extremely important that terrain conditions at the instrument site be like those in the touchdown area so that visibility measurements will be representative. The most serious situation which could arise would be in a patchy fog condition where the instruments are in a fog free area and the touchdown zone is enveloped in fog. If the observer were unable to monitor the instrument site visually, he could then be under the impression that the visibility is excellent when actually it is near zero at the button of the runway. It must always be remembered that the transmissometer is an aid, and the resultant measurements still require scrutinizing and common sense interpretation.

HOT WEATHER NOTES

Hot weather is with us again. Do you know that of all aircraft performance characteristics, takeoff is the one most profoundly affected by outside air temperatures. Each aircraft type has different characteristics but all are affected more or less.

High outside air temperatures increase takeoff distance for two reasons - engine thrust is decreased and the ground speed required to achieve takeoff airspeed is increased.

A CF104, for example, on a 95° F day with zero wind at an aerodrome 1,000 feet ASL takes 10,500 feet to clear a 50 foot obstacle. Do you know the length of runway required for takeoff in the bird you are currently flying.

It might be worthwhile to check the AOIs again.

Also, hot weather often means thunderstorms and the best advice is, avoid them if at all possible.

The area of maximum frequency of thunderstorms in Canada are Southern Ontario, interior regions of B.C. - worst of all - the stretch between the Head of the Lakes and Winnipeg. The Prairies can boast about some exceptionally big ones, too.

The problems encountered in thunderstorm flying are generally listed as turbulence, hail, lightning and icing. But remember too that the mental hazard is perhaps equally serious. When panic takes over, turbulence precipitation and lightning will appear to get worse. Concentrate on your plan of action. A calm sensible attitude which permits you to think clearly and act skilfully will be your biggest aid.

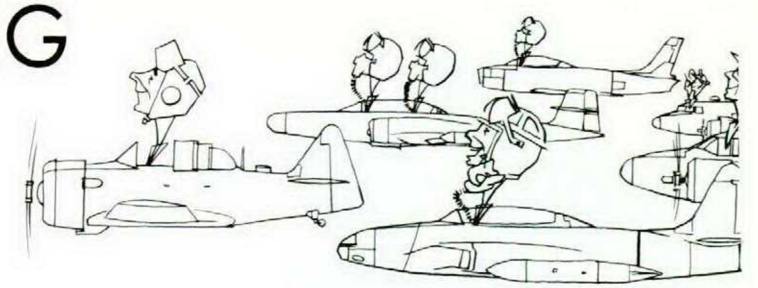
Select an altitude to avoid the worst of the turbulence - in a piston this will be at as low an altitude as possible at or near the base of the cloud - in a jet it will be as high as possible.

There is no reliable method of knowing prior to entry whether hail is occurring in a precipitation area. The best means of avoiding it is to keep well away from overrunning cloud ledges especially under the anvil. Those nasty airborne ice cubes have even been encountered in clear air 10 miles downwind!

If landing in a thunderstorm is absolutely necessary, expect wind shifts, heavy rain and downdrafts with possible loss of airspeed and altitude. Also be alert to sudden pressure variations within the thunderstorm area which will cause the altimeter to indicate other than true height.

It might be very worthwhile to review the article called "Thunderstorms Ahead" in the Jul/Aug 1962 issue of Flight Comment and also the article on "Hot Weather Takeoff" in the May/Jun issue.

HEADS-UP FLYING



WEIGHTY DECISION

F/L C.N. Hartley, captain, and F/L R. Sowerly, first officer, were cruising at 18,000 ft. from Chatham to Montreal in a Cosmopolitan with 40 passengers on board. Between Millinocket and Sherbrooke, oil pressure dropped and the port engine had to be feathered.

The crew declared an emergency and since they could not maintain 18,000 ft. started to leave airways. However ATC cleared them to 14,000 which they could not maintain either and they then received further clearance to 12,000 ft. which was satisfactory. The captain took stock of what airfields were available for landing. Sherbrooke was closest but this was rejected because it had only 3,500 ft. of packed snow and no emergency equipment available. This left St Hubert or Montreal and after careful consideration the captain decided in favour of Montreal because better facilities were available for his passengers and since he was maintaining 12,000 ft. the short distance farther was of little consequence. An uneventful single-engine landing was made.

The professional manner in which this crew handled a serious in-flight emergency is Heads-Up Flying all the way. The decision to overfly an airfield while an emergency exists must not be taken lightly, but in this case we think the captain showed good judgement.

BRAKE LINE FAILURE

Heads-Up Flying to F/O A.S. Raeside of Station Penhold for good airmanship in landing a Harvard without mishap when his VHF and brakes failed.

F/O Raeside was returning to base with a student pilot after completing a training exercise when it was discovered that his VHF had failed. To add to his difficulty, on the downwind check his brake pedals depressed completely. Pumping brakes produced no pressure. F/O Raeside then made a pass between the tower and runway to attract attention. During the overshoot he formated on a dual aircraft and made signs with a grease pencil indicating his difficulties. The other aircraft informed the tower of the failure and indicated later by hand signals for the distressed pilot to return and land. Two passes were then made to determine wind conditions, a green flare was shot and an uneventful short field landing was made.

It was later discovered that the flexible brake line had failed. Flight Comment is pleased to award Heads-Up Flying to F/O Raeside for his ingenuity in drawing attention to his problems and his skill in landing the aircraft without mishap.

POWER LOSS

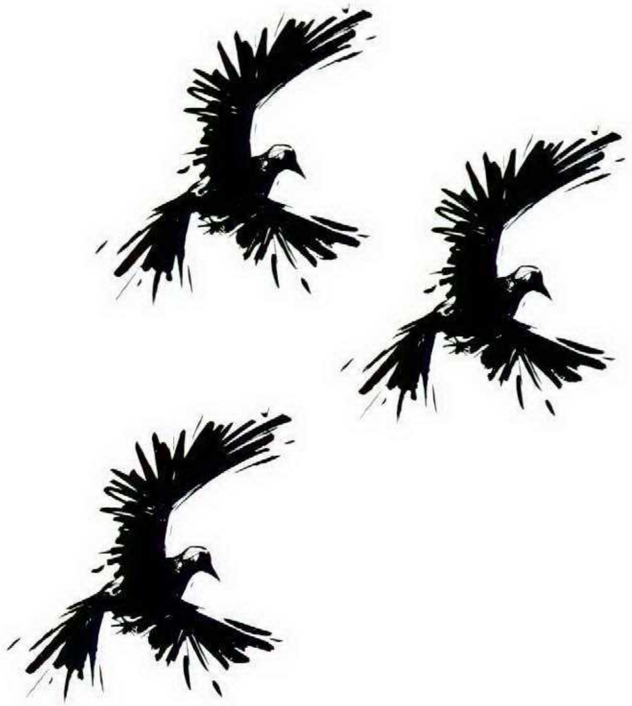
Heads-Up Flying to F/L R.W. Hallworth of Stn Chatham who used good judgement and displayed a high degree of skill in landing a Sabre, when faced with a loss of power at 2500 feet due to centre bearing failure.

F/L Hallworth had been assigned to an airtest following a #4 check. All temperatures and pressures were normal on start-up and run-up. Takeoff was normal, but at approximately 2500 feet and 350 kts. severe engine rumble and excessive vibration started. RPM and JPT were normal. The pilot immediately retarded the throttle to idle where it remained until the engine was flamed out after the landing was assured.

F/L Hallworth landed the Sabre downwind on an icy surface, with a heavy fuel load. He could have jettisoned his external fuel during approach to ease his position but this would have endangered personnel and property beneath him.

This pilot merits the compliments of Flight Comment for the fine airmanship he displayed in completing a safe landing under critical conditions.

Within the past five years the RCAF has experienced 139 bird strikes, 19 of them serious. Within the past four years one airline lost over a million dollars in direct costs because of bird damage. To say we had a slight problem with birds is a gross understatement.



FOR THE BIRDS

You name a type of bird and he could be found near our runway. There were black birds, blue birds, crows, sea gulls, starlings, and sparrows. One of the NCOs, who is a wheel in the local bird watchers society, swears he saw a yellow-bellied sap sucker. He thought there were several varieties of birds on our airfield that the Audubon Society had never heard of.

As Station Flight Safety Officer, I had more than just a casual interest in the problem. The wing commander suggested that we find a solution to the problem but quick. During the next several months I learned more about birds than I did about airplanes. For instance, do you know where a starling likes to build his nest best? If you guess a tree, you are wrong. He prefers the carburettor air intake on a Dakota. If he finds this space taken, he will go to the elevator hinge point on a Sabre. In fact he is pretty much satisfied with any little nook or cranny as long as it's part of an airplane.

Realizing our ignorance of the problem, we called in experts. The first expert came, took one look and said the solution was simple. Our grass near the runway was too high; the birds were nesting in it. Cut the grass low, he said, and the birds will go away. It sounded logical, so we cut the grass. There was only one problem. Cutting the grass lower exposed the hiding place of thousands of insects. This brought in larger birds. The birds that were in the grass originally couldn't see passing up a good meal, so they stayed also. The next expert suggested poisoning the birds. Checking with the wildlife people we found this was legal so long as it was in the interest of flight safety. So out we went with the poison. For a few days it looked like we had it made; there was a marked decrease in birds. But then the birds that eat dead birds came in. They were larger still. One more round of this and we would have birds larger than the airplanes.

After the experts finished we decided to try a few things on our own. First, our Ops people got some special shotgun shells. When fired, they gave out with a 95-decibel bang. At first the crows were scared off by the sound. After the novelty wore off, it looked like they came from miles around just to hear the noise. Enough was enough. We really gave them the business then. The Ops officer went out for them with real shells. The more birds he shot the more they seemed to appear.

Finally someone made what I thought was an excellent suggestion. They suggested we move the unit to some other base—say, like Vancouver. Now don't laugh, I told the wing commander the idea had merit: winter was fast approaching and temperatures of 40 below zero here are not uncommon. Being from BC myself I was intimately familiar with the west coast living conditions in the winter. I'll admit we might not get rid of the birds out there, but we would enjoy our work a lot better. Well, to make a long story short, it got cold, the birds went south, and we stayed in Manitoba.

To sum up our 1962 experiences it could be safely said that we finished the year with more birds than we originally started with. But, being stout-hearted fellows, we were not ready to admit defeat. We took courage from that old safety officers' motto, "Non Bastoris Corburondum" (please see your local Flight Safety Officer for the official translation).

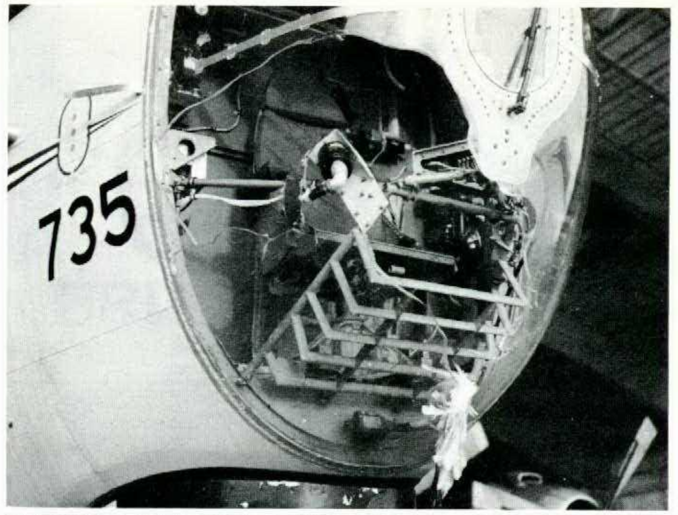
In 1963 we adopted the sage advice of the tactician Von Clauswitz: "In order to achieve local superiority in an engagement, it is necessary to overwhelm the opposition with surprise and superior numbers."

Not even the invasion of Normandy could have surpassed our planning of the Bird Campaign of 1963. Our plan of attack was finalized after the spring thaw (that was the latter part of June, this year). We decided to use all the methods of attack we had used in 1962, with a few additions. First we would cut grass, shoot, poison and scare the birds all at the same time. Second, all birds shot would be left for a few days. This was to be a gentle reminder to those brave souls that stayed behind. Our reserve plan was a masterpiece of sheer genius. If everything else failed, I would again recommend to the wing commander that the unit be transferred to Vancouver. But this time I would wait until it was 40 below zero. We were also going to stick BC travel posters in strategic places--like the door to his office, etc. Our planning staff did veto my piece de resistance, however. I thought a few miniature totem poles in discreet locations would help, but they said my ideas were too far ahead of the times.

Well, fortunately we didn't have to use our reserve plan. Our campaign of a massive assault has worked. So far this year, there has not been one reported case of bird damage to aircraft or engine. We still find an occasional nest, but there has been a marked decrease as compared to last year.

Listed below are the important steps in our so-called battle plan:

Keep the grass cut so that the maximum height does not exceed four inches.



SEAGULL DAMAGE TO NOSE OF ARGUS AIRCRAFT

Frequent bird hunting patrols by Ops personnel to favorite nesting places. Once a bird was shot, it was left there for a couple of days. This was especially effective with crows and sea gulls.

Frequent inspections of the airfield and grass areas by CE, Air Traffic Control, Ops and Flight Safety personnel to monitor the grass-cutting program.

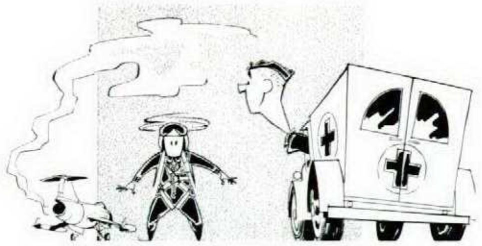
A well-planned poison program that covers all major grass areas around the runway, alert area, and parking apron. The mixture used was five gallons of 50 per cent emulsifiable chlordane to 200 gallons of demineralized water. For our field, it took a total of 3000 gallons of the mixture for two sprayings. We used two men in a decontaminating truck spraying approximately 10 gallons per acre.

In addition to the poison program, the CE Section applied herbicides to grass areas to kill broad-leaf seed-producing plants, and a weed killer where feasible, to eliminate roosting areas. Although one application of insecticide spray is supposed to be effective for four years, we plan to give at least one complete application each year.

Now don't get the idea we are claiming all the credit for the success of this program; there was a lot of hard work and research put in by the experts from the Wildlife Service and the Research Council. A lot more hard work was done by the troops that cut the grass and spread the poison.

The wing commander has finally convinced me that things aren't all milk and honey in Vancouver either. Seems they have a terrific problem with rain on the runway.

Adapted from COMBAT CREW



NEAR MISS

COLOUR BLIND

A pilot was cleared for a touch and go landing in a CF104. The landing had been completed and the aircraft was rolling along on the runway when a vehicle pulled out on the runway in front of the aircraft. Full afterburner was applied and the aircraft became airborne approximately 800 feet before the vehicle.

In the interest of safety the need for absolute control of vehicle traffic on aerodromes was established several years ago. This occurrence was too close, and an accident was only averted by the quick action of the pilot. Had the afterburner failed to light, or had not lit immediately, the pilot would not have been able to avert a disaster.

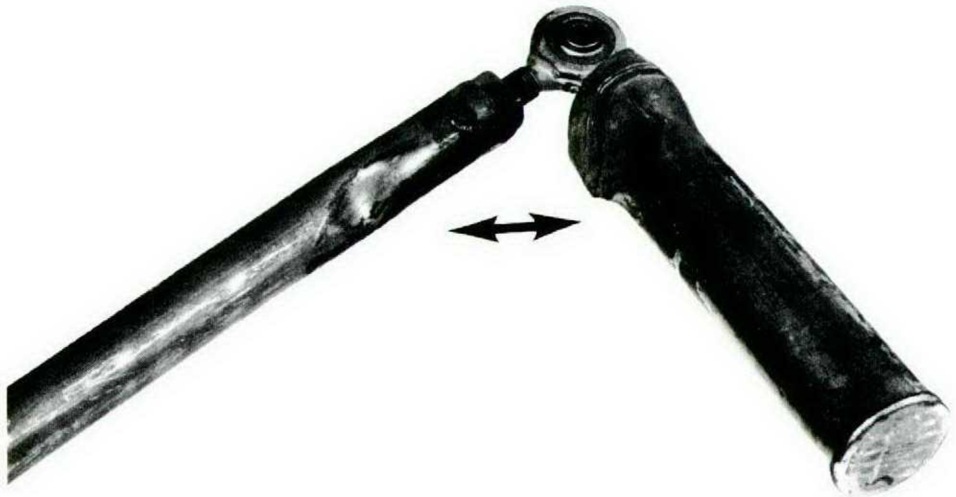
This incident has a curious twist. It turned out that the civilian driver of the vehicle had been given a red light by the tower, but subsequent investigation revealed he was colour blind and consequently could not interpret the light from the tower correctly. It was also learned that the driver was an electronic technician who daily handles many coloured wires. The serviceability of the telephone system on which he works is not known.

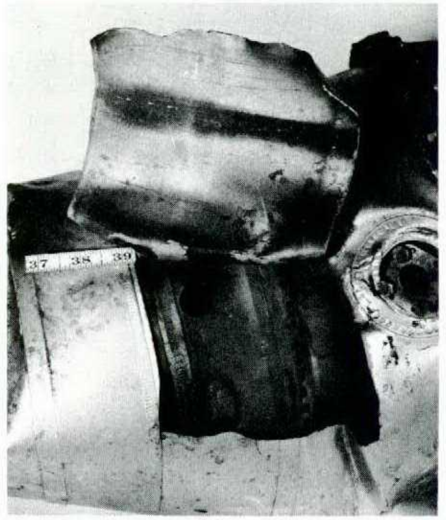
This "Near Miss" has provided concrete evidence of the need for colour blind tests for all vehicle drivers on aerodromes.

FOD

On an acceptance check of a Neptune, the elevators were removed for the first time since the aircraft had been on a special inspection by a civilian contractor some two years before. Inside was found a flashlight in a damaged condition, obviously in a location where it could have completely jammed the elevators. Had this occurred in flight, the results would have been fatal.

This case is an ideal example of FOD at its worst. The battle against it is never ending and although a potential killer like this may rattle around in an aircraft for years without striking, we must forever be on guard.





from AIB FILES

What is happening to our experienced pilots? Are they guilty of complacency; or are they the victims of an inadequate unit training program?

Let's look at a few cases that have occurred in the past:

Number one - An experienced pilot in a jet flames out on the approach and lands some yards short of the runway. Cause - poor fuel handling.

Number two - The pilot of a recip aircraft lands long and fast. Because of improper handling techniques he runs off the end and almost writes off an aircraft.

Number three - A jet pilot takes off from a base for a long trip and has a high JPT. He carries on and by the grace of the Almighty, arrives safely at his destination. His problem - a burnt out flame tube which could have caused a forced landing, a fatal crash or ejection.

Number four - A pilot has a main system hydraulic failure. He and his FE check the EOs believing they have a real problem as he must carry out a flapless landing using the emergency system. He applies brakes at high speed, a brake seizes and he runs off the runway at the 4000' mark. Here is a pilot who has multi hours on type attempting to stop too quickly when he had another 6000' ahead of him.

These are only a few of many problems that have occurred over the past few months and each of the causes can be attributable to pilot error together with a materiel failure.

It would seem that a number of our problems occur because the pilots concerned are not familiar with their emergency procedures, are not up-to-date in their training or just over confident. It seems that many pilots are not receiving adequate refresher training on the unit or are not aware of cause factors of the various problems experienced by their particular type of aircraft. This, of course, points to the higher echelon, the supervisors. In the case of our older aircraft when failures occur, you can bet that the incident has happened to someone before and the problem is on record.

Are your pilots familiar with their emergency procedures? Remember the old adage "forewarned is forearmed."

S/L JEA Hermanson
AFHQ

THE POWER CURVE

This article is a direct and simplified discussion on aircraft power curves. The writer has taken a few liberties with the subject to make the article more comprehensible.

We have heard the expression "behind the power curve" many times. Just what does it mean? Let us attempt to explain this phenomenon in everyday language.

The power curve for purposes of this discussion is identical to the drag curve. The drag curve is classically represented as indicated airspeed plotted against thrust in the case of a jet airplane, and as indicated airspeed versus horsepower in a propeller driven airplane. The plots which comprise the tower curve represent the total drag for the particular flight condition and configuration. Total drag is induced drag which results from producing lift, parasite drag or fuselage skin friction and form drag which is expressed as the equivalent flat plate area for the complete aircraft.

Figure 1 illustrates a typical power curve. Power curves for all airplanes are similar. The speed range plotted on the horizontal axis will differ and the units used to define the power to attain these speeds will vary, but the basic facts pertaining to this curve will remain the' same. You will notice, that relatively high power settings are required to overcome drag at speeds near stall, that maximum speed requires maximum power, and that a point exists between the two extremes where a relatively small amount of power will maintain level flight. Let us now attempt to explain why the power curve takes this characteristic form.

Approximately 75 per cent of the total drag of an airplane near stalling speed is induced drag, the result of producing lift. Parasitic drag reacts in opposite fashion. This form of drag increases sharply as speed increases so that at maximum speed parasitic drag represents approximately 90 per cent of the total drag which must be overcome by the powerplant to maintain flight at this speed. Hence, induced drag predominates at the lower speed ranges while parasitic drag predominates in the higher speed ranges. These two factors explain the reason for the characteristic form of the power curve.

By referring to Figure 1 the relationship of speed, power, and drag becomes apparent. We can also see the area where a greater amount of power is required for each reduction of speed. Also notice that this characteristic exists in the lower speed range, near stall. This area, where an increase in power is required to maintain level flight with a reduction in speed, is defined as the backside of the power curve.

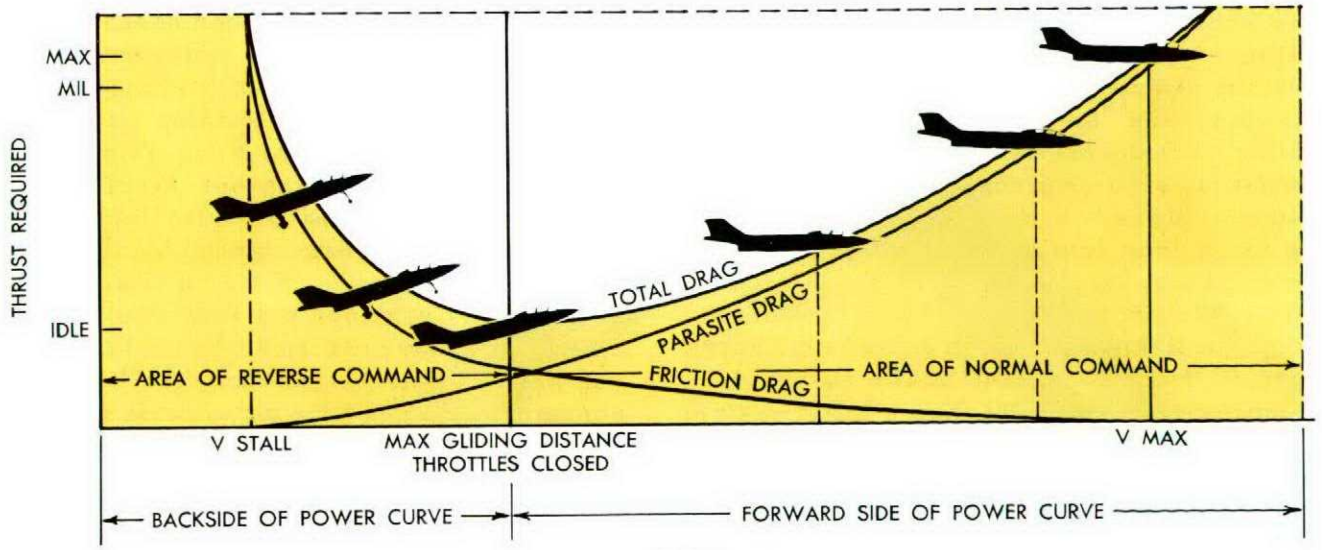


FIG. 1

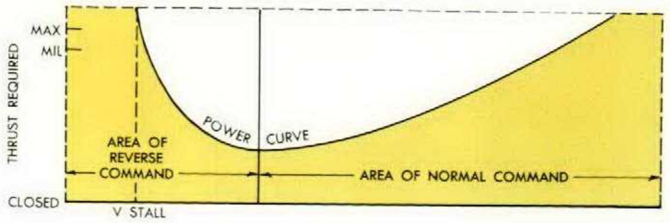


FIG. 2

Just what does being on the backside of the power curve mean to the average pilot during the everyday mechanics of flying? Being on the backside of the power curve is not an uncommon occurrence; it is being behind the power curve that can mean trouble. Getting behind the power curve requires that drag be reduced, power be added, altitude be sacrificed, or a combination of these corrections be made to either get back on or ahead of the curve. Under some conditions these corrections cannot be made or are not practical. When this occurs, you are in trouble.

Now that we have defined the power curve on paper let us explain to the pilot what this means in the mechanics of flying. To do this we must be in agreement with a few basic facts of aerodynamics relating to the power curve which are:

That balance of power controls the airplane's rate of climb or rate of descent.

That the pitch attitude controls the indicated airspeed.

Steady flight implies

(a) Lift equals weight.

(b) Thrust equals drag.

(c) The airplane is trimmed to a specific airspeed.

Transient state implies that the airplane is being accelerated from a lower to a higher airspeed or decelerated from a higher to a lower airspeed.

(a) If controls are used to maintain an airspeed and an excess of power exists, the airplane will climb.

(b) If controls are used to maintain an airspeed and a deficiency of power exists, the airplane will descend.

Accepting these facts, let us proceed with the explanation. The power curve may be divided into two areas as shown in Figure 2. The two areas are defined as the area of reverse command and the area of normal command. The area of reverse command requires a greater amount of power to go slower. The area of normal command is an area where the airspeed increases with an increase in power.

With this introduction into the two regions of the power curve, let us now cite a specific example. An airplane is at a steady state cruise condition at 96 per cent thrust, at 0.87 IMN as illustrated in Figure 3.

Let us now suppose that a gust is encountered that raises the nose, and the indicated Mach number is reduced to 0.83. The thrust is at the same setting; the controls are not moved. The airspeed is reduced but you have an excess of thrust and are now at point B. You now have a slower indicated Mach number and an excessive amount of thrust. The basic facts of aerodynamics state that you will now climb. We assume that you were trimmed for level flight prior to

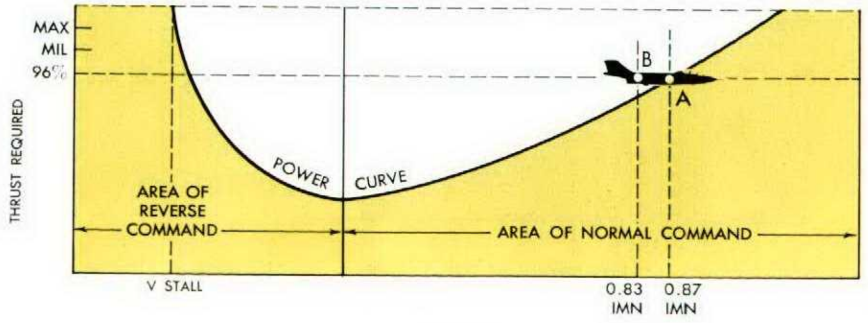


FIG. 3

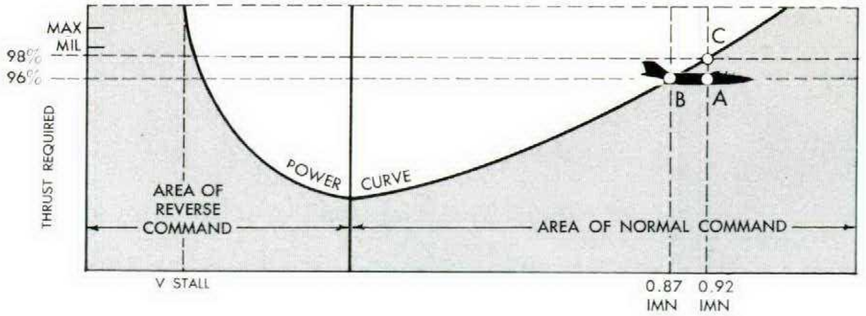


FIG. 4

encountering the gust, consequently you do not climb but accelerate back to your original airspeed.

Let us assume another condition in the region of normal command of the power curve. Referring to Figure 4 we find an airplane in position A. The airplane encountered a gust which forced the nose down, causing the airplane to accelerate to a 0.92 IMN. At this position the airplane is at a greater airspeed with a deficiency of thrust. It would require 98 per cent thrust to maintain the new airspeed. The throttle or controls are not moved; the airplane is still trimmed for the steady state straight and level flight of point B. The airplane is trimmed for straight and level flight, so it will decelerate to the point where it was prior to being upset by the gust. It will not descend because it was originally trimmed for this airspeed.

The two conditions described are normal conditions and are the characteristics of an airplane flying the region of normal command. In this area the airplane will return to the original steady condition (airspeed) if it experiences a momentary decrease or increase in airspeed. We will next examine a similar situation in the region of reverse command.

In Figure 5 we assume that the airplane is in the steady state trimmed flight of position A. A gust is encountered which deflects the nose down momentarily. This causes the airplane to accelerate to position B. In contrast to the deficiency of thrust caused by a similar disturbance within the region of normal command you now have an excess of thrust. The airplane will then climb or accelerate. The continued acceleration following momentary acceleration is in reverse of what we expect in the area of normal command.

Let us now examine the second and more critical situation in the region of reverse command. This is the occurrence which means trouble under certain circumstances. Again assume that the aircraft is trimmed for straight and level flight at the indicated airspeed A, Figure 6. A gust then deflects the nose up, resulting in a decrease in airspeed to point B.

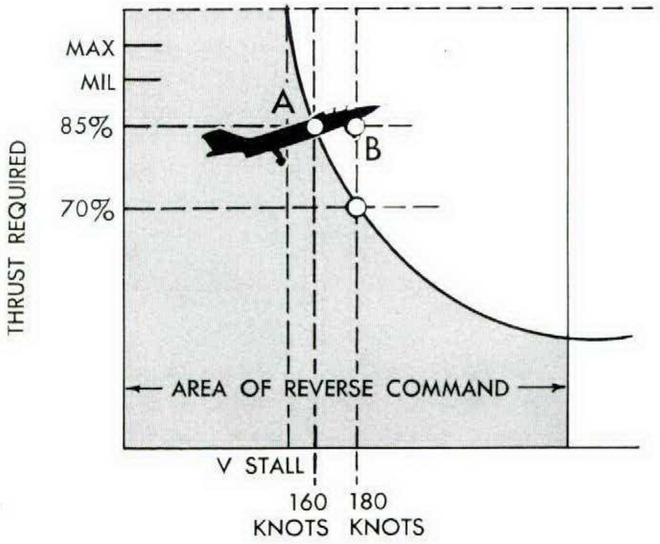


FIG. 5

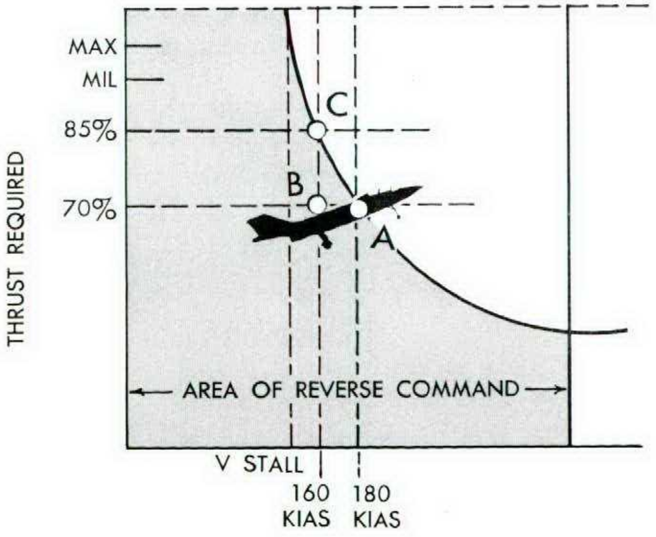


FIG. 6

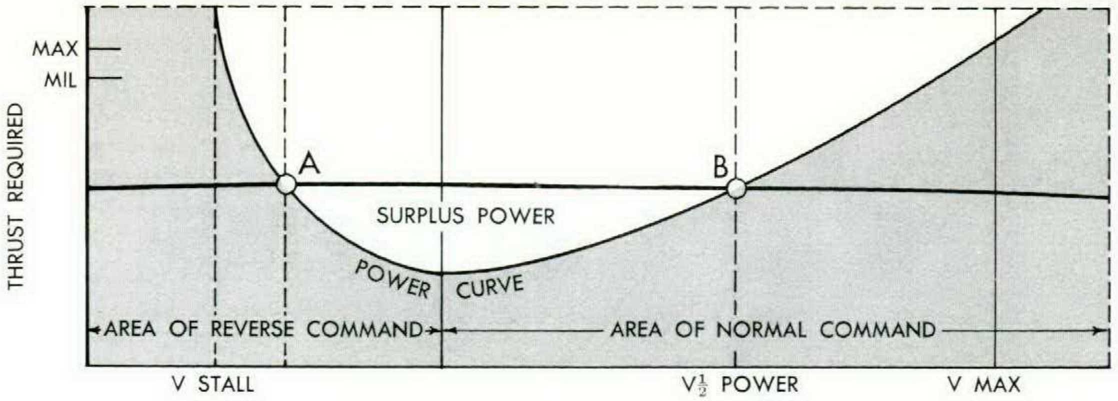


FIG. 7

The thrust setting was not changed so you now have a deficiency of thrust. This is because it requires more thrust to go slower in the region of reverse command. If this situation is allowed to continue, the airplane will slow down or descend unless the airspeed is increased by changing pitch attitude or the addition of power. In situation B you are behind the power curve. The airplane will not return to the original steady state condition without a power or pitch correction. This situation again is the reverse of the condition in the area of normal command where less airspeed requires less power and the airplane will return to the steady state condition it was in before being disturbed. It now becomes apparent what can happen under the right circumstances if you do get behind the power curve and allow the condition to persist.

Figure 7 graphically represents a power curve typical for a multi-engine airplane. The broken horizontal line represents 50 per cent or one-half of total thrust available. Maximum speed with half of total thrust is shown at point B. The cross hatched area is the surplus power available at various points. The airplane operates at point A or B with the same power setting.

When operating at point A, you are well within the area of reverse command, without any surplus power available. It is at this point, under partial power, that the condition can and often does become critical.

In summary, we can conclude that: (1) On the backside of the power curve in the area of reverse command it requires more power to go slower. (2) The important point to remember about the curve is that once behind the curve the pilot must add power, reduce drag, or sacrifice altitude for airspeed to get back on or ahead of it. (3) With a knowledge of this curve, its implications and pitfalls, the pilot can plan and execute each flight so that he will remain on the right side of the curve and not contribute to statistics.

Talon Service News
Northrop Corporation

SUPERVISORS: have you seen our back cover?

PROGRESS IN

ESCAPE SYSTEMS

by S/L DR West

The science of escape systems had its beginning in World War II and owed its initial impetus to German aeromedical workers. The advent of higher performance aircraft and the increased probability of crews getting out of them in a hurry led to the obvious requirement of forcible ejection of crew members. Early studies had shown, for example, that a pilot bailing out at 500 mph at a 3000 ft altitude would pass the tailplane of his aircraft at 90 mph - a situation not conducive to longevity.

The Germans started research on ejection seats in 1939. By 1944 they were able to make them standard equipment in all fighters and by the end of hostilities 60 live ejections had been recorded. Postwar examination of German records indicate a thorough knowledge of ejection equipment and attending physiological limitations. These basic data have changed only slightly as the result of the very considerable research done subsequently by other agencies.

Undoubtedly, the greatest contributor to escape systems, in the early work following World War II was the Martin-Baker Company of England. Under the guidance of James Martin, investigation and development proceeded much along the lines followed by the Germans. Many empirical data were gathered using live subjects in the Martin-Baker ejection seat. Martin recognized the hazards of the high rate of onset of acceleration and appreciated the negative lift characteristics of ejected seats. The former leads to back injury and the latter to decreased trajectory clearance over the aircraft's vertical stabilizer.

In July 1946 Martin directed the first planned live ejection of a subject from a test aircraft using the patented Martin-Baker ejection seat. The escape was successful and paved the way for the adoption of MB equipment by many countries.

A tendency exists, generally, to speak of ejection seats as though they were the sole item responsible for escape of crewmen. Although the seat is a very important item, it is but one link in a sequence of events, the failure of any one of which could result in an unsatisfactory escape. It has been agreed by most workers that the term "escape system" is apt and by definition includes the complete activity which occurs from the moment that an airman ejects until he is returned safely to his base. The system therefore consists of the ejection seat, the parachute, all personal equipment and protective clothing and the survival equipment which will sustain the crewman until he is rescued. The escape system in a modern jet aircraft is a complex of integrated equipment designed to operate in severe environments and to save lives under any aircraft flight conditions.

The requirements of an escape system are of two general types. The first is concerned with human physiological tolerances, the second with the mechanical aspects of the system. Both have limitations. Ideally, an escape system should be able to guarantee safe crew recovery across the entire flight envelope of the aircraft, from ground level at zero speed through all speeds and altitudes of which the aircraft is capable. Few systems can do all these things and a compromise, which will provide the best results for the most probable case, is usually adopted.

The crewman, during an ejection, is precipitated in a matter of milliseconds, from the equable surroundings of the aircraft's cockpit into a hostile environment. He is exposed, in rapid succession, to fairly high accelerations by the ejection seat, airblast or dynamic pressure effects of atmosphere, deceleration by air drag, shock of parachute deployment and finally, the impact of landing.

Extensive studies have been made on the tolerance of the human body to the various forces experienced during an escape sequence. Systems designers now can tailor their equipment to keep the crewman within the bounds of specified human tolerances. The following figures are approximately those accepted by most test agencies for escape system work:

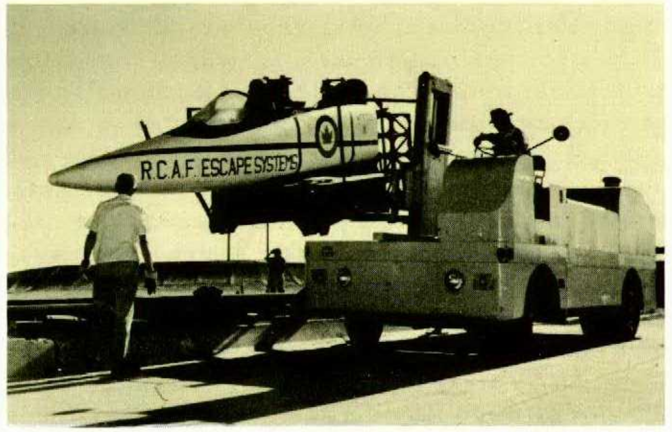
ACCELERATIONS

Peak, POSITIVE, spinally, 20 g
Peak, NEGATIVE, spinally, 10 g

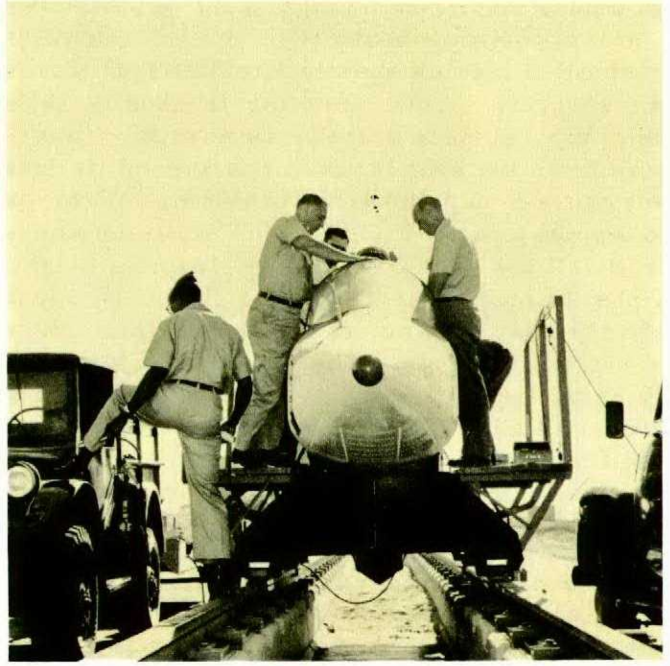
taken as the 10 millisecond portion of the acceleration-time curve containing the largest area divided by the 10 millisecond time interval

Rate of onset of 'g'—250 g/sec.

taken as the highest rate of change of acceleration averaged over a 30 millisecond time interval



The rocket sled is being lowered onto the breech of the high speed test track at Edwards AFB.



The rocket sled receives a final checkout by the project crew prior to a high speed track test.

Accelerations are usually measured in three directions - spinal or vertical, fore and aft, and lateral. They may be considered as positive or negative for each case. For the ejection seat case where the greatest acceleration is along the seat rails, the spinal acceleration is the most critical one.

Dynamic pressure is defined as the parameter $\frac{\rho}{2} v^2$ and its value therefore depends upon air density and velocity. In ejection work, agencies are careful to avoid references to Mach numbers and will refer to equivalent air speeds (EAS) which are indicated air speeds (IAS) corrected for local ambient temperature and density variations at the time of testing. It will be appreciated readily, that an ejection performed at a specified true air speed (TAS) at sea level will encounter considerably greater blast effects than one performed at altitude at the same true airspeed. The lowered air density will reduce considerably the value of $\frac{\rho}{2} v^2$ and a much increased speed would be necessary to duplicate the sea level case for airblast affects. Practical experiments have shown that the dynamic pressure limit for a crewman (eyes and mouth closed) without special face protection occurs at about 500 knots EAS. At this ejection speed the dynamic pressure on his body, as he first enters the airstream is about 7.0 psi or 1000 lb/ft^2 at sea level. This force will cause tissue and eye damage and will strip off clothing and protective equipment. It has been known to cause premature parachute deployment by forced opening of the pack.

Most ejection seats will tumble in an uncontrolled fashion shortly after the seat leaves the aircraft. This tumbling is usually self-damping and since a crewman normally separates from the seat in about one second, it does not cause a physiological problem. Were he to separate at a high altitude and commence free-fall to a safe parachute deployment height, a phenomenon called auto-rotation will occur and the body will act as a propeller and rotate in a prone position. The centrifugal force set up by this rotation can be severe, and fatal if uncontrolled. The effect is one of negative 'g' and from experimental work it appears that a maximum safe limit for rotation rate is about 90 R.P.M. for 4 seconds.

The design of the seat and escape system as a whole must consider the physiological limitations which we have just discussed. The ideal ejection seat will possess positive leg, arm, and torso restraint during ejection but must permit optimum freedom of movement for the pilot in flight. The seat must possess the structural integrity to withstand high accelerations on ejection and airblast damage as it enters the airstream. The seat must provide stability in flight, prior to crewman separation.

The man-carrying parachute is a vital link in the escape system. It must be capable of positive, rapid deployment for the low-level, low-speed case but must also be capable of deploying, without damage to itself or imposing unacceptable decelerations on the crewman, at very high ejection speeds. The crewman's personal equipment must be designed to withstand high airblast loads and to adapt readily to the ejection seat. The survival equipment must be compact and light in weight, yet must consist of all the essential items for survival under extreme environmental conditions.

CF104—C2 Escape System

The escape system in use in the CF104 Super Starfighter consist of basic equipment designed for the USAF F104 by Lockheed Aircraft Corporation and modified by CEPE to meet RCAF requirements. The C2 ejection seat embodies the following features:

(a) Single 'D' ring control which operates all seat primary and secondary systems in one motion.
(b) Positive automatic leg retraction and retention systems.
(c) Automatic erecting leg guards.
(d) Arm support provided by automatically deployed webbing.
(e) Automatic lap belt release and leg retention separation.
(f) Positive automatic man-seat separating device.

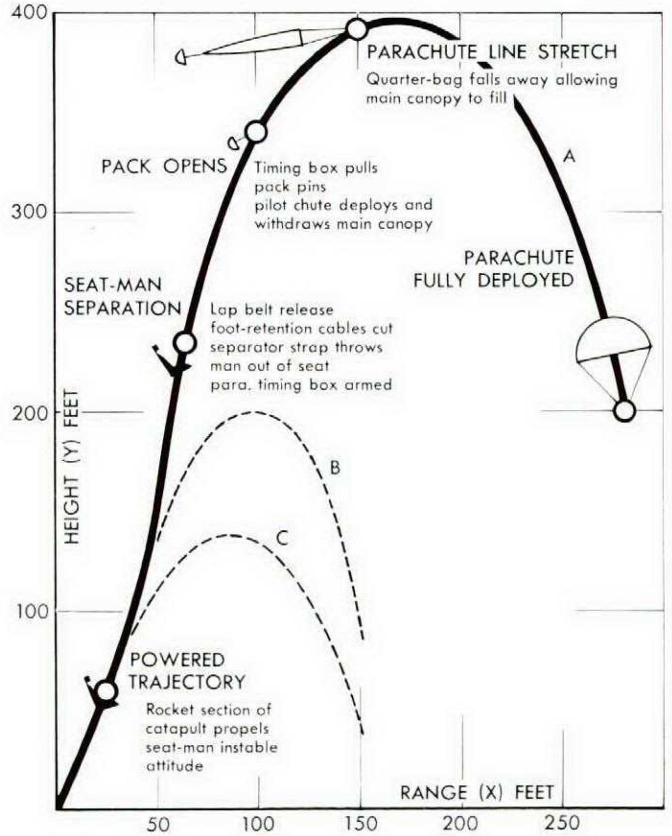
The C2 seat is the first in the history of RCAF escape systems to be propelled by a rocket catapult. Only in recent years has the technology of rocketry reached the point where fully reliable rocket catapults can be used on ejection seats. Early seats were propelled out of the aircraft by a cartridge of cordite or some comparable material, which would burn rapidly when ignited, giving off a large volume of gas. This gas, expanding against a piston in a tube, provided the force necessary to eject the seat. The main drawback to the basic cartridge device is that a high rate of pressure rise is necessary to give the seat sufficient velocity to clear it over the tailplane. This results in a high rate of onset of 'g' for the crewman as the seat starts to move, and may cause back injuries. The simple ballistic catapult exists today in the T33, F86 and F101 escape systems, but thought is being given to the substitution of rocket powered equipment.

The rocket catapults now available are similar in concept. In outward appearance they resemble the ballistic catapults which they supersede; however, the internal configuration is significantly different. The rocket catapult is a two-stage device consisting of a booster cartridge and a rocket motor or sustainer. The booster cartridge provides the force required to start the seat up the rails. As for the ballistic catapult, the inner tube telescopes from the outer which remains fixed to the airframe. When the inner tube has travelled a specified distance, usually about 3 feet, the booster gases are led into the rocket motor which ignites and carries the seat away from the aircraft. The two stage action of the rocket catapult allows for relatively low 'g' on the pilot and has eliminated back injuries as a problem.

Stability of the rocket powered seat is readily attained by giving careful attention to the geometric relationship between the centre of gravity of the combined seat-man mass and the resultant thrust vector of the rocket. In the general case, if the thrust line passes through the centre of gravity, there will be no force couple tending to rotate the seat and it will therefore remain stable during the period of applied thrust. Stability is very important if optimum trajectory height is to be achieved. With the ballistic M5 and M3 type catapult, no stability exists because of a fairly large offset of the thrust line from the seat-man centre of gravity. Ejection seats powered by ballistic catapults will pitch in a very pronounced fashion and seat-man separation may be both poor and unpredictable.

During the past year the RCAF CF104 C2 ejection seat has been thoroughly tested in a series of trials by the CEPE Escape Systems Section. In February '62 eight ejections were performed using facilities of the Primose Lake Evaluation Range at RCAF Station Cold Lake. Five dynamic and two static ejections were executed at Edward AFB using the high speed experimental track and a rocket sled ejection vehicle. (For a description of the

CF 104 ESCAPE SYSTEM—TYPICAL EVENT SEQUENCE AND COMPARATIVE CURVES FOR "ZERO-ZERO" EJECTION



The performance curves shown will serve to give the reader a concept of the improved capability available to the CF104 C2 ejection seat. The M5 and M3 catapult performances, not shown in this diagram, would give the seat a maximum height of only 40 feet under similar conditions.

CURVE A—Rocket Power Inc. trial
Mesa, Arizona—6 Aug 62
rocket catapult—TALCO 2174-11
ejected weight—428 lbs
max. trajectory height—395 ft

CURVE B—Lockheed trial
Edwards AFB—10 Apr 59
XM10 rocket catapult
ejected weight—424 lbs
max. trajectory height—209 ft

CURVE C—RCAF trial
Edwards AFB—9 Aug 62
XM10-E1 rocket catapult
ejected weight—393 lbs
max. trajectory height—135 ft

Edwards AFB project, see Roundel April '63).

During these trials a problem was encountered with the M10 rocket catapult, which is the current standard item for the C2 seat. The RCAF test group was unable to attain a performance with the M10 catapult equivalent to that obtained by Lockheed Aircraft Corporation during their proving trials for the USAF. Fortuitously, a replacement rocket catapult, adaptable to the F104 configuration, but with a much increased performance, had been designed and built by Rocket Power, Inc. of Mesa, Arizona and was made available to the RCAF. Using this catapult the RCAF group successfully accomplished a 600 knot (Equivalent Air Speed) ejection of the C2 seat from a rocket sled. On August 6, 1962, a world first was achieved by the test group when the C2 seat was ejected using the RPI rocket catapult from a stationary sled (zero speed - zero altitude). The seat rose to a height of 395 feet above ground level. The diagram shows the results of the "zero - zero" test and indicates the comparative improvement possible with the new rocket catapult.

As a result of the RCAF trials a decision has been made to retrofit the CF104 aircraft with the RPI P/N 2174 rocket catapult. When this has been accomplished, RCAF aircrew flying the CF104 will have a "zero - zero" or ground level capability from a motionless aircraft. At the present time no known aircraft has this capability. However, response to this progress is favourable and various programs are going ahead to retrofit rocket catapults to other jet aircraft.

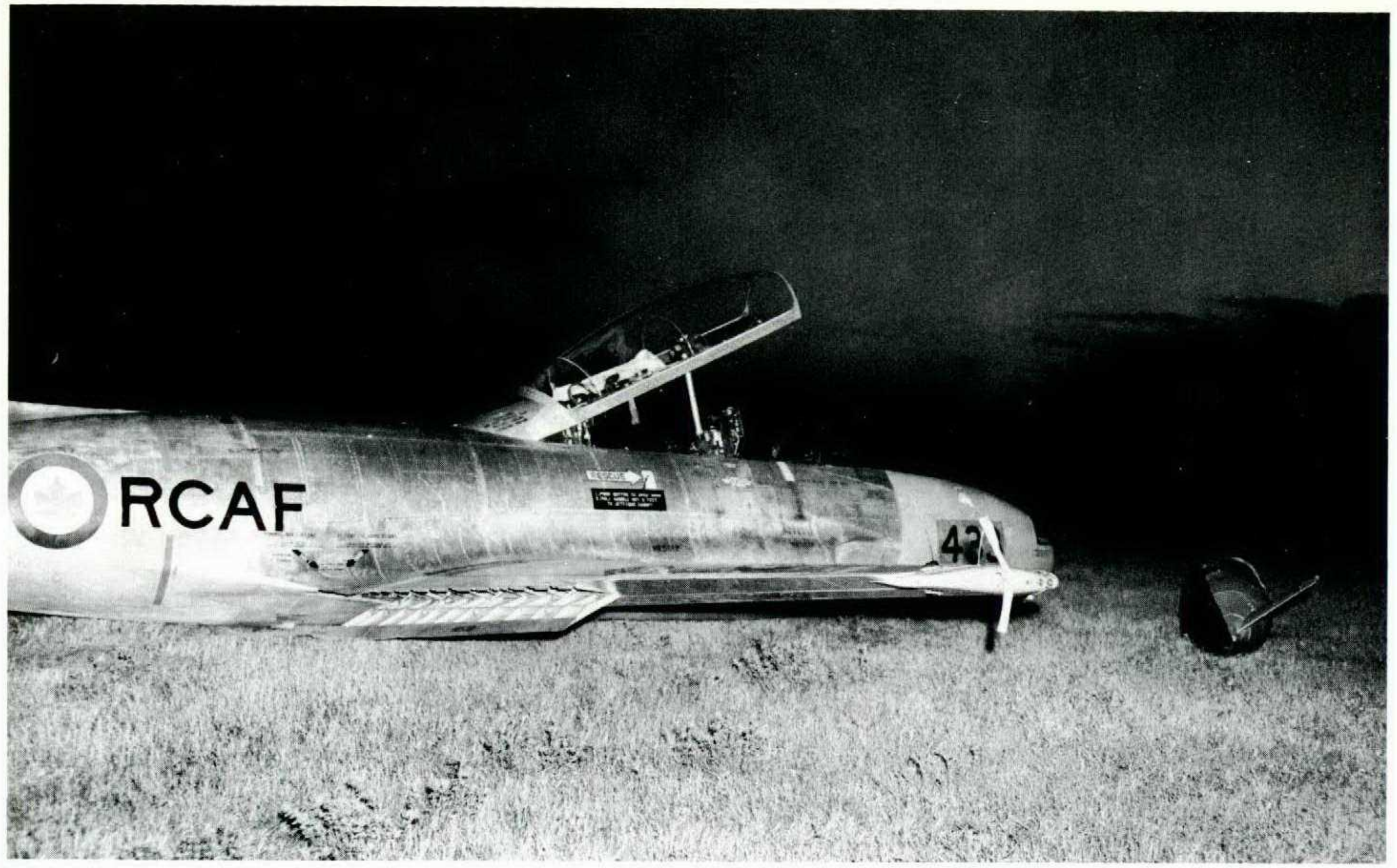
The progress made in escape systems development, since its beginning in World War II has been impressive. The stimulus of space programs and the accompanying exacting problems of assuring safe escape for the astronaut under all conditions have required intensive research and development work in the fields of human tolerances (biodynamics) and escape system design. Much of this information has been applied to the escape systems of high-performance jet aircraft and has resulted in increased survival capability.

The prognosis for rocket catapults is very favourable. Proposals have been received for the retrofit of T33 and CF101 aircraft and plans have been made to test the CT114 Tutor aircraft escape system using rocket catapults. The impetus to use this system will vary between military organizations and will of necessity consider the factors of cost, aircraft obsolescence, and operating conditions. In the case where a large number of aircraft and long service life are indicated, rocket catapults will undoubtedly be fitted. For new aircraft they will be mandatory. The improved escape capability provided for the crewman, will increase his confidence in his aircraft. He will be able to operate his craft through all normal flight configurations without the present "twilight zone" of limited capability. Much credit is due to organizations which have developed rocket catapults, in some instances at their own expense. Acceptance of new developments is sometime slow, either through skepticism or ignorance. Technical and flight safety branches of the air forces have a responsibility to look ahead constantly to improved escape systems.

Progressive, open-minded attention to the CF104 escape system by RCAF authorities in the adoption and testing of up-to-date equipment has placed the CF104 in the forefront of technology. With the installation of the RPI P/N 2174 rocket catapult, the CF104 will have the most reliable and capable escape system of any agency operating the Starfighter aircraft.

✓

S/L DR West was transferred to CEPE in December 1960 after a tour of duty in Air Division. He was appointed head of a section set up to test and evaluate escape systems. Under his direction a number of projects were carried out on the T33 and CF100 systems. The most ambitious program was on the CF104. This was the first time the RCAF tested rocket seats and used high speed track testing. The trials were carried out at Edwards Air Force Base, USA. The section at CEPE is currently at work on the Tutor CT 114.



ARMAMENT DOORS

Since the RCAF began operating T33s, there have been only six reported cases of armament doors opening in flight and two of these cases occurred in the last six months.

The first case, in 1954, was fatal. It is the only time where the armament door came off completely and was due to failure of the locks themselves.

That accident initiated a modification and each subsequent case has been pilot error - failure to ensure that latches were properly fastened prior to flight.

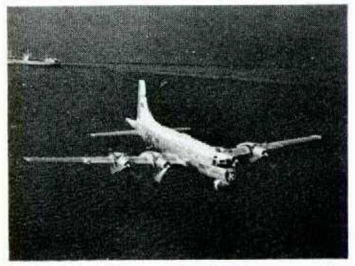
In 1959, there was another fatal crash when an armament door opened just after takeoff but this fatality was due to the pilot stalling the aircraft with insufficient height to recover. Last October a pilot noticed an armament door opening just after lift off and with the gear retracted. He aborted and luckily escaped injury, but the aircraft was a write-off.

Thus armament doors have resulted in four fatalities and the loss of three aircraft. With the exception of the first case which occurred before the locks were modified, the statistics show that if the pilot follows the proper technique as outlined in AOIs the aircraft can be brought back and landed with no damage than perhaps a bent door. This was done in three of the six reported cases. Also, we suspect that there were several other cases that were not reported since no damage occurred. This is not to say that taking off with the armament doors unfastened is not hazardous - but if it does happen follow the AOIs. Abort the takeoff only if sufficient runway remains to bring the aircraft safely to a stop.

But above all, do a proper external, because whatever the result, if you take off with the doors unfastened it's bound to be embarrassing.

Resumes of accidents are selected for their interest and the lessons which they contain. The time required to complete the accident investigation and the additional time necessary for publication generally totals six months.

ARRIVALS and DEPARTURES



ABORT!

An Argus crew were detailed for a routine patrol. They checked their aircraft and taxied out to takeoff position only to be called back because the weather was below limits. However, before shutting down, the weather lifted and so they taxied back to takeoff position. As they were now behind schedule a hurried pretakeoff check of what was considered "essential items" was completed. Takeoff power was applied and everything seemed normal until at 80 knots control was transferred from nosewheel steering to flying controls. A gradual drift to the left could not be corrected with rudder. The airspeed reached 115 knots and the flying controls had no effect whatsoever on the aircraft. The pilots suddenly realized that the gust locks were on and called for the abort!

Using reverse thrust, normal brakes, and emergency brakes, they managed to stop the aircraft on fairly level ground 1000 feet past the end of the runway with little damage. But it is frightening to think how close this was to the complete loss of crew and aircraft.

The gust locks are required items in two separate places on the check list but they were missed both times. There were five red lights glowing on the instrument panel and they were not noticed. Also the throttle arrestor safety feature which is designed to prevent full power from being applied to all four engines simultaneously did not perform its intended function since the extra pressure to open the throttles was again not noticed.

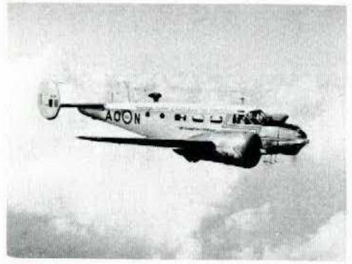
It this professionalism? The captain was court martialled and the throttle arrestor safety feature is being modified to be more positive. What else can be done? Accidents like this should just not happen.

OVERREACHED-OVERSPED

Prior to takeoff on a pilot training mission in an Argus, the captain instructed his co-pilot to simulate a failure of one engine as soon as the aircraft was established in a climb. This the co-pilot did by moving the mixture control of number 4 engine to idle cut-off. The engine cut OK, but the co-pilot inadvertently moved the control slightly towards rich. The engine caught again, and since the throttle was still nearly wide open, the engine oversped

Any aircraft engine is a pretty expensive piece of machinery and it doesn't seem to be very good airmanship to abuse them like this.

An official order cannot be published to cover every possible situation but it is only common sense that retarding the throttle is the only really safe way to simulate an engine failure.



POWER CURVE

An instructor and student took off in a T33 for a pre solo check. As the instructor had briefed, as soon as the aircraft reached 5000 feet and 275 knots, he retarded the throttle and said "PFL." The student carried out the appropriate checks, positioned himself well at low key, and when on final with 150 knots, it looked as if he had it made so he lowered full flaps. It still looked OK to the instructor and at 250 feet he ordered the student to overshoot. Power was applied and the nose lifted but with over 400 gals. aboard, the T-Bird continued to sink. At 100 feet the instructor took control and applied full throttle but it was just a little too late. On the back side of the power curve, the aircraft just wouldn't climb away and after clipping out a few approach lights finally settled to the ground, short of the runway, causing "A" damage to the aircraft but no injury to the pilots.

It's the old story of how far can an instructor let a student go before taking control. In any case it might be a good idea to read the article on the Power Curve on page 10 of this issue.

EVERY STEP COUNTS

When the undercarriage in an Expeditor was selected down prior to landing, nothing happened. A check of the circuit breakers did not reveal the cause of the trouble. But this should be "no sweat" — the aircraft designer very thoughtfully installed an emergency system for lowering the gear. When the emergency system was used, the green light would not come on and the horn blew when power was reduced. Now there was some cause for concern. A re-selection and a second attempt to lower the gear by the emergency system didn't help. The pilot flew across the button to be observed by another aircraft and was told that the gear appeared normal. It was then decided to fly the aircraft on to the runway to do a gear check. On touchdown the undercarriage seemed secure so the landing was completed and the aircraft shut down. A check on the ground revealed that although the undercarriage was geometrically locked down, it was not fully extended. There was a real risk that it might have collapsed on the landing.

A malfunction of the port undercarriage lower limit switch was the suspected reason for the gear not lowering by the normal method. However, the disturbing fact about this incident is that although the captain was a very experienced pilot, he used the incorrect emergency procedure in that he failed to keep the clutch depressed while the hand crank was rotated to lock the undercarriage down. It was very fortunate that a serious accident did not result from this incident simply through the omission of a single item in the emergency procedure for lowering the undercarriage.

To make matters worse a check of the L14 revealed that another pilot undoubtedly did exactly the same thing six months before! He got away with it too, and it was not reported.

How well do you know your emergency procedures? Perhaps there is a tendency for all of us to become a little complacent when flying some of our older more simpler aircraft.

Compared to the Argus or Yukon, the C45 is perhaps a "piece of cake". But let's not take it for granted. There is just no excuse for a pilot to be captain of any aircraft for which he doesn't have the emergency procedures down cold.

BIRD STRIKE

A CF101 had just been lifted off the runway when the pilot observed a large gull in the path of the aircraft. The bird appeared to be below the line of flight but an impact was felt near the pilot's feet. Estimated height of aircraft was 100 feet and airspeed was 250 kts.

The aircraft responded normally but on shutdown it was found the forward right door to the fire control system was damaged, surprisingly so considering the relatively low airspeed.

Investigation continues on several fronts into eliminating hazards of bird strikes in the vicinity of airfields, but as yet no satisfactory solution has been found. Try and share the air with the birds--don't argue about who has priority. This goes for the birds too!

FOULED

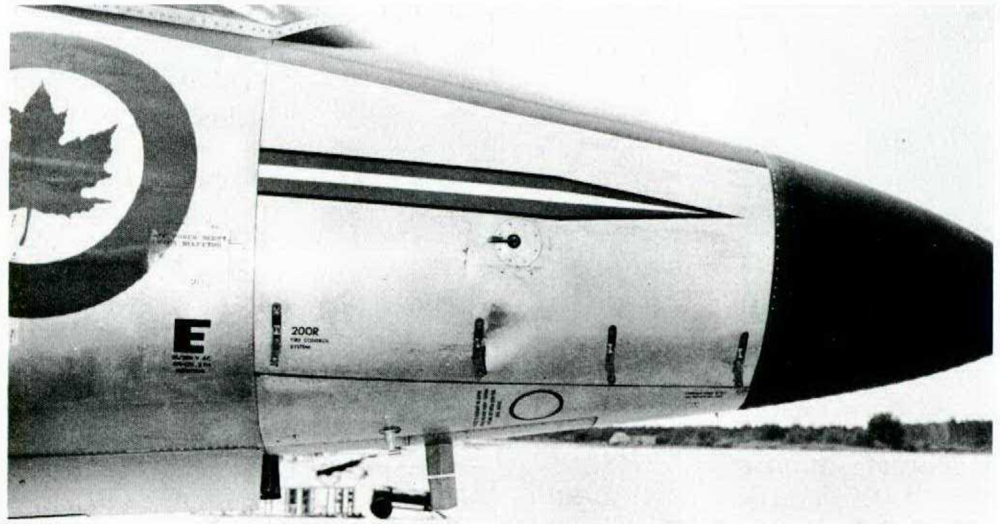
After start-up in a Neptune, a fault was discovered in the ASW detection equipment, and the engines were left running for approximately one and one-half hours while the fault was rectified.

Although a plug cleaning procedure and ignition analizer check had been carried out just prior to takeoff, the torque on number two engine fell to 140 pounds after approximately 1500 feet of runway had been used on the takeoff roll. The captain decided to abort and the aircraft was safely stopped with 2000 feet of runway remaining.

It was later determined that the partial engine failure was due to fouled spark plugs - probably aggravated by the prolonged ground running.

Although in this case the crew used accepted procedures, the incident again points up the need for crews to use extra caution after an extended period of ground running of a reciprocating engine.

If a long delay is envisaged after the engines have been started, it would appear to be a good idea to shut down and use ground power, if feasible.



CUMULATIVE ERRORS

During an engine re-installation in a Sabre, work was interrupted when AFTechs discovered a hydraulic leak. It was repaired the following day and the engine crew completed the installation.

When the aircraft was ready for post inspection run-up, an airframe crew chief proceeded with the run-up even though the engine entries in the L14-1B had not been completed. The Corporal who had started the installation was on a one-day security course and the NCO i/c AETechs was not available due to Orderly Sergeant duties.

The engine start-up was normal; the temperature and oil pressure held normal and the airframe crew chief commenced an acceleration to top RPM. At 95% the oil pressure dropped to zero and he immediately retarted the throttle. On deceleration at about 75% a loud thump was heard and a very short rundown time was noted.

When the engine was removed, it was impossible to turn it over by hand; the bearing had seized due to oil starvation. It was discovered that the quick disconnect coupling on the oil line from the oil tank to the oil pump was not connected but just held in place by the spring of the flex hose.

Although the primary cause of this accident is assessed as the error of the engine technician who did not connect an oil line, inadequate supervision also played a major role in the accident. The engine installation procedure was interrupted by the airframe hydraulic snag spoiling continuity of operation; failure to run an independent check prior to engine ground run as was the usual practise at the station and a post inspection run-up without L14B entries complete, all added up to a cumulative effect in defeating a system of maintenance control.

CARELESS COLLISION

As a Harvard was being towed into a hangar at the end of the day, the starboard wing struck a hangar-door causing "D" category damage. It took 27 manhours to fit a new wing.

The accident happened at dusk during a rush period when several night-flying jobs besides aircraft towing, were in progress. The towing crew consisted of two LACs, and a sergeant who was NCO i/c of night shift groundcrew. There were three other night shift crewmen on duty.

The towing operation was being supervised by the sergeant, who was sitting in the front cockpit of the aircraft, despite the EO which reads "The NCO i/c will walk in a position where he can see both wing tips and the personnel detailed." The tractor driver was experienced with a valid permit but in this incident was not cautious enough. A second airman was riding on the tractor but had not received instructions from the sergeant or the tractor driver before or during the move. There was no clear understanding that he was a part of the towing crew so that he was not of much value to the job.

The accident was the result of negligence by the NCO i/c of night flying crew. He did not organize and supervise his available men so that aircraft towing operation could be done safely without haste and in accordance with existing orders. The EO pertaining to towing in this instance states "The position of the men will be left to the NCO i/c who will ensure maximum coverage against possible damage."

This was an accident which should never have happened. There are clear and adequate orders covering aircraft servicing duties including aircraft towing. It pays to "toe the line" at all times.

Supervisors are urged to exert particular and continuing emphasis on proper aircraft marshalling, towing and handling procedures.

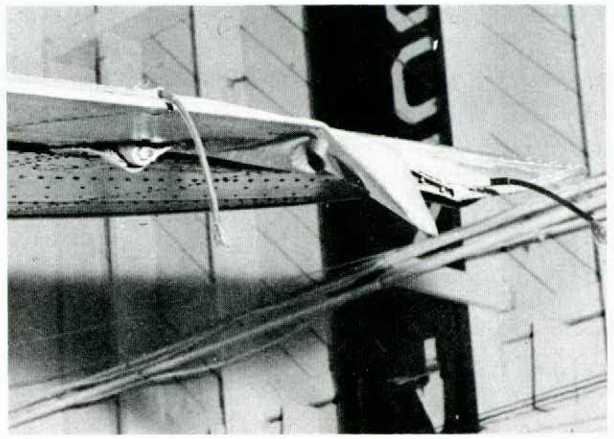
WHAT'S BEHIND?

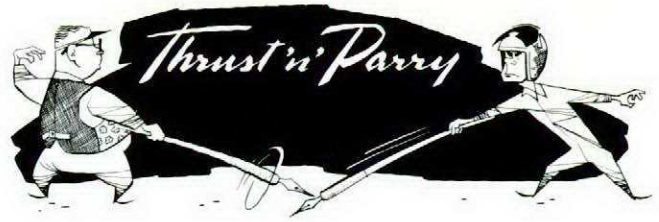
A mule driver was detailed to tow a mobile chock rack out of the hangar into the servicing line. On entering the hangar he noticed the clearance between a parked C47 and the hangar walls was not sufficient for him to pass between, but on checking the clearance under the wing tip found it to be alright. He then proceeded to drive the tractor to the rear of the hangar where he attached the chock rack and started the return trip to the servicing line.

The airman apparently overlooked the warning mast attached to the chock rack and as he proceeded under the starboard wing of the parked a/c the warning mast struck and damaged the wing tip and aileron.

The warning mast on the mobile chock dolly, consisting of a 1" diameter steel pipe, extends to a height of approximately twelve feet from ground level and has a set of warning vanes attached to the uppermost end to mark the position of the dolly when it is parked in its normal position on the servicing line. At night, the dolly is brought into the hangar and upon commencement of flying next day it is again towed out to the line.

If the airman had taken time to get an overall picture of the job he would have realized that clearance sufficient for the driver and mule is not necessarily sufficient for the load following behind.





Dear Editor:

In the article "Don't Wait Too Long" on page 13 of the Mar-Apr 61 issue of Flight Comment, it is stated that, as the rate of descent increases beyond 250 fps. the altimeter lag increases rapidly until a rate of descent between 600 and 625 fps. is reached. This is the maximum unwind speed of the instrument itself.

During a test done here in a vacuum chamber simulating a descent from 40,000 ft. at rates in excess of 60,000 fpm. the altimeter exhibited no appreciable lag. I should like to determine the reason for the discrepancy.

D.F. Moffatt F/O
4 (F) Wing
Baden Soelligen

Editor's Comment

We have been unable to verify the source of the figures on maximum unwind speed of the instrument itself quoted in the original article. The Directorate of Instrument and Electrical Engineering, AFHQ, have advised that the only figures they are aware of are contained in a report by Sperry which stated that the maximum safe (no damage to the instrument) unwind speed is 50,000 fpm for the CF104 type AAU-8/A precision altimeter.

They conclude that your observation is quite valid. An altimeter in a vacuum chamber will unwind almost as fast as the pressure can be increased. However, it will not do so in an aircraft, because the length, small diameter, and bends in the tubing used in the aircraft's static pressure system result in considerable system lag. Other static pressure instruments being fed from the same source cause additional lag. Also, position error due to the location of the static pressure sensing port increases with speed and adds yet another error. All of these are accumulative and amount to a considerable error in a very fast descent.

In the final analysis, it is what the aircrew actually read on the instrument that is important and the total error given in the original article is thought to be substantially correct. —Ed.

BIRD WATCHER'S CORNER

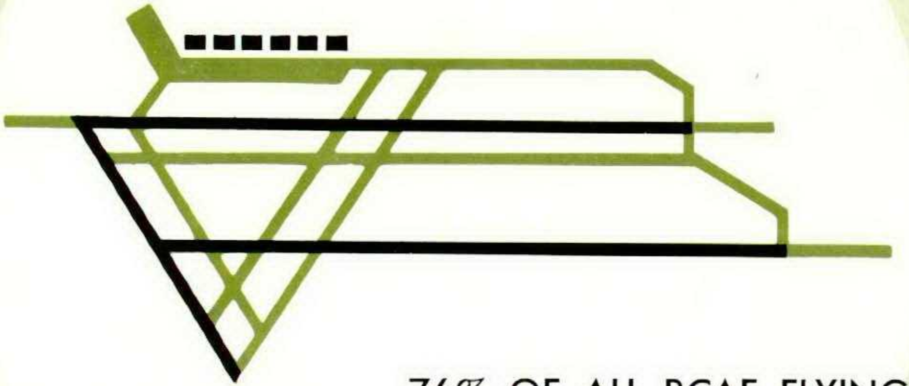
THE CRAZY-FLYING RAGTAG

Although this bird is similar in appearance to the desirable species known as Heads' Up Hawk, it can easily be distinguished by the foolhardy and show-off manner in which it flies. It is convinced that rules of the flock do not apply to it and will arrogantly flaunt any order or regulation. It seems to have a compulsive need to impress other species with its flying ability and for this reason has a very short life-span.

A few have been known to respond to a treatment of strict discipline and become identical with the desirable species they resemble. These few are the only ones that live to maturity.

CALL: WATCHTHIS, WATCHTHIS, WATCHTHIS!

Roger Duhamel, F.R.S.C., Queen's Printer and Controller of Stationery, Ottawa, 1963



76% OF ALL RCAF FLYING ACCIDENTS IN 1962 OCCURRED WITHIN THE IMMEDIATE VICINITY OF THE AIRFIELD