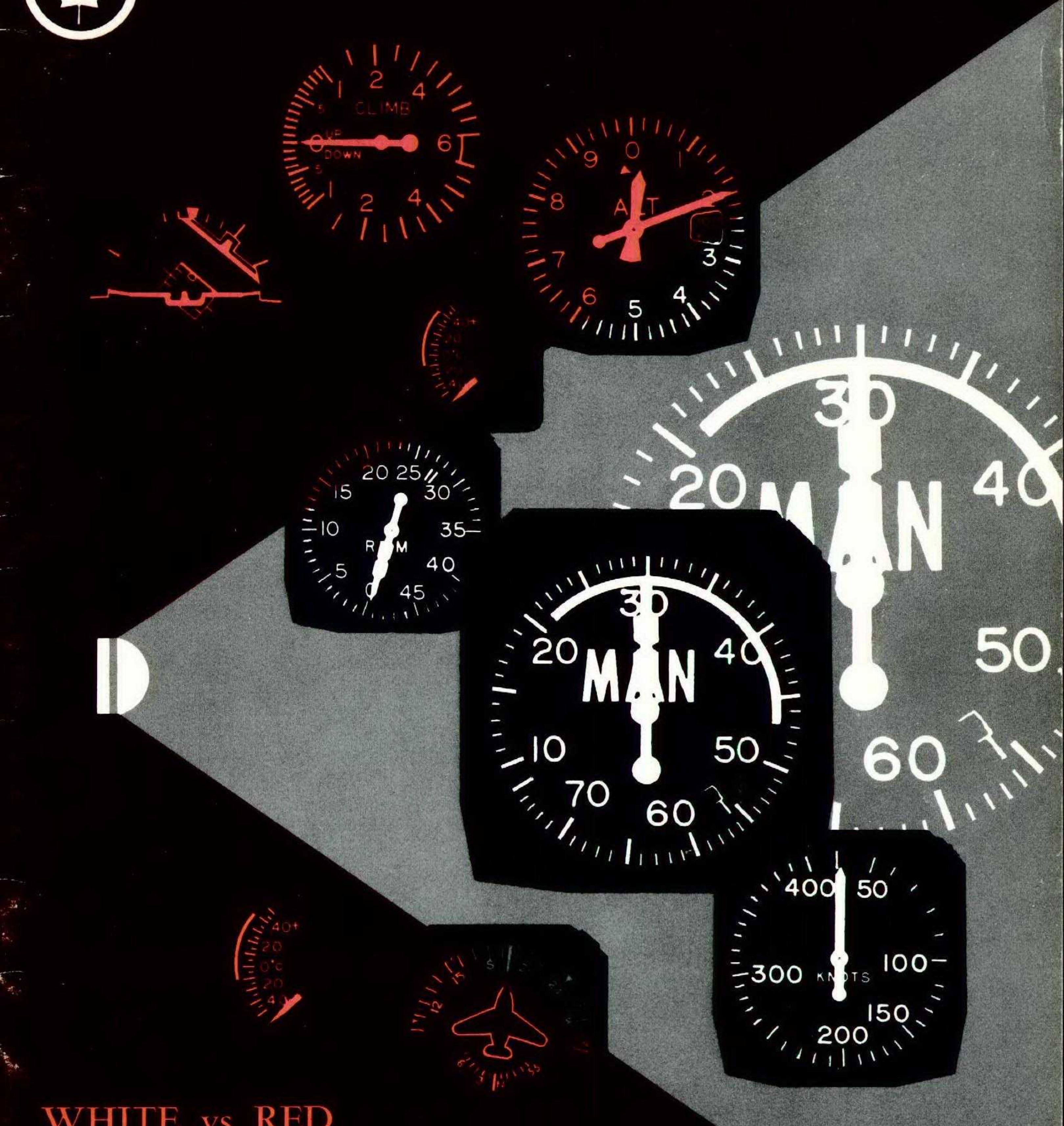
FLIGHT COMMENT

JANUARY · FEBRUARY · 1966



WHITE vs RED

INSTRUMENT IMPROVEMENT

COLOURED COCKPIT INTERIORS

Comments

Recently, after a training flight an aircraft sustained major airframe damage in which skin was torn, rivets popped, and other destruction incurred. During a practice single-engine portion of the flight several landings were made, in the words of the captain "none of which were hard in my opinion, although some were slightly harder than would be experienced in normal operation". The captain's statement was supported by his supervisors but this well-meaning contention was later overruled in the face of the evidence.

Suggesting that the structural failure of the aircraft under such circumstances was the fault of the aircraft or its manufacturer, is being something less than objective. When accident reports are made out, bear in mind their prime value can be derived only if "the truth, the whole truth, and nothing but the truth" emerges. It also suggests, in this case, an "agonizing reappraisal" of this pilot's notion of what constitutes a NORMAL landing.

For a year now, our directorate has been providing a MAID service which began in response to your demands for up-to-date flight safety information. Too often, you said, an accident or incident would go unreported pending the outcome of the investigation and cause assessment. As many investigations are lengthy, an important occurrence - or worse still, a series of similar occurrences - would not immediately be publicized. The "quick turnaround" nature of MAID has given rise to some criticism that the reports it contains, are often incomplete and inconclusive. We agree; but to achieve immediacy we have sacrificed completeness. Flight Comment, in its column "Gen from Two-Ten" attempts to dwell at length on significant accidents, however, completeness is often purchased at the price of immediacy. We'd like your comments on what MAID service is doing for you.

The title "Arrivals and Departures" was a legacy with an obscure origin and meaning. The demise of the D14 and A25 afforded us the chance to have a go at something new. The "Gen from Two-Ten" is new to reflect the introduction of their successor, the new CF210 which appears on page 2

Perhaps, calling the event "a million-dollar shortcut" would reveal our annoyance at the unfolding of details in a recent CF104 crash in the Mediterranean. The pilot didn't appreciate his experience - any more than we did - as the evidence was brought to the surface by SCUBA divers. For the full account, see AIB Files.

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ROGER DUHAMEL, F.R.S.C.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA, 1966

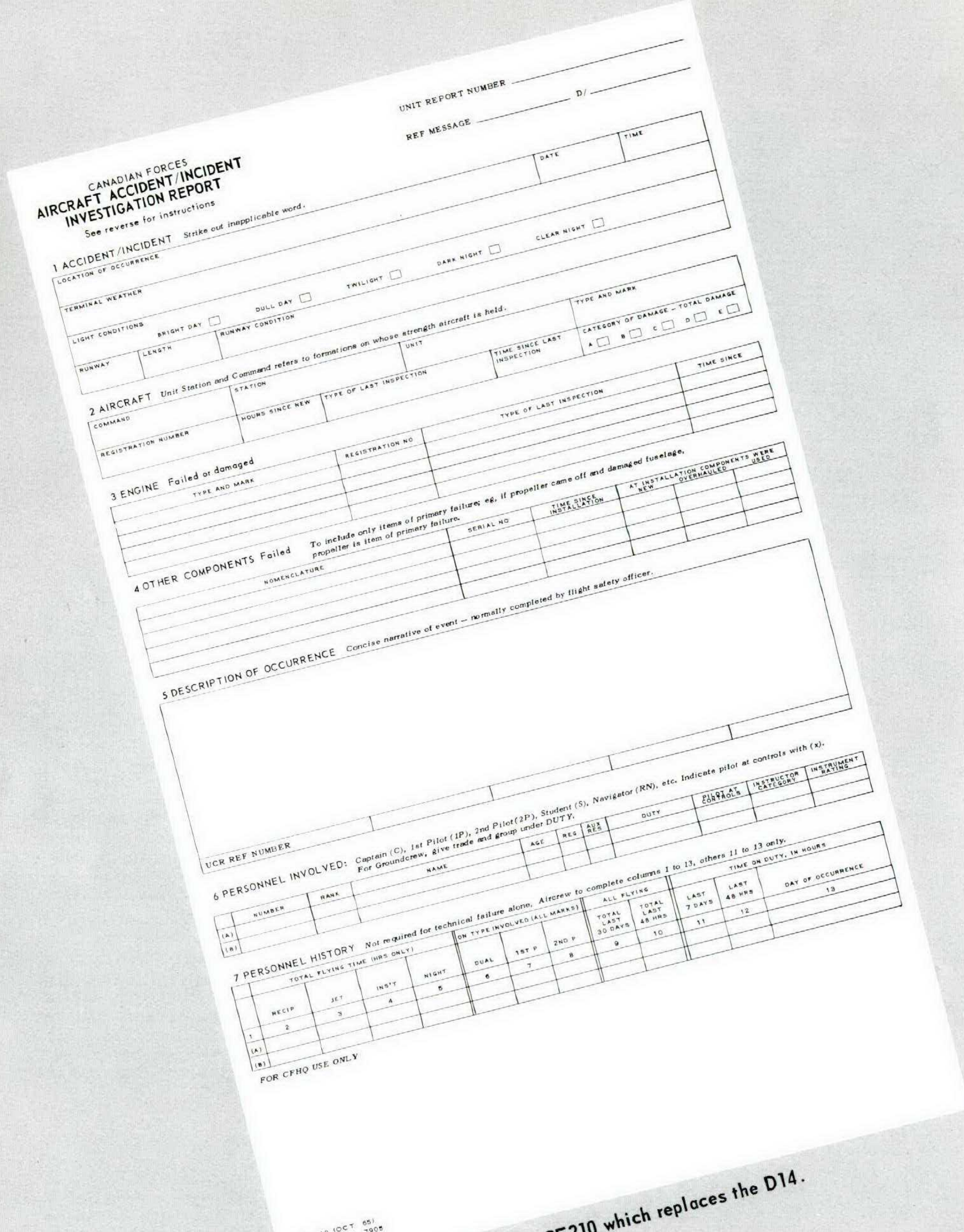
Over the years our flight safety programme has brought about an increasing awareness of the importance of sound safety practices by all those who operate and service our aircraft. As our procedures improve, however, so the difficulties which confront us mount. Machines become ever more complex and costly, and the environment within which they operate calls for ever greater skill and attention to the task in hand. Thus as we surmount one hurdle we are faced with another – and always will be. There is, therefore, no room for complacency.

Recently a discernible shift in the cause of accident has occurred. Human error on the part of those who operate aircraft has become less frequent, and materiel failure a more frequent cause. In the past year we have sustained a disappointing set-back in our CF104 satety record, but our response to the complex problems which have given rise to this set-back is beginning to have its effects and there is every reason to believe that we shall return to the steady rate of improvement which has become our pattern over the years. However, if we are to maintain this improvement we must accept the fact that high performance and simplicity are rarely compatible. We must redouble our efforts and respond with precision and speed to the conditions imposed upon us by the modern aircraft now in service or shortly to be introduced.

Unless we adapt with the times flight safety will elude us. I would, therefore, urge upon all of you a continued and sustained effort in this field while at the same time I congratulate you for your past achievements.

Robert Moncel

RW Moncel
Lieutenant General
Vice Chief of the Defence Staff



UNIT REPORT NUMBER D/

REF MESSAGE

CANADIAN FORCES
AIRCRAFT ACCIDENT/INCIDENT
INVESTIGATION REPORT
See reverse for instructions

DATE | TIME

1 ACCIDENT/INCIDENT Strike out inapplicable word.

LOCATION OF OCCURRENCE

TERMINAL WEATHER

LIGHT CONDITIONS BRIGHT DAY ☐ DULL DAY ☐ TWILIGHT ☐ DARK NIGHT ☐ CLEAR NIGHT ☐

RUNWAY | LENGTH | RUNWAY CONDITION

TYPE AND MARK

CATEGORY OF DAMAGE – TOTAL DAMAGE A ☐ B ☐ C ☐ D ☐ E ☐

2 AIRCRAFT Unit Station and Command refers to formations on whose strength aircraft is held.

COMMAND | STATION | UNIT | TIME SINCE LAST INSPECTION

REGISTRATION NUMBER | HOURS SINCE NEW | TYPE OF LAST INSPECTION

3 ENGINE Failed or damaged

TYPE AND MARK | REGISTRATION NO | TYPE OF LAST INSPECTION | TIME SINCE

4 OTHER COMPONENTS Failed To include only items of primary failure; eg, if propeller came off and damaged fuselage, propeller is item of primary failure.

NOMENCLATURE | SERIAL NO | TIME SINCE INSTALLATION | AT INSTALLATION COMPONENTS WERE NEW | OVERHAULED | USED

5 DESCRIPTION OF OCCURRENCE Concise narrative of event — normally completed by flight safety officer.

UCR REF NUMBER

6 PERSONNEL INVOLVED: Captain (C), 1st Pilot (1P), 2nd Pilot (2P), Student (S), Navigator (RN), etc. Indicate pilot at controls with (x). For Groundcrew, give trade and group under DUTY.

	NUMBER	RANK	NAME	AGE	REG	AUX RES	DUTY	PILOT AT CONTROLS	INSTRUCTOR CATEGORY	INSTRUMENT RATING
(A)										
(B)										

7 PERSONNEL HISTORY Not required for technical failure alone. Aircrew to complete columns 1 to 13, others 11 to 13 only.

	TOTAL FLYING TIME (HRS ONLY) RECIP	JET	INS'T	NIGHT	ON TYPE INVOLVED (ALL MARKS) DUAL	1ST P	2ND P	ALL FLYING TOTAL LAST 30 DAYS	TOTAL LAST 48 HRS	TIME ON DUTY, IN HOURS LAST 7 DAYS	LAST 48 HRS	DAY OF OCCURRENCE
1	2	3	4	5	6	7	8	9	10	11	12	13
(A)												
(B)												

FOR CFHQ USE ONLY

CF 210 (OCT 65)
7530-21-841-7905

The new CF210 which replaces the D14.

THE NEW CFP 135

AFAO 21.56/01

NGO 21.56/4

Next to flying clothing (and particularly orange flying suits!) there is probably nothing that will provoke a heated discussion more than the accident reporting system. The consensus, so we suspect, might go something like this: the complexity of the form was conceived by autocratic flight safety bureaucrats as a deterrent to accidents, the theory being, that if the form could be made painfully complex we could cleverly link the punishment to the crime!

Cynicism and levity notwithstanding, the serious business of accident reporting is often misunderstood. The CF210 Accident/Incident Investigation Report you submit is primarily a report of the *investigation;* the announcement has already arrived by message. In other words, we're hoping to employ the CF210 to PREVENT the next accident. Without the collective experience available in our records, no sensible attack on accidents and their causes can be devised.

About a year and a half ago we started to write an order which would remove many of the annoying irregularities and complexities of the reporting system; we used to ask, for example, how many night hours you had flown in the previous 30 days if somebody rammed you in the wingtip with a mule in the daylight! We are pleased with the new order but humble in the knowledge that it won't please everybody. For the first period we ask an open-minded trial of the new CF210; we feel sure that it incorporates many of your suggestions and recommendations. The few changes in the new CFP135 (which incorporates the old AFAO 21.56/01 and GNO 21.56/4) are discussed below.

THE NEW DEFINITIONS

ACCIDENT and INCIDENT The term ACCIDENT has been redefined. Whereas previously A, B, C and some D category damage determined the definition, an ACCIDENT now has a *degree of seriousness* criterion. In this respect, an accident differs from an INCIDENT by degree of seriousness only; you will see for example that when a fatality, serious, or very serious injury is involved, the occurrence is an ACCIDENT.

AIR and GROUND Also new, is the designation of an occurrence as AIR, or GROUND. The AIR occurrence is divided into ACCIDENT and INCIDENT; a GROUND occurrence is an ACCIDENT only. The definitions of AIR and GROUND are identical to the previous designators – AIRCRAFT and GROUND. For example, an occurrence previously named AIRCRAFT ACCIDENT is now called AIR ACCIDENT. The qualifications or the descriptions of these areas are in paras 9 and 10 of the new order.

An important item to note is sub-sub-para 4 under AIR INCIDENT which calls attention to a "hazard to flight". This area is frought with interpretative difficulties in that a similar occurrence happening to two people might be construed by one person as an air incident, and of no particular significance to another. An example of this would be the failure of cockpit lighting during a daytime flight. Certainly, this occurrence did not hazard the flight, yet this is no matter for merely an L14 entry. It would, therefore, be reportable under para 11, that is, SPECIAL OCCURRENCES. The integrity of the individual is involved here because many major entries following flights now are reportable under para 11, SPECIAL OCCURRENCES. The special occurrence report (SOR) is a simple format message (see Annex 3, to Appendix "D"). Ground accidents are being treated in much the same manner as in previous orders.

PARA 11, SPECIAL OCCURRENCE It is interesting to note that under sub–para (d), a BIRD STRIKE is reportable as a special occurrence only when there is no damage; if D category damage or more results, it is reportable as an air accident or air incident. All bird strikes still require the submission of a Bird Report. In the interests of flight safety it is your responsibility to pay particular attention to the requirements spelled out in sub-para (e). These might be judged by the individual aircrew member as warranting only an entry in the L14, but seen in the context of flight safety could be defined as having accident or incident *potential*. Obviously, the integrity of the individual must be called upon here, so that occurrences having these dangerous potentials are brought to light.

CATEGORY OF DAMAGE In "C" category the inclusion of "Replacement of a major component" is new, the change being, that replacement of a major component on unit is now of "C" category.

PARA 21, PARENT UNIT Any confusion which might arise under the definition of parent unit can be resolved by applying this criterion: Which unit will receive credit for the aircraft flying hours at the time of the occurrence?

Appendix "D" outlining reporting of aircraft accidents and incidents is straightforward and essentially unchanged from earlier orders. Particular attention should be paid, however, to the reporting of SPECIAL OCCURRENCES, which includes several related reports.

I have just had an accident or incident; this will require my submitting the form CF210 (successor to the RCAF D14). Under the new orders and the revised form will there be a completely new system or set of rules I will have to know about?
There are no radical departures in the methods of reporting accidents under the new system. The form is as clear as we could make it. However, there are areas which you should know about; these have already been discussed in this article.

Why was the new category SPECIAL OCCURRENCE introduced?
Previously, minor occurrences required overly-elaborate and detailed reports; this undoubtedly coloured the judgement of the person involved, resulting in his downgrading its importance. The special occurrence classification employs one simple format for initially reporting diverse occurrences.

Will the reporting procedures, that is my having to fill out a CF210, be simplified?
The new reporting system and accident definition are similar to that already in existence in the armed forces. The new form CF210 is much simplified from previous reporting forms.

Will the new CFP135, Flight Safety for the Canadian Forces, involve a departure from the previous reporting procedures in the Army and Navy?
No, the Army has for some years been reporting accidents and incidents using the RCAF system, but while the Navy forms are different the information required is quite similar.

There has been much discussion in the past years about whether Canada's accident reporting definitions are in line with other nations. Was this a factor in the alteration of the definitions?
To a certain extent this is true; however, the change is also in response to a greater need for international understanding of terminology among flight safety experts. The introduction of the extent or seriousness of the damage or injury into our definitions brings it more into line with the trend throughout the world in defining accidents. Statistical comparison however, is still and will remain for some time an imprecise and tenuous science. Ideally, what is required is a new international language among flight safety experts so that dialogues can be meaningful.

Will the new system mean an increase in reports?
If these new regulations are diligently applied you may be submitting more (but simpler, remember,) reports. Many disasters could have been averted had we possessed more information. Seen in this light your report is a small – but perhaps vital – contribution to flight safety.

From AIB files

CF104
FUEL PUMP DRIVE SPLINE FAILURE

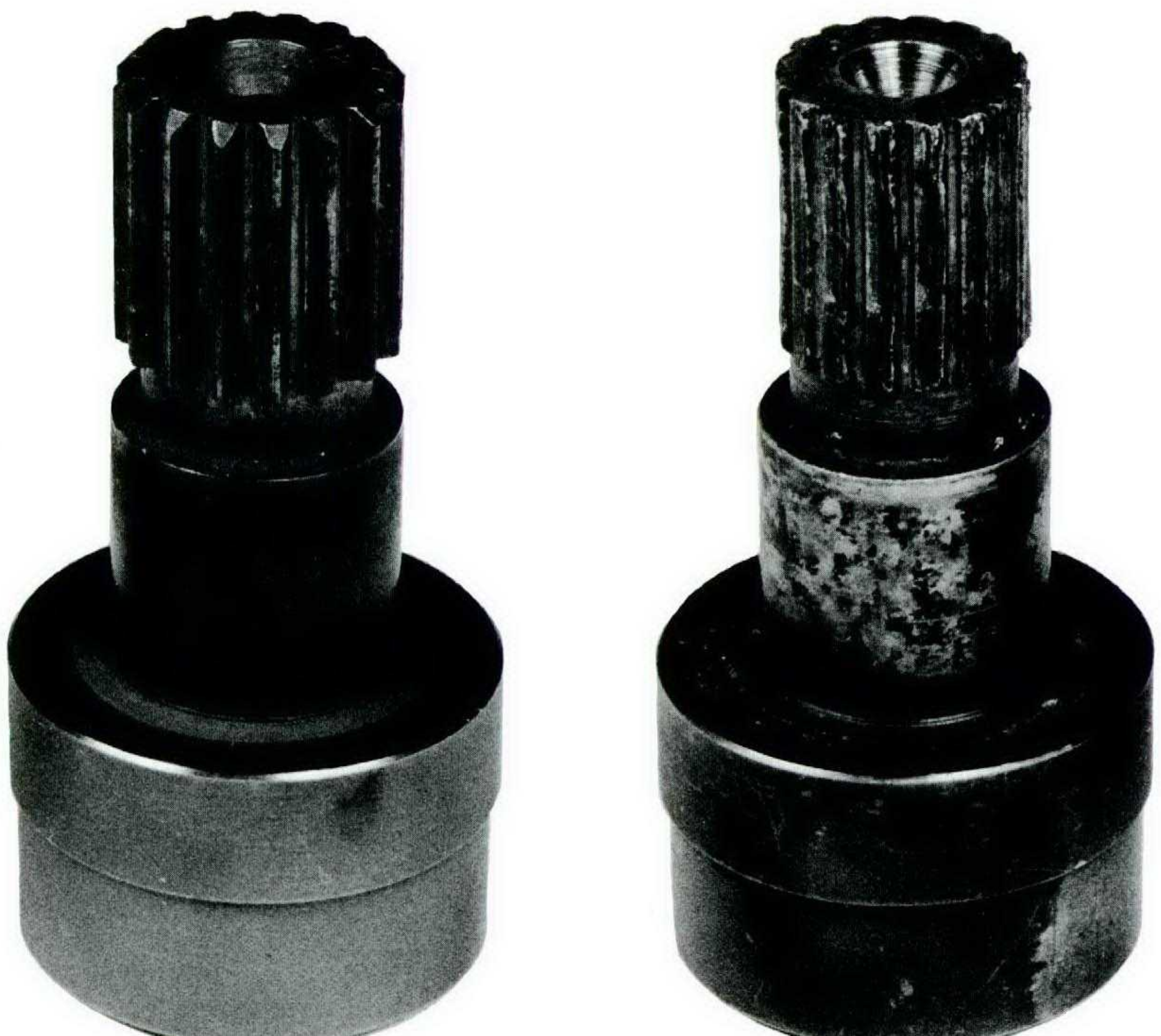
In July we lost a CF104 from a fuel starvation flameout. Both pilot and aircraft splashed into the Mediterranean following a successful ejection. The splines on the main fuel pump driveshaft had failed from excessive wear (see photo); the J79 engine has *one* fuel pump with *one* driveshaft, hence the flameout.

Thirty flying hours before, this engine had a periodic inspection requiring that this shaft and area be inspected and lubricated. The specified lubricant was unavailable, so the accompanying inspection, which probably would have revealed wear beyond limits, was not performed. Later, a fleet inspection uncovered numerous cases of wear.

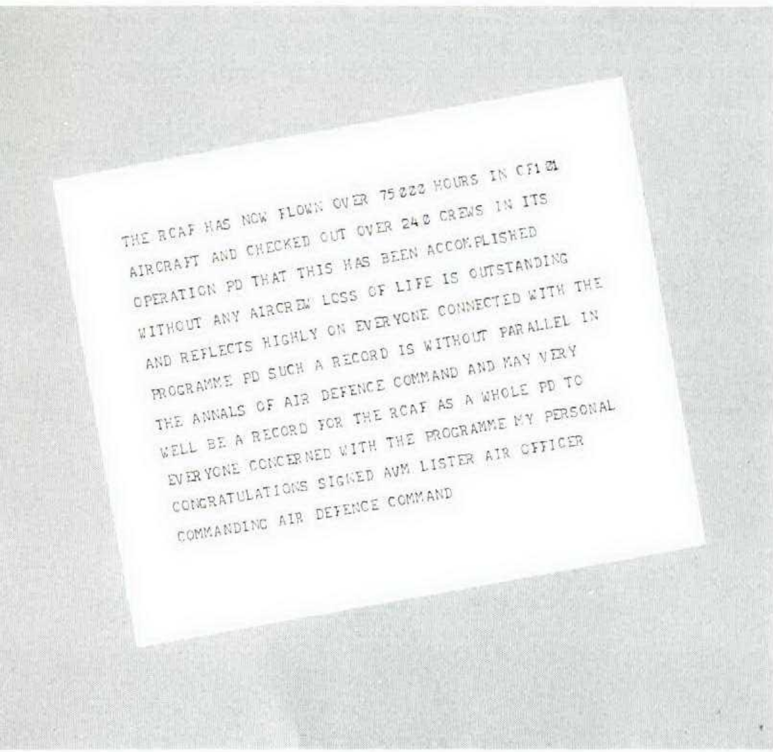
This inspection and lubrication order was late, but still would have prevented the loss of a valuable aircraft. The moral to the story is quite clear - ***deviation from laid down maintenance procedures will result in disaster sooner or later.***

Our bouquets to the RCAF volunteer SCUBA divers whose determined efforts at depths of 100 feet and more, resulted in recovery of the vital evidence.

Two shafts, one showing spline failure.



GOOD SHOW



THE RCAF HAS NOW FLOWN OVER 75000 HOURS IN CF101
AIRCRAFT AND CHECKED OUT OVER 240 CREWS IN ITS
OPERATION PD THAT THIS HAS BEEN ACCOMPLISHED
WITHOUT ANY AIRCREW LOSS OF LIFE IS OUTSTANDING
AND REFLECTS HIGHLY ON EVERYONE CONNECTED WITH THE
PROGRAMME PD SUCH A RECORD IS WITHOUT PARALLEL IN
THE ANNALS OF AIR DEFENCE COMMAND AND MAY VERY
WELL BE A RECORD FOR THE RCAF AS A WHOLE PD TO
EVERYONE CONCERNED WITH THE PROGRAMME MY PERSONAL
CONGRATULATIONS SIGNED AVM LISTER AIR OFFICER
COMMANDING AIR DEFENCE COMMAND

F/L WJ HUTCHINSON, F/L RF PATRICK, SGT AL MARLEY

At destination, the nose gear actuator of their Hercules failed, preventing the nose gear from cycling to full down position. A nose gear up-lock emergency release was tried without success and an emergency extension with the forward cargo door hydraulic system also met with failure.

Back at base the crew continued their attempts to release the nose gear. Further attempts using emergency release with "G" being applied caused a partial extension of the nose gear. Each time "G" was applied the gear would reach an almost full down position but would partially retract in level flight. Several other methods were employed, including a touch-and-go landing on the main gear, without success.

F/L WJ HUTCHINSON, F/L RF PATRICK and SGT AL MARLEY

As a last resort the flight engineer Sgt AL Marley with the assistance of F/L RF Patrick, under difficult conditions, cut a hole into the nose gear well with the crash axe, and then lashed the nose gear in the partially down position. The aircraft was landed on a 3500 foot strip of foam without further damage.

The captain, F/L Hutchinson, and crew exhibited a high degree of airmanship and resourcefulness in combatting this emergency and bringing the aircraft safely back without further damage.

F/O JK SALTER

The two pilots and four passengers from Station Summerside, departed Ottawa for Summerside in an Expeditor. At 7000 feet and in VFR weather approximately 45 NE of Sherbrooke, white smoke began streaming from the starboard engine. The cylinder head temperature and oil pressure began dropping, so the engine was shut down. The captain, F/O JK Salter, wisely elected to reverse course and make for Sherbrooke. An emergency declared on 121.5 was answered by an RCAF C130 which relayed communications and remained with the Expeditor until the safe landing was carried out at Sherbrooke 25 minutes later. A gradual descent of 150 feet/min at 95 kts was established using 2000 rpm and 28 inches manifold pressure; this power setting was used by the captain to preserve the serviceability of the port engine. F/O Salter ensured that the passengers were briefed for a possible emergency forced landing.

The crew of the Expeditor, particularly F/O Salter, displayed good airmanship and skill in a potentially dangerous situation. The captain of the Hercules, F/L MS Vacirca of 435 Sqn Namao deserves praise for the speed with which he offered assistance to F/O Salter. The low altitude the C45 eventually maintained (2800 ft ASL) with the sun directly in the eyes of the pilot made the assistance given to F/O Salter welcome indeed.

By handling the emergency in this manner, F/O Salter demonstrated good judgement in announcing his predicament early, and doing a cool, competent job of bringing passengers and plane to safety.

F/L WR BARNES

About twenty minutes after takeoff on a night low-level training mission in a dual CF104, F/L WR Barnes, the captain and F/L DH Gregory the first officer, experienced a nozzle failure. It moved from 2.2 to 10+almost instantaneously, accompanied by a loss of thrust. F/L Barnes commenced a zoom climb. During the climb the ENCS was activated but the nozzle did not move, nor was there any indication of regained thrust. Full afterburner gave a small increase in thrust and the zoom was continued to 6000 feet. This altitude could not be maintained with takeoff flap and 250 kts; the 104 was descending rapidly despite the selection to full afterburner. During this descent the ENCS was shut off and reactivated with no result.

Even in full afterburner, altitude could not be maintained confirming that the afterburner had not lit. However, F/L Barnes elected to leave the throttle in this position as fuel was now being rapidly pumped overboard, reducing the aircraft weight.

When the failure occurred F/L Gregory declared a "Mayday" emergency and got an immediate response from nearby Lechfeld with a heading to steer. As this heading was directly over the north end of Munich, F/L Barnes flew around the built-up area; there was a real possibility that the crew would have to abandon the aircraft. Then, Furstenfeldbruck (Fursty) GCA came on the air with a positive contact: "Bulldog 51 this is Fursty GCA, you are niner miles northeast of Fursty turn left, turn left to a heading of 180". GCA was asked to vector for an emergency straight-in landing. Fursty GCA then gave recovery instructions and vectored the 104 toward their airfield. However, they were too close to the approach end of the runway and the sharp 90° right turn necessary for a straight-in approach would have been dangerous; there was hardly enough thrust available to maintain level flight. Now, at only 1000 feet above the ground over a heavily populated area, F/L Barnes elected to do a shallow 270° left turn away from the airport using a gentle 10-15 degrees of bank to line up with the runway. Meanwhile, GCA continued to give headings, distances and other information in a calm competent manner.

The night was very dark although visibility was excellent. However, the confusion of lights of Munich and Fursty (which was on emergency runway lighting and had no approach or lead-in lights) made the runway difficult to locate. During this final turn, altitude control became critical as the suburbs of Munich were now only 800-1000 feet below. In maintaining altitude during the turn the airspeed decreased to 220 kts, but later increased to 240 kts on final at eight miles. Undercarriage and landing flaps were delayed until a landing was assured.

In coping with this emergency and accomplishing a successful night landing with an open nozzle F/Ls Barnes and Gregory displayed fine judgement and flying skill. In his attempt to bring in the crippled bird, F/L Barnes faced an enormous responsibility in overflying a built-up area in the latter stages of flight; in his assessment of this situation he exhibited high competence worthy of commendation.

F/L Barnes commented on "....the competent professional control provided under stress by Sgt Detlefs of the German Air Force". We wish, also, to commend Sgt Detlefs, whose alert handling of the situation played such an important part in the recovery of this crew and aircraft from a serious emergency at night.

F/L WR Barnes is now our most experienced open-nozzle pilot; in December 1963 he landed in open nozzle configuration. Not all the members of the "Open Nozzle Club" have appeared in the Good Show column and we are pleased to add their names:

Capt MD Cook, USAF
F/L DW McGowan
F/L A Bowman and F/L L Nelson
F/L FG Fowler
F/L BJ Gilland
Mr B Fleming

Just one of those days...

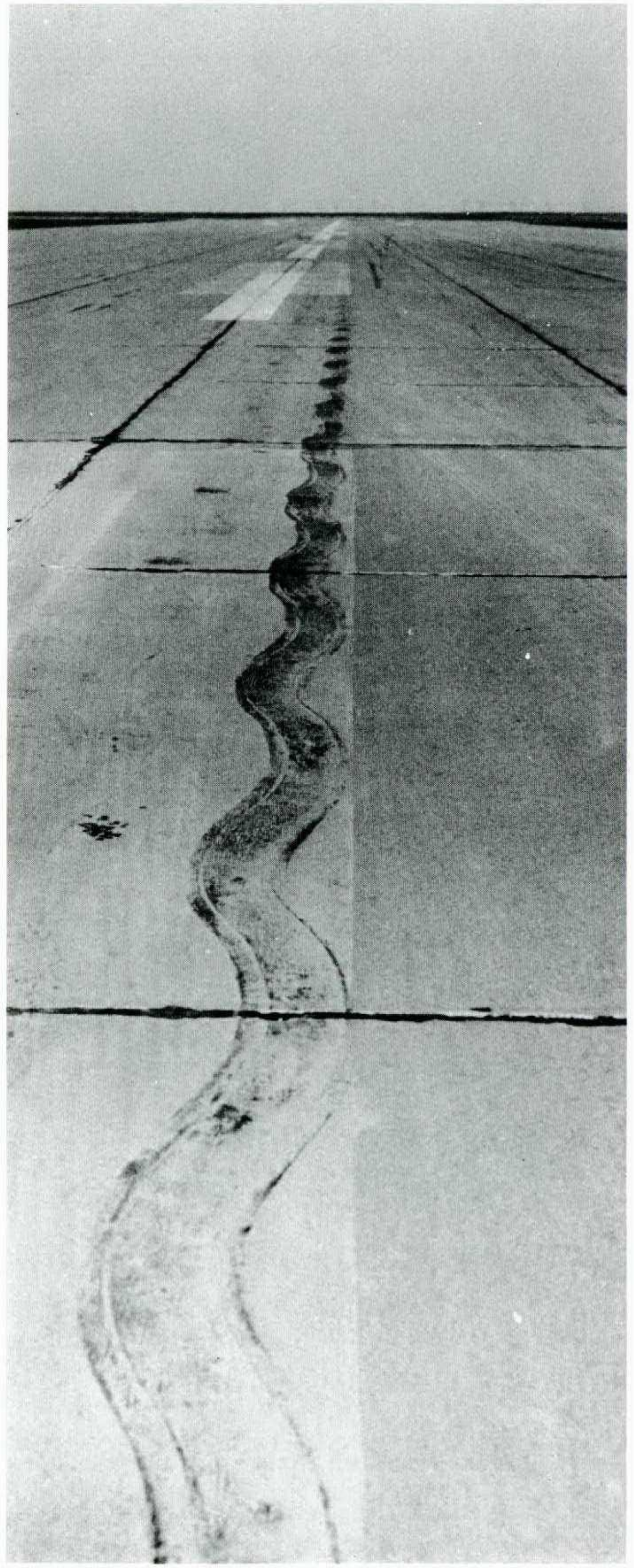
The Hercules had landed for a brief stop for unloading, and during the shutdown check the flight engineer noticed that the nose gear groundlock had not been installed. Actually, this flight engineer was observing on another NCO who was under training. Later, the new man recalled his oversight, returned, and inserted the groundlock.

The unloading finished, the aircraft was prepared for flight. During the start-up the under-training NCO was acting as ground crewman outside the aircraft but since the external headset cord was unserviceable the removal of the groundlock was not confirmed; because of this man's *second* oversight, it was forgotten. The aircraft took off and as the nosewheel came up there was "a loud metallic crunch" followed by a continued thumping noise which prompted the flight engineer to investigate. While the flight engineer was de-pressurizing the aircraft prior to opening the wheel-well panel the overly-enthusiastic man under training had removed the panel before de-pressurizing was completed; his eye glasses and flashlight were sucked into the well. The thumping noise turned out to be the red streamer of the groundlock flapping in the airstream beneath the aircraft at the edge of the door.

Next, the utility suction pump low pressure light came on - the system reservoir was empty. Eight quarts of hydraulic fluid were added to the system to re-fill the reservoir which, naturally enough began to drain out, also. By now, at destination the crew concluded that the gear would have to be extended manually. The pilot, by deciding to continue the flight without immediately attempting to confirm that the gear would come down, had unwittingly necessitated this emergency lowering of the undercarriage. The starboard came down with no trouble but the port wheel could not be moved. The crew decided to give the hydraulic system another try, this time with the speed selector in high torque. The flight engineer put his last three quarts of fluid into the system bringing the reservoir to one-third full. The nosewheel went down and locked but the port stopped nine inches short of full-down as the hydraulic system ran dry. The hand crank was still jammed so a "last ditch" three quarts of prop oil were added; this time the gear came full down. The Hercules was landed without flaps using full reverse thrust and minimum use of the emergency brake system. The pilot expected to have no nosewheel steering; during the latter portion of the landing run a severe nosewheel shimmy left the tell-tale wavy rubber line on the runway.

The nose gear groundlock (which ironically, had been installed incorrectly) was forced out of position when the gear retracted after takeoff and had been squeezed against the nose selector valve where it broke the casting causing the hydraulic leak.

The whole story contains several ironic twists not the least of which is the commendable resourcefulness of the highly-experienced FE whose failure to complete a check list caused the emergency in the first place.



On The Dials

TACAN POINT-TO-POINT POINTERS

Soon, most everyone will be blessed with TACAN, so ready or not, you must be taught. It's a proven widely-used nav aid, and simple to use once you learn how. Unfortunately, for many of you this will involve self-tutoring; for this, the Manual of Instrument Flying Procedures, TC-42 (which can be ordered from supply or borrowed from the friendly neighbourhood UICP) will tell you all about it. We propose to explain one of the procedures used in TACAN.

Basically, TACAN will enable you to fly:

- a radial
- an arc
- directly point-to-point.

It's the third item that is the challenge for the TACAN user.

Flying point-to-point is basic to any cross-country operation. On a chart, a line is plotted between the two points; the angle to north is measured for a track, and a distance thrown in completes the description of the flight or leg. TACAN point-to-point navigation differs:

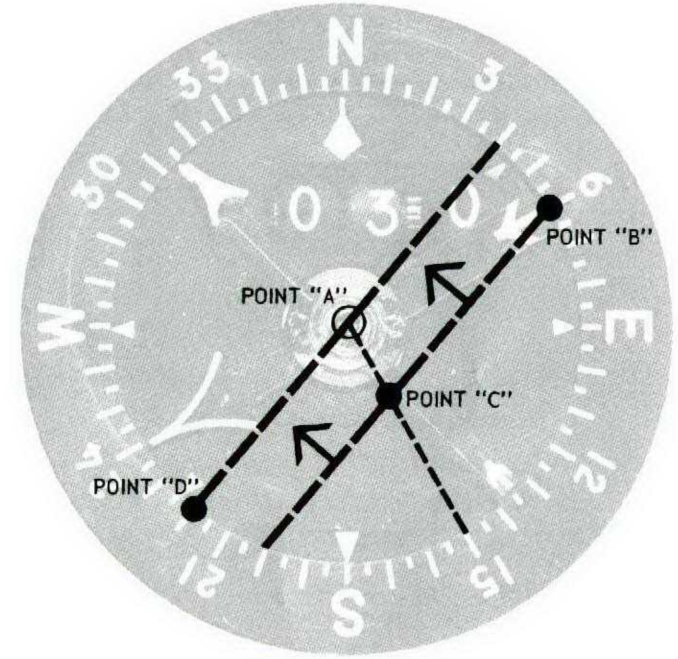
- the points are expressed as a radial and DME distance from a TACAN station,
- the TACAN instrument face, (DRMI or HSI depending on aircraft equipment) is used as the plotting chart.

A common situation is flying from your present position directly to the initial approach fix. Say, you are on the 060 radial at 30 miles and going to the initial fix, located on the 150 radial at 10 miles. On a chart you would draw a line between these points, measure a track and determine the distance. To plot this in the cockpit, use the face of the TACAN instrument.

The centre of the instrument represents the TACAN station (point A). The *tail* of the bearing pointer, shows the radial you are on – in this instance, the 060. An imaginary line from 150 to the centre of the instrument represents the radial you wish to proceed to. To complete the picture you need a mileage scale, so let the distance from the centre of the instrument to the bearing pointer's tail equal the greatest distance involved in the problem – in this case, 30 miles.

We have now converted the instrument face into a plotting chart; we're ready to plot the points. You are on the 060 radial at 30 miles; on the instrument it will be at 060 on the tail of bearing pointer (point B). Your track will be to a point on the imaginary line, ie, the 150 radial, one third of the length of the bearing pointer. As the length of the radial pointer is 30 miles, the one third (point C) represents 10 miles.

Join these two points with a straight line (line BC) – a pen or pencil is best but a gloved, knobby finger will do. Now, transpose this line parallel to BC so that it passes through the centre of the dial. Where it intersects the degree scale (point D) read the required track. The length of this track is measured by the scale already established – in this case, the bearing pointer tail equals 30 miles.



MORE POINT-TO-POINT POINTERS

If you are looking for a more precise method of TACAN point-to-point than afforded by the above method, here's one. Ever wonder what that squared grid at the bottom of the computer slide is for? It may not be designed for this use but it works quite well.

Set the zero of the square grid under the center dot. Set the radial you are on against the heading index and mark on the grid scale the appropriate mileage (as you would mark a wind velocity). Repeat this procedure to mark the radial and distance to which you are proceeding. Join the two dots with a straight line. Rotate the computer face until this line is parallel to the vertical lines on the grid. Read the required track at the heading index; for the distance use the grid scale.

A word of caution: you can come up with the reciprocal of your track. This, however, is easily resolved as you no doubt know the general direction to go, or, on the line joining the two dots put an arrow pointing from actual position to desired.

GCA GLIDE PATH CHECKS

Since the unfortunate accident that occurred on a GCA final in 1 Air Div, much thought has been given to devising a glide path check.

A bit of added insurance is yours if you can readily calculate your altitude for a given range from touchdown. This can be done as part of the cockpit check, and it is extremely simple. For a 2½° slope the altitude change is 266 ft per mile; a 3° slope gives 309 ft per mile. Simplify this by rounding off the numbers:

2½° - 250 ft per mile
3° - 300 ft per mile

Three miles is usually about half-way down the glide path but two miles can be used as well. For three miles on a 2½° slope: add 3 x 250 ft, (or 750 ft) to the field elevation and you get an approximate indicated altitude at three miles. We admit this is only approximate due to minor altimeter errors and because the actual altitude should be 3 x 266 or 798. Okay, so add 800 ft to field elevation for you nit pickers. ■

NEAR MISS
OPERATIONAL HAZARDS
SAFETY SUGGESTION

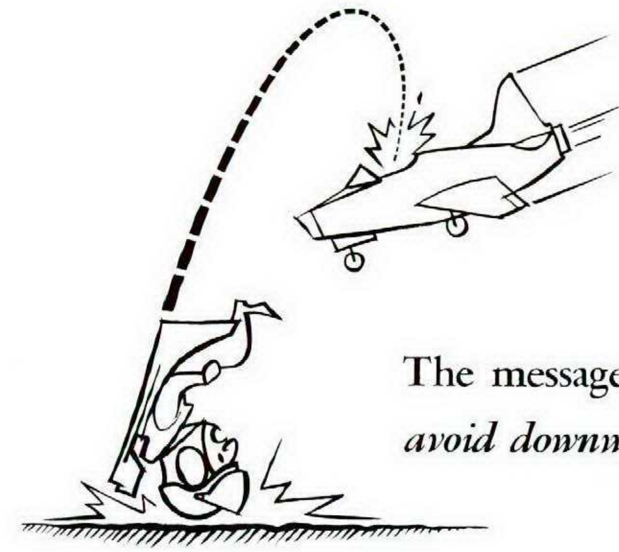
CANVAS BAG JAMS THROTTLE

The pilot reported an engine malfunction and made a precautionary recovery at base; however, repeated ground runs uncovered no malfunction. Later, the pilot was found to carry a canvas bag containing flight publications which he would hang on the throttle. This would create sufficient inboard pressure to cause the binding the pilot originally reported.

After several decades of military aviation behind us, we have been able to largely resolve aircrew requirements of this sort. Using non-issue devices, therefore, is only asking for trouble.

A VITAL MESSAGE FOR JET AIRCREW

Some recent ejections have been "close calls" . . . in each case the pilots ignored the facts – read on . . .



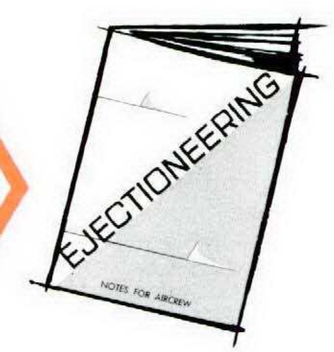
Despite the misnomer zero-zero applied to modern ejection seat systems, if an aircraft is sinking at a greater rate than an ejection catapult can lift the seat/man combination, the resultant vector will be downward.

The message for low-level ejectees is therefore: *avoid downward vectors and sink rates.*

This is best accomplished by the tried-and-true Zoom manoeuvre. A 10% climb even at ground level in a flying aircraft is enough to ensure a successful ejection even with low energy rocket or even a ballistic catapult.

ALL IT TAKES TO ZOOM IS AIRSPEED AND IT CAN BE DONE FROM THE DECK ! ! !

The complete story is available in the booklet "Ejectioneering" – read it – it could save your life.

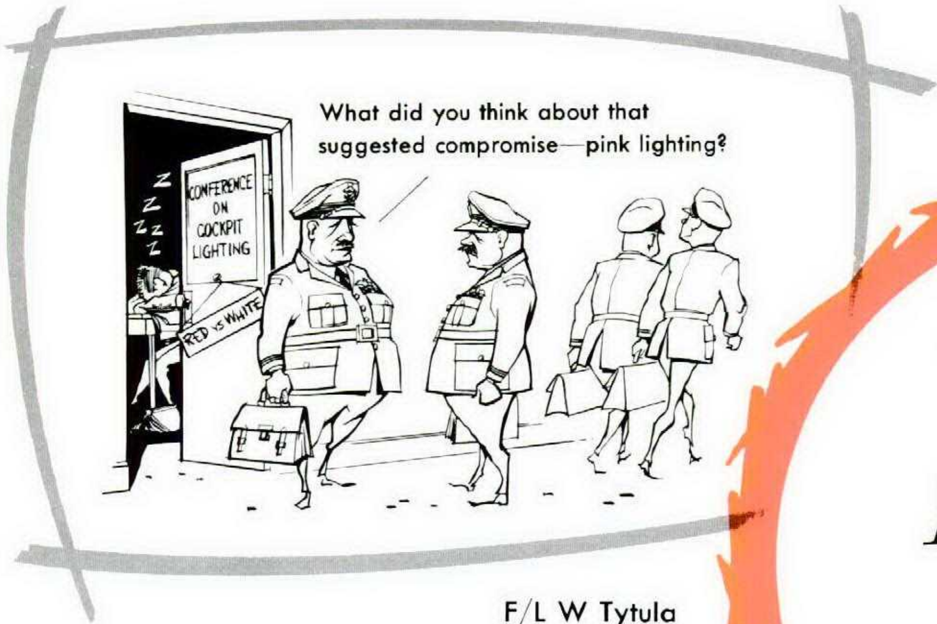


New Light Shed on Instruments

WHITE vs RED

COLOURED COCKPIT INTERIORS

INSTRUMENT IMPROVEMENT



F/L W Tytula
CFHQ

White instrument lighting is already here for some and just around the corner for many others. The Tutor and C130E have white lighting and installation in the Training, Transport and Maritime fleets is already planned. The Argus, Neptune, Caribou and C5 are presently being converted; the Buffalo and the CF5 will have integral white lighting on delivery. Later, the Yukon Cosmopolitan, and possibly the C130B will be equipped; however, some aircraft such as the Otter, CF104 and the CF101 will retain their present lighting. The CF104 now has integral red lighting which proves to be difficult and expensive to change; the Voodoo, while less difficult and expensive to convert, has too short a remaining life to make the conversion economically feasible. There are no plans at this time to convert helicopters to white lighting.

During World War II our Intelligence learned that German scientists were experimenting with red instrument and cockpit lighting. These scientists had found that red light caused the least degradation of the night vision so important to target detection and landing at blacked-out airfields. Until recently, we have retained the conviction (not *now* shared by the Germans) that red lighting still offers advantages which outweigh its drawbacks. The drawbacks, however, are formidable enough for most nations to have abandoned red lighting and with it the dull black cockpit and uneven illumination, to name only two.

Since World War II the requirement for optimum night vision no longer prevails; runway lighting, landing lights, air traffic control, place fewer demands on the "owl eyes" of yesteryear. Yet, cockpits remain black, cluttered and confusing - the by-product of red lighting. As a result, we had accidents labelled "Pilot Error" with stated sub-causes such as "fatigue", and "disorientation" - the common manifestations of prolonged exposure to red lighting.

There are, no doubt, operations where peak night vision is vital. However, assuming that night vision of this order is generally not required, there are several cockpit improvements that now become possible.

WHITE vs RED

What is achieved by converting from red to white instrument lighting?

- White lighting permits the unrestricted use of colour coding for instruments, range markings, equipment, maps and charts; eg, it is highly desirable to employ colour in the new integrated flight systems instruments.
- Fatigue caused by long exposure to red light is eliminated.
- Instrument markings are more easily discernible with the better contrast provided by white light.
- Red warning indicators become more prominent.
- Increased luminosity of the gyro horizon for example, provides vivid sensory images essential to reducing disorientation. (Accidents have been caused by disorientation attributable to inadequate lighting of attitude indicators).

Low intensity red lighting produces several undesirable reactions in man. Man is least efficient under low illumination; the lower the illumination the slower his reactions, both physical and mental. Since man is light dependent he should be placed in an environment conducive to comfort and efficiency; coloured lighting creates an abnormal environment and if it must be used it should be approached cautiously. Red light handicaps the eyes by reducing peripheral (side) vision. Diminished contrast of the instrument markings means perception time is increased.

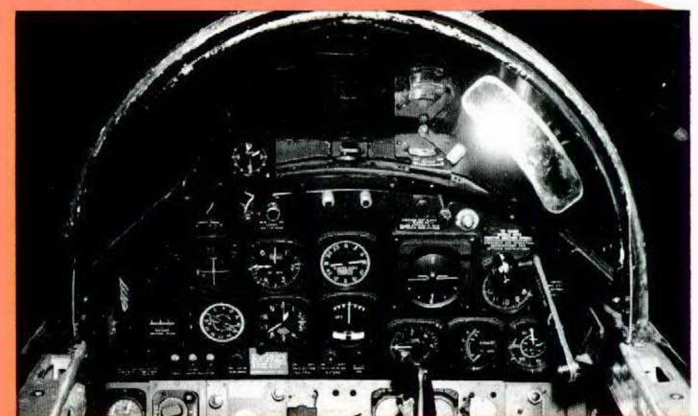
The move to white instrument lighting has been a slow and cautious one and has been the subject of interminable disputes. Admittedly, there are special roles that require peak night vision; in these, red lighting will be retained for its unique properties.

COLOURED COCKPIT INTERIORS

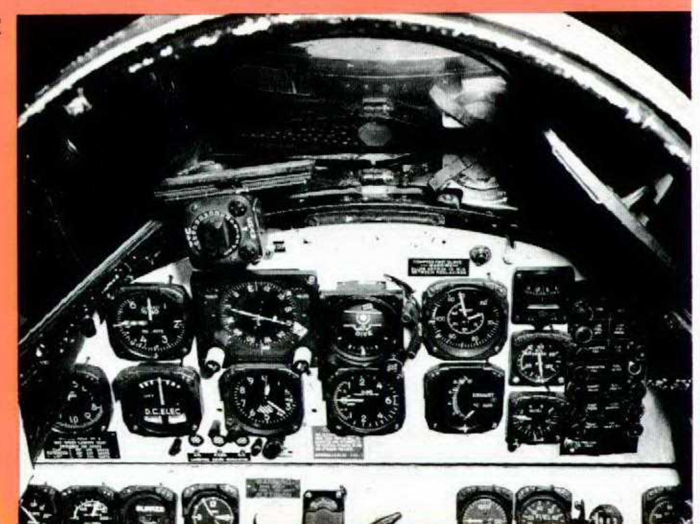
The decision to employ white light sparked studies to determine the colour best suited for the cockpit. Researchers found the gray cockpit interior to have several advantages over the black:

- It was generally agreed that gray effects a certain colour harmony with the remainder of the work space.
- Mounting a black instrument on a gray panel serves to delineate the shape of each instrument case, enabling aircrew to readily identify each by their distinctive size and shape.
- The pilot is often exposed to high intensity light from the sky and objects outside the aircraft, eg, reflection off metal surfaces. If his eyes adapt to this intense brightness, each time he glances at his instruments, he must first adapt to the much lower level of brightness in the cockpit. Under extreme conditions this task becomes very distracting, contributing to delay, fatigue, and reading errors. Gray panels reduce the difference between the two adaptation levels.
- Visibility within the cockpit is poor under the "high altitude glare" of direct sunlight and the little or no atmospheric scattering of light. Gray interiors reflect light, making items in the darker recesses of the cockpit more discernible.
- Under ultra-violet light, many pilots experienced "floating" of the instrument marks during long night flights. The instrument marks - the only objects visible - would appear to move. This generally occurred under low lighting where the black panel was all but invisible. The gray panel provides a visible background or reference for the instrument markings.

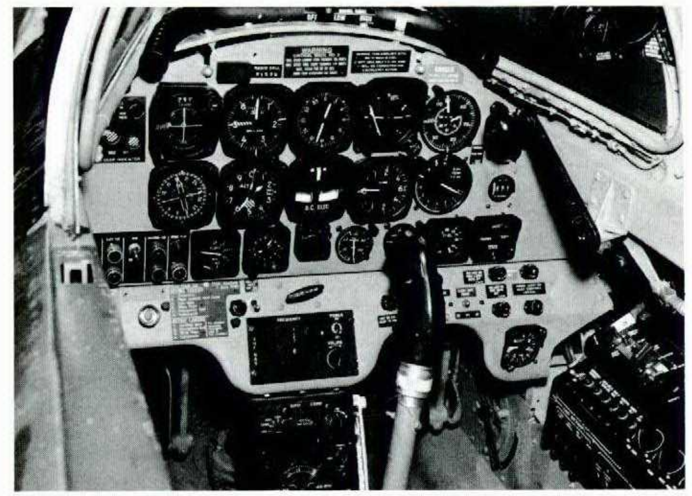
BEFORE



AFTER



The grey cockpit interior of RCAF T33 prototype.



The grey cockpit interior of USAF T33.

The primary disadvantage of a gray cockpit interior is also that of white instrument lighting - it degrades night vision. It also increases the amount of light reflected from surfaces such as canopies (halo). However, these undesirable effects can be minimized by using a dark gray and by intelligently designed glare shields.

Gray was specified for the Tutor as a trial, the decision to use gray in the cockpit and on instrument panels deriving from extensive consultations with the aircraft users. Reports are so enthusiastic that we plan to repaint other types on an "as practicable" basis.

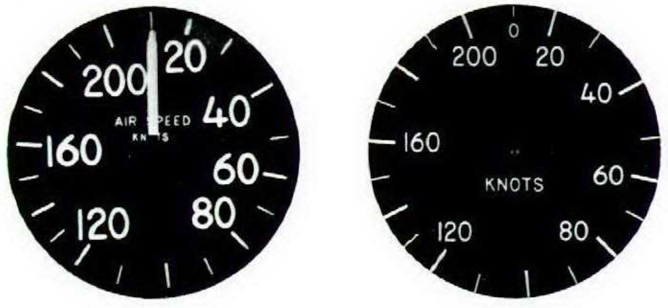
The new colours selected for cockpit interiors are "Medium Gray" (Federal Standard 595 - Colour number 36231) for flight decks and lower portions of crew compartments and "sky" (colour number 34424) for upper decks and portions of crew compartments.

INSTRUMENT IMPROVEMENT

The conversion from red to white instrument lighting and the associated abandonment of radioactive markings meant that instrument faces had to be repainted. The new "lustreless white" requires new silk screens to be manufactured for the repainting; this afforded us an excellent opportunity to redesign all instrument presentations at little or no extra cost.

At CFHQ, a working party of designers, operators, and a human factors specialist directs the instrument improvement program. The program aims at a "clean-up" of instrument displays:

- removing useless information, such as manufacturers' names,
- standardizing letters, numbers and markers,
- eliminating "hot spots".



BEFORE **AFTER**

Instrument clean-up prototypes were checked and double-checked under both red and white lighting and reworked until the desired product was achieved. The program has been underway for over a year - many of the converted instruments are now in the field. Most instruments will be converted by the end of 1966. The standards established by this working group will be applied to future purchases of aircraft instruments.

Members of the Instrument Improvement Working Party are involved in several other areas of cockpit improvement. Their efforts are being directed toward better instrument layouts, and removal of useless information, placards and clutter. Their influence now extends into the selection, development, and procurement of instruments – aimed at creating simple, logical, comfortable and therefore, efficient cockpit layouts. Thus, the days of designing cockpits and instrument layout for the convenience of *everyone except the aircrew* are no more.

F/L Tytula is presently engaged as a human factors specialist in projects involving equipment development and requirements. He joined the RCAF in 1948, served at the Repair Depot at Trenton and the CEPE Climatic Detachment at Namao as an aircraft communications technician. In 1956 Sgt Tytula entered the University of Alberta as a serving airman, graduating in 1960 with a degree in mechanical engineering. As a commissioned officer (Tech AE) he served at Stn Rockcliffe and at the Materiel Laboratory until 1963. Following a year's post-graduate study in the Industrial Psychology Department of Purdue University, West Lafayette, Indiana, he graduated in 1964 with a MSc in Human Factors Engineering.

THE GHOST RETURNS

Two incidents occurred recently when T33 aircraft were given GCA identification on the basis of SIF radar returns which later proved to be false. The SIF target seen by GCA was a ghost return on the same bearing 60 miles closer than the aircraft's location. In the first case, a T33 was enroute from Namao to Gimli; the controller asked for "370 normal" on SIF for an identification. At that moment, GCA observed a "370 normal" return at approx 18 miles and requested the pilot select "low" for identification; GCA observed the target change to "low". For further identification the GCA controller had the pilot turn to a heading 180°M – a change of 80 degrees from the inbound heading. The SIF target was observed to make the turn and the GCA controller descended the aircraft to 2500 feet, although no radar skin paint had been established.

The GCA controller had no reason to believe this was a ghost target; he had never seen or even heard of one before. The SIF target was now at seven miles but at flight level 290 it seemed unlikely that a skin paint was possible. He expected that during the descent he would obtain a radar target; the GCA approach would then be based on a skin paint.

This same phenomenon was duplicated by another T33, a few hours later.

Controllers should be aware of the possibility of SIF ghosting especially with the CPN4 and MPN11 equipment. A technical report is in preparation on this subject.

This reminds us of another incident recently when a pilot deliberately created a radar misidentification. The consequences of this type of behaviour are deadly enough to deter even the most immature.

During a loading operation on an Argus, the two port engines were temporarily shut down. As soon as the engines were restarted the pilot proceeded to taxi the aircraft without informing the groundcrew to disconnect the ground power unit. This occurrence, which fortunately was just that, again points out that check lists must be followed on all engine starts. This near miss would have been avoided had the aircrew gone through the prescribed pre-taxi check.

Beware of get-home-itis – there is no short-cut to safety.

ICE COLD FEAR

A pilot's flying career can be described as long periods of casual routine interspersed with moments of stark terror – this flight had both. T-bird operators in particular can grab some tips from this Near Miss but the lesson (the "stark terror" part) is there for all aircrew.

The T33 was to fly a target mission from Bagotville, landing after dark at Chatham. The forecast for Chatham included a "slight possibility" of freezing rain. The pilot quite naturally checked at Chatham before descending and also listened to reports of aircraft already in descent – nobody mentioned freezing rain. During the descent in cloud it became apparent that the aircraft was beginning to pick up ice. At about 1500 feet, below cloud, ice could be seen along the leading edge and tiptank cones as well as covering the entire windscreen and side panels. On the GCA at minima the pilot could not see the runway lights, and the approach lights appeared only as a blur. The pilot elected to overshoot, do a VFR circuit to permit the pilot in the back seat to land the aircraft as his vision was less obscured.

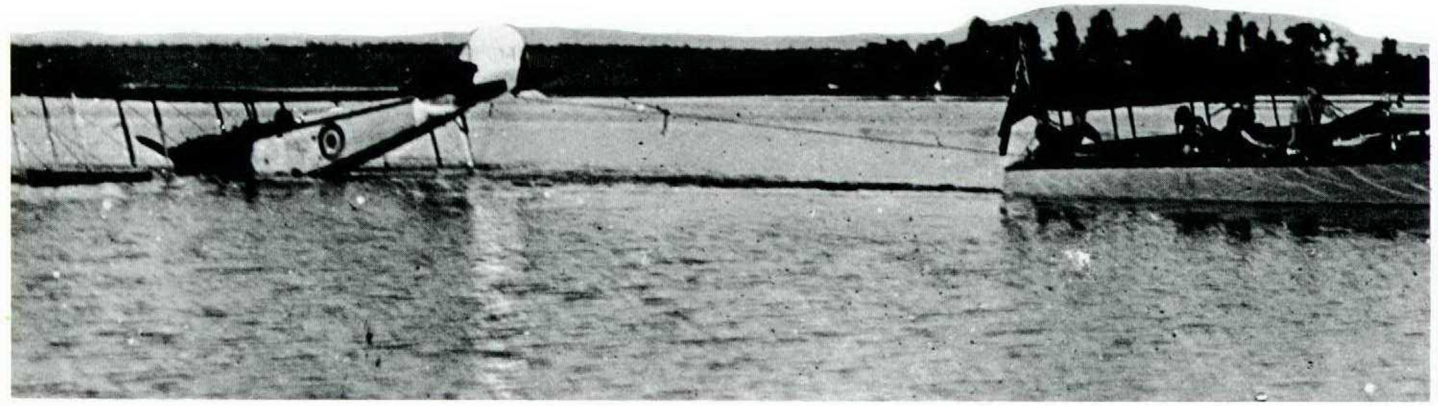
Then things began to happen, or rather, not to happen. The 90% power on overshoot gave 155 kts; power was advanced to 98% on downwind and the aircraft (clean) staggered along at only 165 kts! The pilot quite rightly suspected intake ice but this would have caused higher JPT but even at 98% it remained at a very low 425°. With the wheels down on final turn it took 98% to get 140 kts; power was then slightly reduced to 90% to give 115 kts at touchdown with 160 gallons.

On shutdown two shaken pilots examined their aircraft. There were two inches of rime ice on the leading edge and tiptank cones; three quarters of an inch on the windscreens! The engine screen was partially covered and the nose section was one inch deep in rime back nearly to the static vents.

WHAT HAD HAPPENED? At first glance it would appear to be straightforward airframe icing with a restricted intake causing loss of power, and increase of drag. But a restricted intake will not *lower* JPT – quite the contrary. What most probably happened was ice accretion on the sensor of the barometric pressure control (BPC). If the sensor is iced over, the fuel flow at a given throttle setting will remain *constant* during a letdown, rather than *increase* as it normally would do. So, you have a reduced airflow due to intake icing and a reduced fuel flow from the frozen sensor on the BPC. Add to this loss of thrust the much-increased airframe drag and toss in a loss of forward visibility at night and you have the makings of a real hairy do.

The pilot points to the major discrepancy in the forecast weather and pireps from landing aircraft and feels that he wasn't given a fair shake – ". . . not bad for an area where no freezing rain or icing was reported. . . we nearly broke our necks walking in on the slippery tarmac. . .". Could be, but no doubt this pilot has learned to expect the worst and be prepared for nothing better.

"Flash-Back" Inter-service harmony – pre-integration style.



The first flight - strapping in.

The first group to graduate at Moose Jaw......and at Gimli.

A First Reading on Our New Trainer

Tutor

IT'S GREAT!

F/L R Dobson
Directorate of Training
CFHQ

A band was playing, men were marching and spectators applauding - it was another graduation ceremony - but this was a parade with a difference. The young men receiving diplomas were the first Tutor-trained students. Over the years RCAF Stations Moose Jaw and Gimli have held many graduation parades but the one on 24 September was an important milestone in the long history of Canadian flying training.

It was an occasion for mixed reactions from the hundreds of people who were directly and indirectly a part of the transition program from Harvard to Tutor. A 200-page document would barely suffice to list the numerous elements of the Department of National Defence, the RCAF, Canadair Ltd and Orenda Engines Ltd whose teamwork made possible the September graduation of Course 6406 on schedule. For many of the departments involved, the ceremony was the gratifying culmination of a long and complex project. For others, it was the beginning of an association between aircraft and student that will continue for years to come. For the students, it was the first step toward an exciting career.

Whether involved or not in the Tutor program, we all have asked the question - How does the Tutor stack up? The Tutor is indeed an excellent basic trainer. Without a doubt, the performance of the aircraft and the standard of student skills achieved far exceeded our expectations.

From a student point of view the inherent ease of handling and safe flying characteristics throughout the wide speed range allow for concentration on learning the instrument procedures and modern flying techniques without risk of losing control. The Tutor's high-speed and high-altitude capabilities enables the Basic Flying Syllabus to touch on all fundamental aspects of military aviation. In fact, the other stages of flying training yet to come will be a polishing of the skills he has already developed in the Tutor.

The side-by-side seating arrangement has advantages for both the student and the instructor. The student can learn by witnessing the instructor's movements; similarly, the instructor can more accurately assess the student's actions. Gone forever is the peering over the side, a talent perfected by Harvard instructors, especially during night approaches.

Tutor instructors appreciate the wide performance envelope that permits coverage of all the latest flying techniques. The predictable handling characteristics make demonstrations a pleasure and the variety of lesson plans throughout the syllabus make the job infinitely more interesting than during the Harvard era.

The road to unqualified acceptance however was not a smooth one. The Tutor has a long way to go before it is regarded a staunch and true companion; it has yet to win over the Doubting-Thomas's. To some T33 instructors, once the undisputed eagles of the training mill, it was a dash of salt on the tail feathers to "step down" to basic training. This attitude could stem from many causes, for example, the unnerving spectre of facing for the first time a horde of ab initio pilots who haven't had the rough edges ground off by a stalwart Harvard instructor after 165 death-defying hours in the "Yellow Peril"! Or possibly it's the sudden confrontation of a modern cockpit layout including an annunciator panel and TACAN equipment, or even the anticipation of being watched by some keen beady-eyed student sitting close by, intently following his every movement. For those of you who haven't yet experienced the cold shivers that accompany the first side-by-side trip, it can be likened to the naked fear endured by the Olympic diving champion who emerged from the water after a perfect dive only to notice his bathing trunks floating in the swimming pool!

The ex-Harvard instructor finds a major difficulty in adjusting to the much larger flight envelope and environment of the Tutor, and its attendant complexities. He finds it hard to forget about "mixture rich, carb-heat cold" and concentrate instead on the "15,000 foot check". For him, today's comprehensive briefing has replaced the "pull the chocks and crank the props - the first one airborne is the leader". He must now consider diverse weather conditions (the Tutor can reach a jet stream), and that fuel supply is suddenly an important factor - it doesn't last forever any more. A system of planned flying has hit him right between daylight and sunset and he can no longer rely on back-to-back trips to pull him out of a hole. However, he is so relieved to actually hear while airborne that he gratefully sits back and enjoys the peaceful atmosphere of his draft-free air conditioned cockpit. Many were quite surprised on their first trip to discover that the world is round and that a mountain is no longer an insurmountable object.

It would be appropriate to interject some of the opinions of the maintenance men at this particular point, but their story is long and complex; besides, it could not be written without reference to the appropriate EO and that one is still under revision. Actually, the inception of the Tutor "Maintenance Concept" is a story in itself, and will appear in a later issue. Suffice to say here, the Tutor maintenance programming has been well planned and professionally executed.

Tutor graduations will become commonplace as Training Command pilots and groundcrews work year around to provide the operational units with qualified pilots. But it was this first graduation that made us pause to reflect on the enormous task that has been accomplished: a new aircraft was built, a new maintenance concept developed, new runways constructed, new syllabi written, technicians and aircrews trained.

The transition from piston to jet basic training is over and the Tutor has more than lived up to expectations.

Only the first chapter of the "Book of Tutor" has been written; the next few years will see additional chapters on syllabus changes, modifications to the aircraft procedures streamlined, and so on - but for those of us involved in pioneering the Tutor, the climax has been reached with mixed feelings of relief and intense satisfaction.

A native of Moose Jaw, F/L Dobson joined the RCAF in June 1956, and trained on Harvards at Claresholm, Alta, and on T33s at Portage. On graduating from the Flying Instructors School (FIS), Trenton, in 1957 he went to Moose Jaw as a Harvard instructor, and two and a half years later, joined the staff of FIS which had by this time moved from Trenton to Moose Jaw.

F/L Dobson was commentator for the Golden Hawks in 1961 and was instrumental in the formation of the Harvard Aerobatic team (The Goldilocks) in 1962. Since 1963 he has been Tutor Project Officer for the CFHQ Directorate of Training.

The Horizontal Situation Indicator

S/L BT Burgess
DFS/AIB

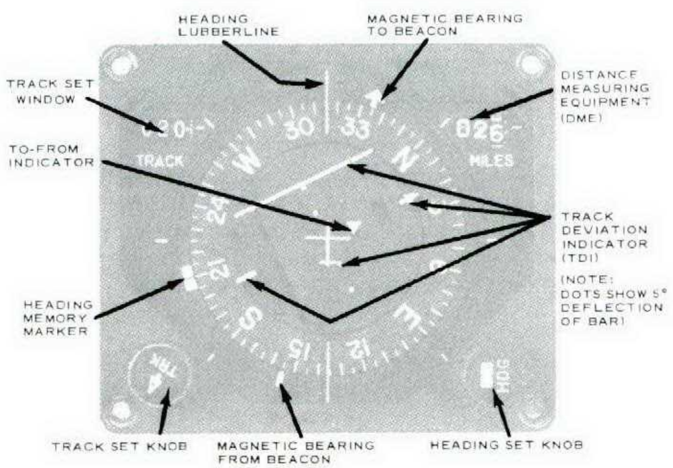
In the next year or so, many of our cockpit panels will be displaying a new navigation instrument - the Horizontal Situation Indicator (HSI); the T33, Yukon, Argus and Dakota are slated for early conversion. This instrument will be more or less familiar to some pilots and new to others depending on the equipment you are using now. Those of us who have flown with this new HSI are enthusiastic - once you have mastered the basics we know you'll be fired up, too. A glance at the misleading complexity of the HSI face may unnerve you but once (or twice) through this article and you're well on the way to being another contented customer wondering, as we did: "Why didn't they do it this way in the first place?"

Two aims of the HSI program:

- ▲ to display navigation information more clearly than previous instruments, making the pilot's mental gymnastics less complicated
- ▲ to standardize the navigation display in as many aircraft as possible, concurrent with the TACAN modification programs.

We'll outline some of the advantages of the HSI and give a brief preview of the instrument you'll be seeing more of in the future.

Let's examine the thinking behind the HSI design. The basic aim was to present to the pilot a picture as if he were looking directly down on his aircraft and could see both his aircraft and the desired track in relation to his position - the horizontal situation. The aircraft is depicted as a small symbol etched on the glass in the centre of the HSI. The desired track is shown by the track deviation indicator (TDI).



Depending on the equipment in your aircraft the HSI will give you all (or part) of this information:

Heading Aircraft Heading is displayed conventionally on the lubberline at top of the dial.

Heading Memory Marker This may be employed as a reference only, or can be fed into the bank steering function of flight director and/or autopilot. The marker is set with the lower right-hand HDG knob. The heading memory marker may also be controlled by the tactical compartment in maritime aircraft and by data link on air defence aircraft.

Desired Track The track appears in the TRACK window and also on the track deviation indicator (TDI) portion in the centre of the instrument. The setting is made with the TRK knob. The displacement of the TDI bar to either side of centre is controlled by the TACAN, VOR, or ILS localizer, whichever is selected by the pilot. (The TDI can display target track on data link).

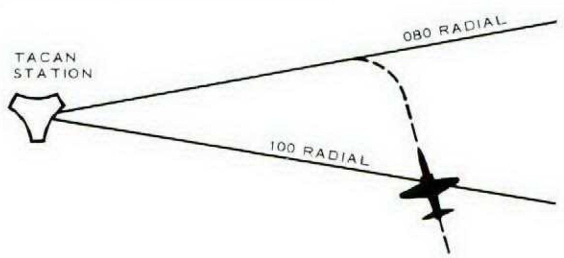
Bearing Information The arrowhead points to the TACAN, VOR, or non-directional beacons - depending on selection. The tail will, of course, give the radial or bearing from a beacon.

Distance Appearing in the MILES window, this is the TACAN DME, or the readout from any of the navigation or tactical computers.

WORKING THE HSI

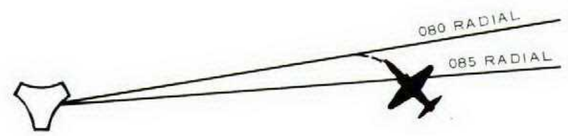
To Intercept a Radial and Fly Inbound

The aircraft heading (350°) is shown on the lubberline; the intended flight is to intercept the 080° radial and fly toward the TACAN beacon. With the track knob, 260° is set in the track window; this will cause the TDI to point at 260° on the compass rose - in this case, on the left wingtip. The tail of the bearing pointer



shows the aircraft to be on the 100° radial and thus south of the desired radial or track. By being fully displaced to the top of the instrument, the bar portion of the TDI also indicates the aircraft is south of the desired radial. Note that the TDI shows pictorially the intercept angle the aircraft is making with the desired track of 260° - in this case, 90°. The DME indicates the aircraft is 26 nm from the TACAN beacon. (The heading memory marker has been deleted from the photos for simplicity).

The aircraft is approaching the desired track of 260°, and the pilot has cut the intercept angle to 45°

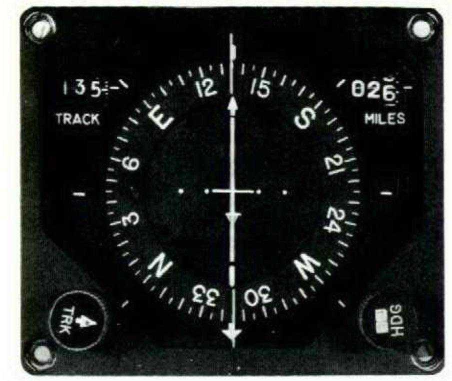


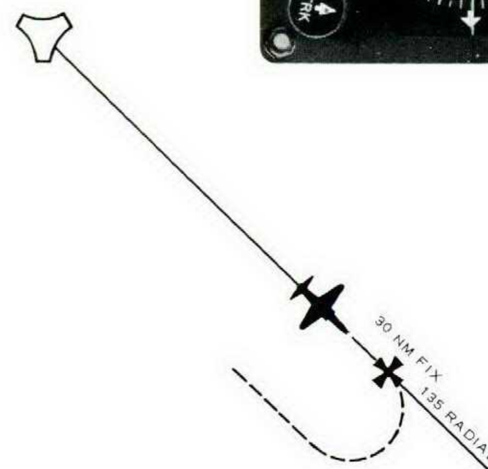
by turning left; the heading has now changed to 305° on the lubberline. The tail of the bearing pointer indicates the aircraft is on the 085° radial - 5° from desired track of 260°; the bar of the TDI also indicates this by a displacement to the right of one dot, or 5°. Note the TDI is still pointing at the desired track (260°), and pictorially shows the track at 45° to the aircraft symbol.

The aircraft is now inbound on the 080°radial. The heading is 260°; the magnetic bearing to the station is 260°; the TDI remains at 260°. The bar of the TDI indicates no displacement from track by being centered directly under the aircraft symbol.

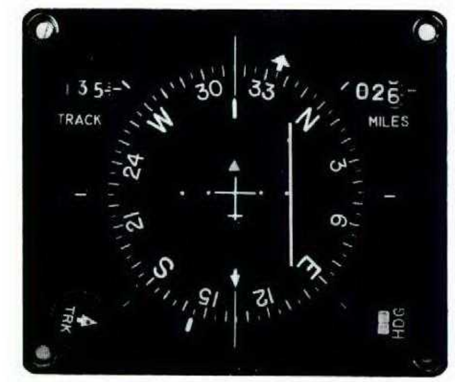
To Fly a TACAN Holding Pattern

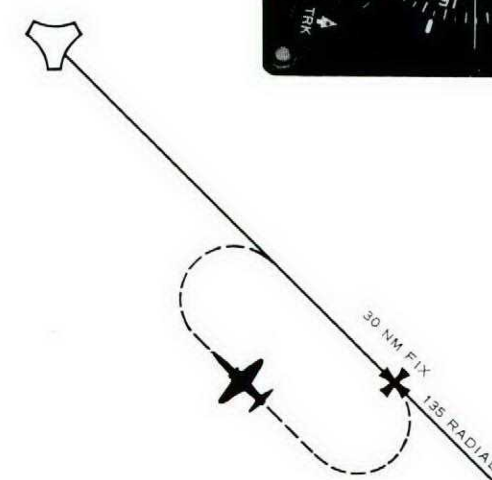
In this example the 10-mile long TACAN holding pattern uses right turns, and is to the NW of the holding fix at 30 nm on the 135° radial. The desired track is the 135° to the 30 nm holding fix. This is set into the window





with the track knob; as a result the TDI points to 135°. The bar of the TDI is centered indicating the aircraft is on track; in this instance, the pilot is holding a heading of 135° (under the lubberline) to maintain the desired track. The DME tells him he is 4 nm from the holding fix and the bearing pointer is indicating 315° magnetic, ie, the TACAN beacon is directly behind the aircraft.





The aircraft has reached the holding fix, turned through 180° to the right, and is in the holding pattern. The heading is now 315°; the TDI and To-From indicator show pictorially that the inbound track to the fix is on the right, and 180° to the aircraft heading. When the DME indicates 20 nm the turn inbound will commence.

It can be seen then, that the HSI accomplishes two major assists:

- **it eliminates the separate instrument required by the older TACAN equipment,**
- **displays pictorially the track in relation to the aircraft, eliminating mental calculations of intercept angles and aircraft heading.**

All you have to do is fly - the HSI will keep you in the picture.

•••

FLIGHT SAFETY FLASH

No ______

ALTHOUGH THE BOARD OF INQUIRY HAS NOT YET COMPLETED ITS INVESTIGATION, THERE'S ALMOST CONCLUSIVE PROOF THAT AN AIRCRAFT WAS FLOWN INTO THE GROUND BECAUSE THE APPROACH PROCEDURE WAS VIOLATED. THE BASE WEATHER WAS REPORTED AS 3000 SCATTERED, 6000 OVERCAST, VISIBILITY 1.8 MILES; HOWEVER, THE WEATHER IN THE LETDOWN AREA WAS ZERO ZERO IN HEAVY FOG. THE AIRCRAFT COMMENCED A DESCENT TO MINIMUMS APPROXIMATELY FOUR MILES *PRIOR* TO THE PUBLISHED DISTANCE. FOR UNKNOWN REASONS THE CAPTAIN PERMITTED THE SECOND PILOT TO CONTINUE DESCENDING UNTIL THE AIRCRAFT CONTACTED THE TREES. YOU ARE URGED TO STUDY THE LETDOWN PLATES PRIOR TO AN APPROACH TO ENSURE ALL POSSIBLE KNOWLEDGE OF THE PROCEDURES INVOLVED. THIS BULLETIN IS ISSUED NOT TO LAY BLAME BUT TO INFORM YOU OF AN ACTUAL EVENT AND ALERT YOU TO THE DANGEROUS CONSEQUENCES OF VIOLATING LETDOWN PROCEDURES.

Comments TO THE EDITOR

Dear Sir:

It was with interest that I read F/L Chamber's letter in the Jul-Aug 1965 Flight Comment regarding the susceptibility of an aircraft to jet wash. F/L Chamber's letter commented on a report in the Jan-Feb 1965 Flight Comment concerning an incident involving a temporary loss of control of a Tutor flying through the turbulence caused by another aircraft on the final approach.

In both these references, the basic assumption is made that an aircraft's susceptibility to jet wash is a function of the wing loading. This is not true. An aircraft's susceptibility to turbulence, gusts or jet wash is a function of the "slope" of the lift curve.

First it is necessary to understand what causes an aircraft to roll when flying through the slipstream of another aircraft. Turbulence or slipstream is simply "pockets" of air that have been given a vertical motion. An aircraft flying through these vertical gusts will temporarily have the direction of the relative airflow, and therefore the angle of attack and lift will be changed. If both wings fly through the same gusts, then the aircraft is simply subjected to a bump. If, however, only one wing enters the gust, then this wing will temporarily have its lift increased if the gust is upwards or decreased if the gust is downwards. This will cause the aircraft to roll.

Referring to Figure 1, aircraft "A" has a high lift, low speed wing section. Aircraft "B" has a high speed supersonic section. Both aircraft are assumed to have the

continued on page 24

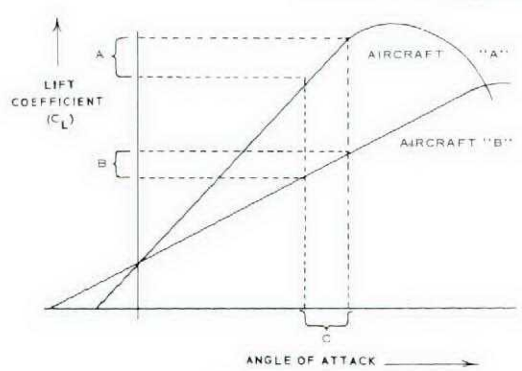
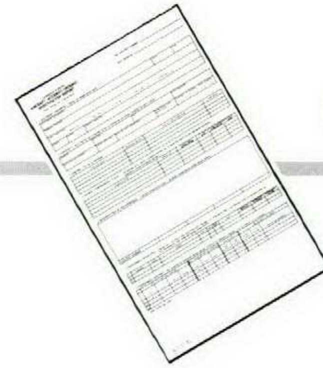


FIGURE 1

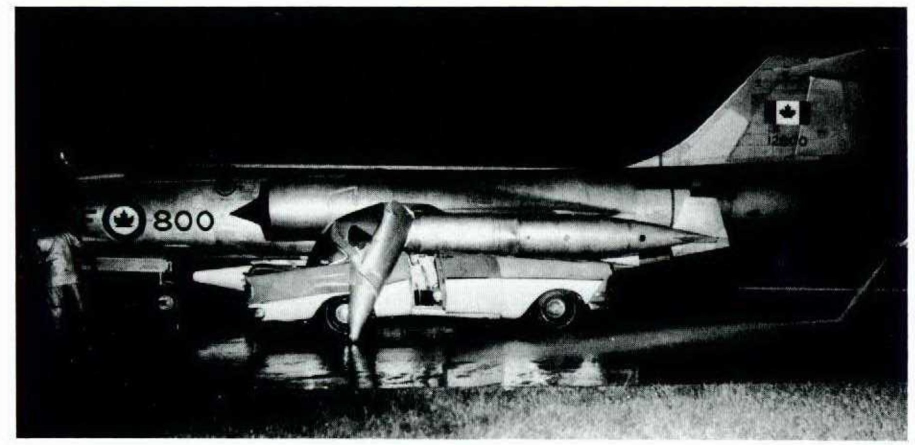


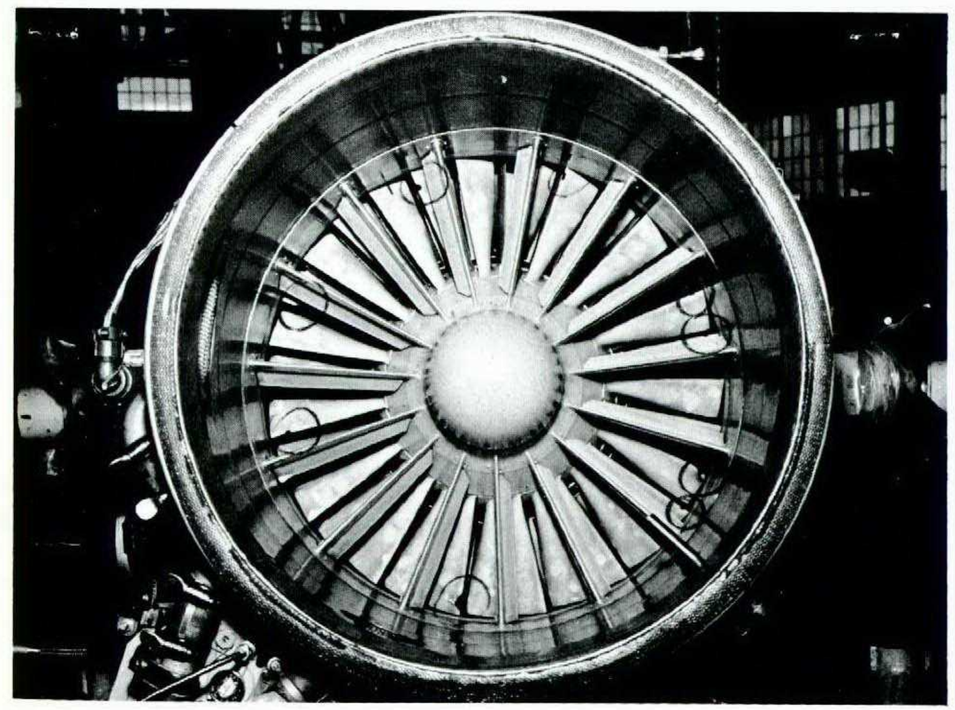
Gen from Two-Ten

CF104, 104 VS pmc The NCO in charge of the night shift had just come on duty and was proceeding to the button to ascertain the position of his aircraft. Contrary to regulations he elected to drive down the taxi strip near the centre-line of the pavement rather than use the painted portion at the side of the taxiway designated for vehicle traffic. Also, contrary to the usual procedure, a 104 was being towed at night unilluminated. The tow vehicle normally illuminates the aircraft with rear-mounted spotlights but this vehicle had not been so modified.

This NCO saw the approaching tow vehicle, passed close-by at about 30 mph – close enough, that is, to strike the invisible aircraft on the left pylon, the wing leading edge and the tip tank.

The Sergeant fortunately was not seriously injured. The photo shows how a combination of orders contravened plus inadequate equipment can be deadly.





TUTOR, FOD ON RUN-UP The technicians involved in the engine run-up are described by their supervisor as "competent men of the highest calibre", and yet an oversight in a run-up procedure resulted in a nut and spacer damaging an engine.

An extensive investigation at the station led to the unearthing of several other contributing factors. The list includes all the time-honoured ones, and there's quite a cluster of them. Under these circumstances this engine damage had been just waiting to happen:

- inadequate run-up area
- poor lighting
- extreme noise hazard
- intensive maintenance program (overtime)
- improper design of coupler
- lack of supervision.

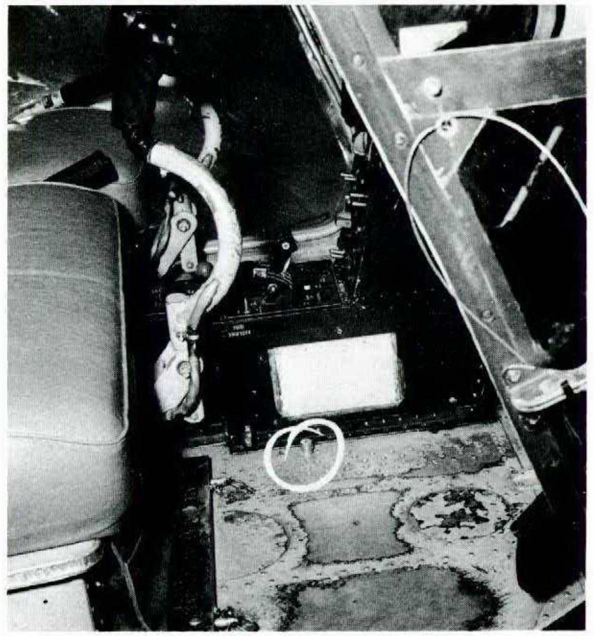
TUTOR, HOT START The pilot states "During the starting cycle, the engine rpm appeared to be increasing more slowly than usual. After building to 38%, it rolled back to 33% and the EGT rose to 850°C. I immediately stopcocked the engine. As the rpm ran down, some white smoke or vapour blew out from the engine inlets".

Further investigation showed that the pilot had not cleared the engine as outlined in orders following a previous attempt which had resulted in a hang-up. A defective starter was to blame.

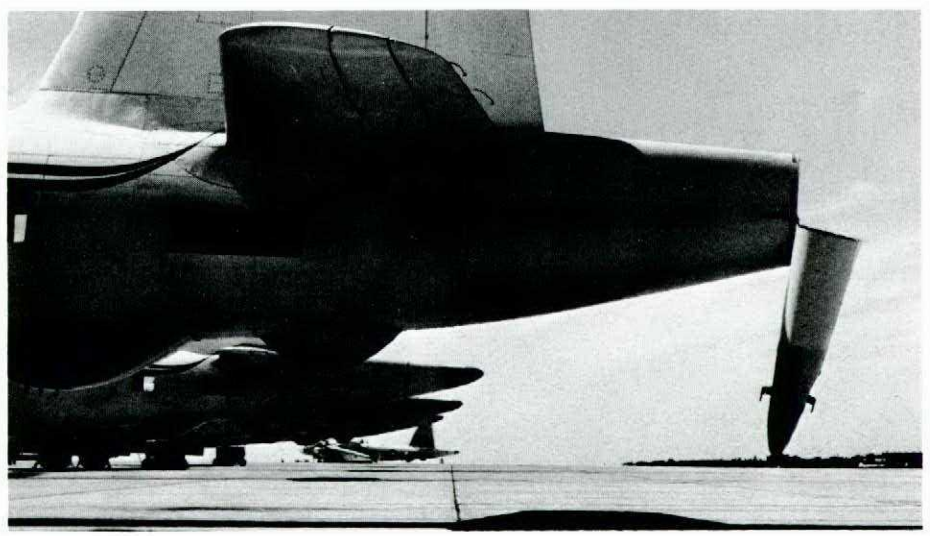
The pilot, however, had not referred to this previous start attempt in his statement. It can be embarrassing when someone else comes up with the complete story.

CH112, MID-AIR FUEL SHUT-OFF The passenger was on his first flight but had been associated with the aircraft for the previous nine months. The captain admitted later that he therefore, "....did not brief him as thoroughly as I should have". Once airborne, the passenger complained over the intercom of noise in his headset, and was told to step on the floor switch which was under the pilot's right leg. The pilot noticed the man reaching down towards this button but did not notice that he had pulled the fuel cut-off lever, mistaking it for the floor switch. Moments later the engine coughed and died. There was only one spot available for an autorotation landing; they were too low to attempt a re-start.

The helicopter wound up tail-first in a pond. The photograph shows the relative position of the two controls and why a re-positioning of the fuel shut-off lever is currently being pursued.



NEPTUNE, CLIPPED TAIL The engines had just been started when a jolt was felt and the ground crew signalled the pilot to cut the engines. An Argus which was taxiing behind a row of Neptunes struck the tail cone of one of them. Why? It had been parked twelve feet short of the designated spot and had been left there. The photo shows a Neptune way out-of-line but wagging its partially-severed posterior.



L19, GROUNDLOOP The student was on his first solo flight in the L19 and had completed one circuit. He rounded out at 70 miles an hour in a light port crosswind. The student hit one wheel first, bounced and settled in a three-point attitude. Fifty feet further on, the aircraft commenced turning to the left. "I applied right rudder in an attempt to keep the aircraft rolling straight. The rudder was ineffective so I applied power. . . I saw that the added power only aggravated the condition. . ."

And he was so right – the aircraft groundlooped through 300°. Applying power in a groundloop is only asking for trouble. A look back in Flight Comments of yesteryear makes this painfully clear.

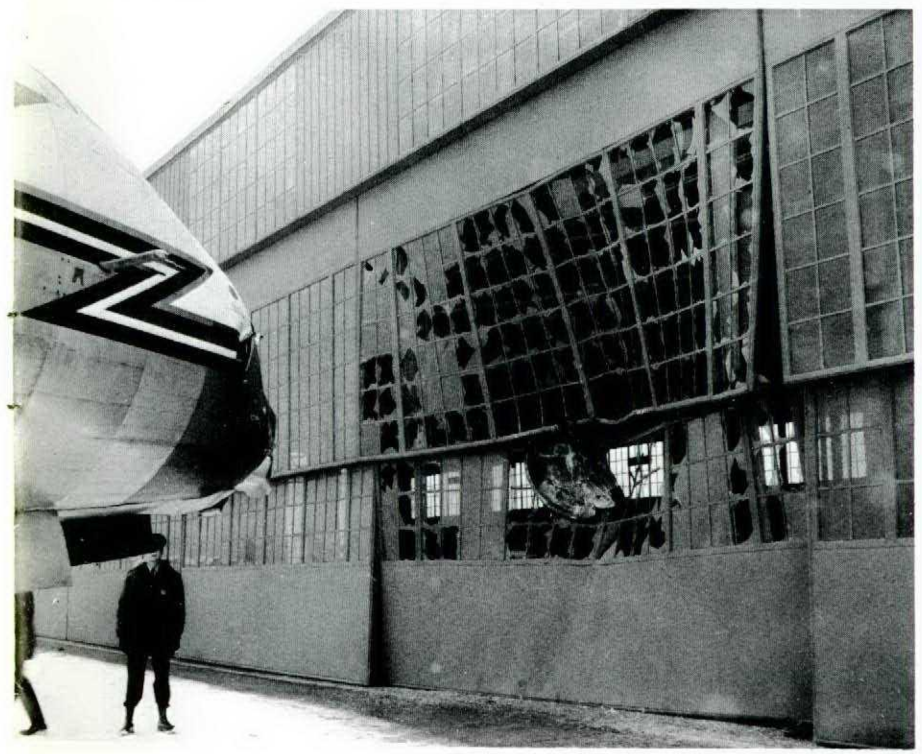
YUKON, TAXIED INTO HANGAR What had started a few minutes before as a routine run-up was now a nightmare – the four airmen inside the Yukon stood by helplessly as they watched their aircraft roll out of control, nose-first into a hangar door, smashing the glass panelling and carrying away a major section of the aircraft nose. The force was so severe that the aircraft "bounced" backward from the impact about five feet.

Earlier that evening the NCO in charge had appointed four men to carry out a run-up on number three engine following a propeller control unit change. He failed to delegate authority to any one man which resulted in no one informing him that the aircraft had no braking during the towing to position for the run-up. Despite this obvious inadequacy in the aircraft state, the run-up was continued. As the number one engine was started it registered full hydraulic pressure; the number three was then started. As the power lever on number three was advanced about half the travel the aircraft began to move forward pushing aside the double-wheel chocks in the process. These were later judged wholly inadequate to hold the aircraft even on the dry surface. The brakes were applied but the aircraft continued to move forward on the down-slope. Ruling out the use of reverse thrust and possibly injuring the ground man outside there was nothing to do but shut down the engines, turn off fuel and electrics, and brace themselves against the impact.

The investigation was hampered because no one had recorded the several details relating to hydraulic accumulator pressures and valve positions, so the exact cause of the brake failure could not be definitely established. All indications point to the loss of hydraulic pressure, which deprived the aircraft of wheel brakes and nosewheel steering, caused by the manual hydraulic shutoff valve (which dumps the main system pressure into the reservoir) being left in the unload position.

This accident would never have occurred had the starting crew followed orders by ensuring adequate hydraulic pressure for braking purposes was available prior to towing the aircraft out in the first place. An attempt to build up hydraulic pressure with the hand pump had failed yet the crew continued with the towing out and run-up.

Needless to say, this expensive accident has sparked tighter controls on run-up procedures and an improved training program for crews running-up engines.



Comments

To the editor

same weight and wing area and therefore the same wing loading. Both aircraft now fly at the same IAS through a gust which changes the angle of attack by an amount equal to the distance "c". On aircraft "A", the change in C_L is represented by the distance "a". Similarly, on aircraft "B", the change in C_L is represented by the distance "b". It is obvious that "a" is greater than "b". Therefore aircraft "A" will be subjected to a greater change in lift and therefore feel a larger bump or suffer a greater rolling moment than aircraft "B".

It can now be seen that the reason the Tutor is susceptible to turbulence on the final approach is because it possesses a low speed wing section.

S/L R Feakes RAF
CFS RCAF

The effect produced by the gust is proportional to:

- *aircraft speed*
- *spanwise distribution of the gust*
- *lift curve slope,*

and inversely proportional to the inertia wing loading – this being the most significant.

The lift curve slope in your letter is true for the overall wing performance – attributable, of course to the low aspect ratio normally found on high-speed aircraft, but precise analysis requires the wing section to be employed in computations. The lift curve slope, in the unstalled region, is nearly the same for all airfoil sections. Below is a comparison of a thick and a thin section with transition at the leading edge and a Reynolds Number of 107 (Reference – Royal Aeronautical Society Data Sheet Wings 01.01.05).

t/c	*.20*	*0*
Trailing edge angle	*20°*	*0°*
dC_L/da, per degree	*.103*	*.104*

Dear Sir:

While reading "Comments" regarding VASIS and safety aids for pilots (Sep-Oct) it brought to mind a question which never to my satisfaction has been answered fully, perhaps you can have it clarified for me.

During the repair of USAF F84 jets at N.W.I. in Edmonton I was employed as a material expeditor. Part of my job was to identify parts that had been "called up" by the inspection teams, for replacement. It happened one day that the team called for the replacement of the "yaw cord". I knew what a yaw cord was, but what is its purpose on a jet aircraft?

On the F84 the cord is attached to the gun deck door approximately one foot back from the airscoop, directly in line with the canopy. It is made from 3/16" to 1/4" nylon cord about 3 ft long. Since the F84 is a fairly modern jet and is equipped with a varied assortment of radio and instrument aids for landings and navigation, the yaw cord on this aircraft seemed as out of place as a kimona at a bikini beach party.

My question, of course.... Why an item like a yaw cord on a modern jet fighter? Great aid on a Tiger Moth....but an F84!

I hope your quandry does not parallel mine.

John G. Kirkman
Edmonton, Alta

The venerable yaw cord of yesteryear has defied improvement and resisted the best efforts of the engineers to produce something more elaborate to replace it. The yaw cord is an economical and accurate indicator that the aircraft flies true in the yawing plane, or, whether the aircraft fore-aft axis and airflow are aligned. The RCAF's T33s (which are generally in the F84's speed range) have yaw cords. Of course, adjusting the yaw, ie, the rudder trim, requires a man out back with a pair of pliers as the T33 rudder trim tab is a metal U-bend-um variety.

Dear Sir:

I have been trying, without much success, to stimulate a bit of controversy with the statement "I think we should used QFE rather than QNH". What do you think? What do your readers think? I have my arguments ready in favour of QFE and would like to know what the arguments are against it.

F/L EV Mold
3 Wing, Zweibrucken

Before we proceed let's recall that QFE means setting the sub-scale so that the airport of departure or arrival reads zero altitude. Its obvious advantage is the freedom from the interminable interpolation of the QNH - but:

The limits of the altimeter sub-scale preclude the use of QFE at high-altitude airports and for terrain or obstacle clearance en route. Providing adequate meteorological services are available, (primarily to provide pressure readings at intervals of say, not more than 100 miles) it is generally agreed that QNH has these advantages:

- *provides reasonable en route vertical separation,*
- *provides good terrain and obstacle clearance at all altitudes,*
- *provides good vertical separation near airports – vital in areas that have two or more airports*
- *with different elevations,*
- *can be used for takeoff without the transition to en route procedures,*
- *eliminates, prior to landing, the transition from en route setting thereby reducing the risk of error by the pilot while making large adjustments to his altimeter.*

The QNH, we therefore contend, has two prime virtues: Simplicity and Logicality.

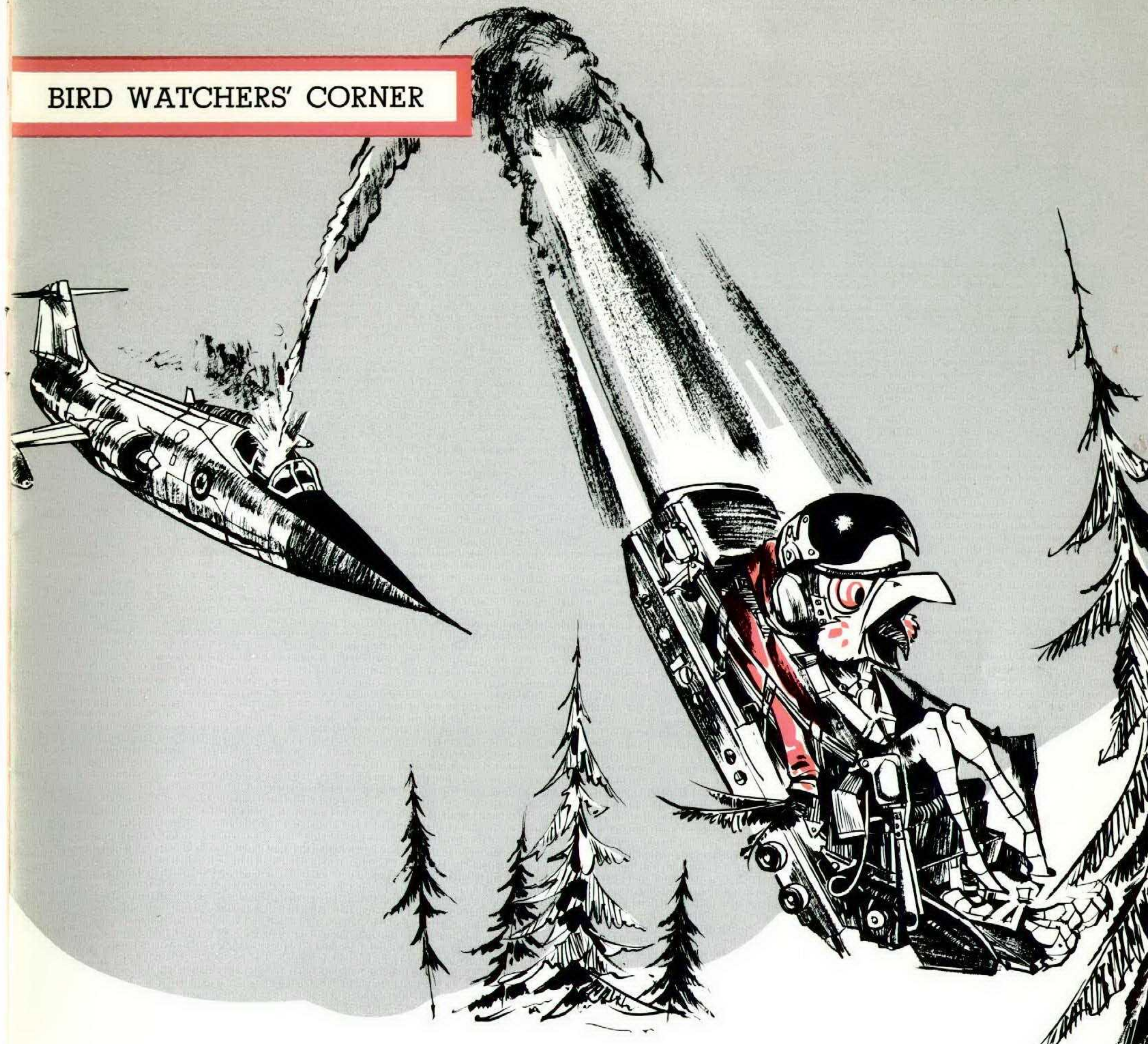
Dear Sir:

The "Flash-Back" photos are very interesting and amusing in Flight Comment. However, I for one, would be even more appreciative of them if you could slip in a paragraph giving at least, the type of aircraft, when and where picture was taken, and a word or two about "wha' hoppen"...

LAC B Burke
1137 TSD

Our "Flash-Back" photos are from the Air Historian's files. In those days crashes didn't get the photo coverage they do now, so most of these were personal photos which were sent in many years later. We consequently don't have this information which, we agree, would increase their interest.

BIRD WATCHERS' CORNER

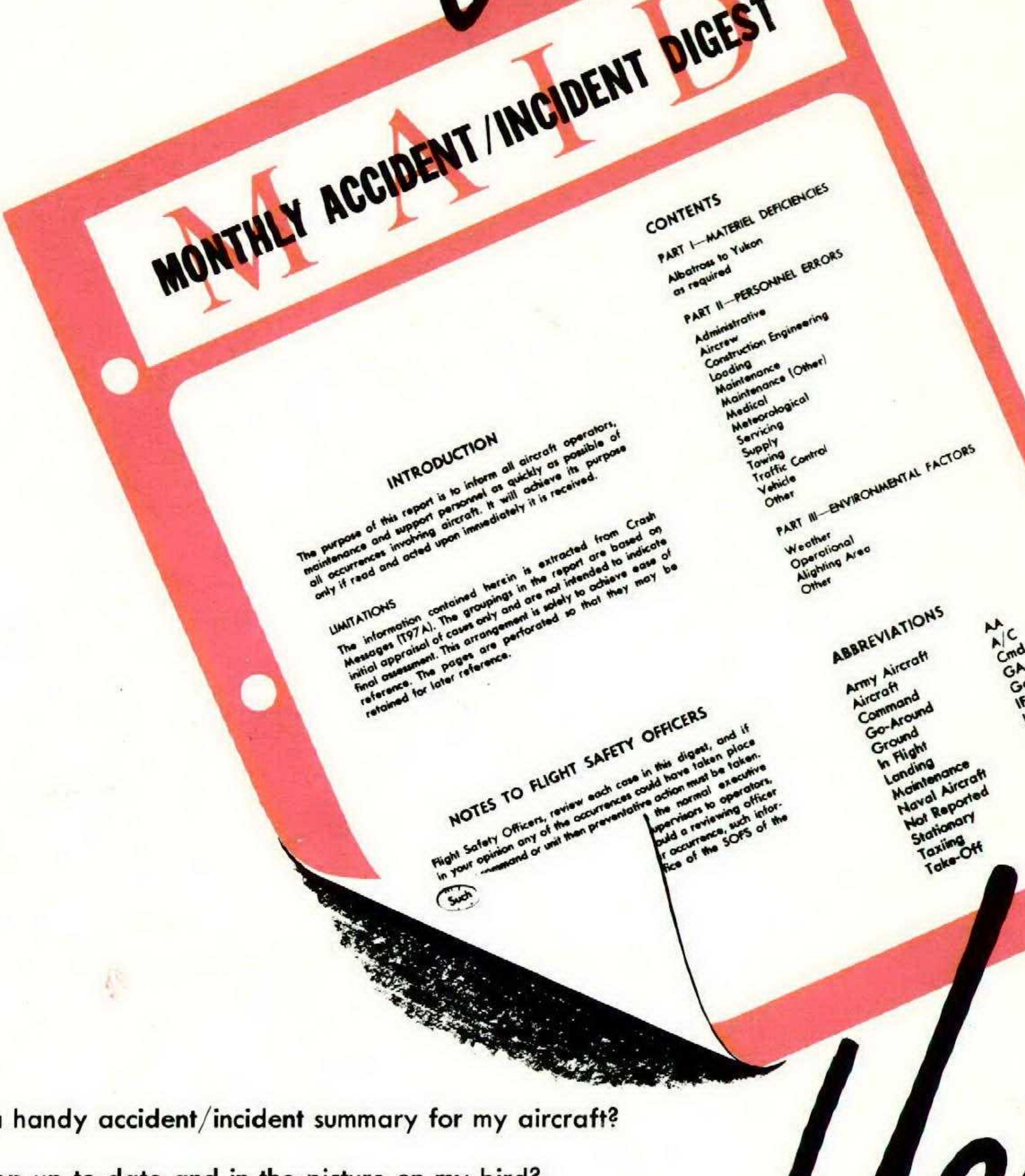


PROCRASTINATING PLUMMET

Plummet's progenitors got by with a climb out on the wing and a quick pull of the ring. Times change but not Plummets, however—"sink rate", a Plummet would tell you, is something out of a plumber's price list. Before ejecting, his cockpit loitering reflects a blissful indifference toward a century-bird's deceptive rate of descent. The image of the "Zero Seat" fixed in his mind, Plummet unwisely tarries, and swoops too close to the deck. At this point, a victim of the hidden hazards in the geometry involved, he emits his characteristic cry:

TOOLATETOOLATE *NEXT*TIMEI'LLNOTWAIT

answering service



Yes!

Is there a handy accident/incident summary for my aircraft?

Can I keep up-to-date and in-the-picture on my bird?

Can I know if other commands are having similar problems?

Is there a document having MATERIEL, PERSONNEL and ENVIRONMENT separated for easy reference?

Is a MAID available to me?

ASK YOUR FSO