FLIGHT COMMENT

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FLIGHT COMMENT

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ROGER DUHAMEL, F.R.S.C.
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FLIGHT SAFETY

W/C JT MULLEN
ACCIDENT INVESTIGATION

Articles

Features

CANADIAN FORCES HEADQUARTERS
DIRECTORATE OF FLIGHT SAFETY

Comments
TO THE EDITOR

Dear Sir:

I was very interested in the article on PIREPS in your November issue. My personal opinion is that Mr McIssac has failed to put his finger on the problem.

Many pilots do not make weather reports because they do not wish to clutter up obviously busy ATC R/T channels by passing information which the forecaster can be reasonably assumed to already have. The reason the forecaster doesn't have it is difficult to understand, when the phone at his elbow is available for a call to Terminal Control asking for the next departure to report specific information to confirm his forecast.

Some pilots must have encountered the situation where they have arrived for a weather briefing at a busy terminal (from which there have been departures all morning at least every 15 minutes), received a briefing, ". . . Strato-Cu tops at 6000 overhead", filed 8000, and on climb-out still been in cloud at 8000. Whose fault is this? Should the dozen or so pilots who had departed that morning have each made a lengthy pirep or should one or two have been asked to report specifically on the SC tops?

Some years ago pilots were required to pass their flight conditions with each position report. This was dispensed with, presumably because it was thought unnecessary and cut down on the length of R/T messages. I have often asked at a forecast office for information on in-flight conditions between that terminal and the next airways reporting point. The reply is, "sorry no pireps"; yet a check on previous traffic shows that the route had been well travelled. How simple for the forecaster to ask Terminal Control (or any other available agency) to have the aircraft report back his enroute weather at the next reporting point for relaying by teletype or landline to the forecast office.

With the wealth of communication systems available the onus for requesting pireps should be on the forecaster. Only he knows what information he needs in order to provide an accurate weather picture.

WM Monkman
102 KU Trenton

Comments

In the spirit of experiment we are allocating this space for comments which for one reason or another don't fit into the magazine format. We look forward also to speaking directly to you from the flight safety shop—the comments we make here are an invitation for your contributions, also. Just slip your pointed prose into an envelope addressed to "Editor, Flight Comment, CFHQ/DFS".

■T33 fuel starvation caused the loss of two aircrew and two aircraft last year alone. In view of this disturbing statistic, maybe it's time we all took a look at the T33 fuel system. Both crashes cannot be blamed positively on the system but malfunctions are occurring and the warning system is failing to warn the pilot in time to prevent flameout. While a major rebuild is probably unlikely this late in life for the T-Bird, thought is being given to moving the fuselage vent pipe, moving the low fuel warning light and making it operate independently of the fuselage quantity gauge. In the meantime the article on page 18 is worthwhile reading for all T-Bird drivers and maintainers.

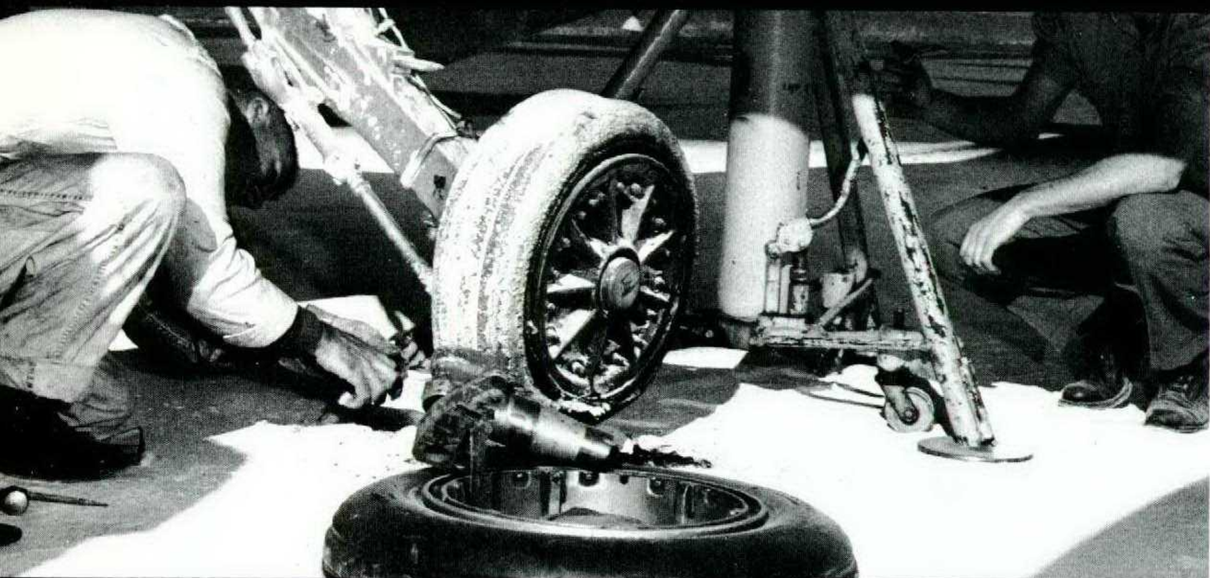
■Some aircrew types are still crying the blues over the orange flying suit claiming that the wheel-house is out of touch with field requirements. "Don't Colour Me Orange" is an expert's analysis of the situation. We are glad to do an article of this type in answer to beefs, complaints, queries, etc., from the users—drop us a line and we'll see what we can do to clear the fog.

■We cannot honestly think of anything further to say on the care required of forklift truck drivers. So we put together an album of goofs to suggest that you may not be having accidents but others are. The pictures on pages 12 and 13 are from a $2\frac{1}{2}$ year crop.

■By now, our new MAID (Monthly Accident Incident Digest) is in the field. This digest is our attempt to satisfy your requirements for rapid dissemination of accident information throughout the armed forces. MAIDs are sent to flight safety personnel and it's our hope that they get good circulation around your station. If your work requires the latest accident information call your FSO and he'll send around a MAID. We think it might be a good idea to have this handy digest in a place where the people can get—the latest accident information.

■Two issues ago we ran a succinct little summary in our "from AIB Files" section about the spectacular goings-on out of Bagotville last July; this issue's AIB section contains the final word on the Orenda. Admittedly, it's been some time but we point out, that with many of our stories and articles the delay is unavoidable since time-consuming investigations must be completed before the case can be released. Such was the case in the bailout of F/L Connelly and F/O Lillie; a file some two inches thick takes time to grow! We're pleased to have F/L Connelly's story for inclusion in Flight Comment.

■CEPE has released preliminary findings on the Tutor rocket seat ejection trials at Cold Lake and Holloman AFB, New Mexico. The trials also included tests on the CPI/ADR (Crash Position Indicator/Accident Data Recorder). When the complete story is released it will be in Flight Comment. A monkey who rode in the Tutor cockpit assembly on the rocket sled at Holloman seems to have come through very well! Which proves . . . anyhow, the full story will be out in an issue or two.



BRAKING: A HEATED DISCUSSION

Recently, a CF104 pilot aborting a takeoff, decided that there was sufficient runway remaining to stop without deploying the dragchute. He probably reasoned: there's 9000 feet of dry runway ahead of me and the AOIs indicate that I can stop in half that distance. Why bother with the dragchute and put the groundcrew to all the extra work of picking it up, repacking it and installing another in the aircraft? The photos on the opposite page give the grim answer.

Did this pilot consider all the factors in making such a decision? Obviously not—the aircraft suffered "D" category damage.

The pilot had no difficulty stopping, or, for that matter, starting back to the ramp, but obviously there is more to braking than this pilot knew at the time. So loosen that grip on the latest Playboy and give a close look to some other figures, although not as pleasant to contemplate, may prove hotter than you think. Before deciding why our jockey found it necessary to dismount the noble steed with embarrassing haste while getting it back to the barn, a few facts might be recognized to make the discussion understandable.

First, let's agree that energy cannot be destroyed; it is only convertible to some other form. Thus, in stopping an aircraft the kinetic energy of aircraft motion plus the energy from the idle thrust of the engine, is converted to heat energy by the wheel brakes. To simplify calculations we will ignore the low aerodynamic drag of the CF104, the heat created by rolling friction and tire flexing (which can be considerable), and the runway profile (in this case, practically level). So much for the theory, not the facts:

CF104	170 kts
Aircraft weight	21,000 lbs
Runway remaining	9000 ft
Engine thrust (idle)	400 lbs

Now, using the formulas: $KE=\frac{1}{2}MV^2$ and $W=F\times D$ to find the aircraft's energy plus the energy due to engine idle thrust, we compute the total kinetic energy the brakes converted to heat energy as 30,800,000 ft lbs. Dividing this figure by 778 converts the foot pounds into heat energy units—British Thermal Units—or 39,500 BTUs.

What does this mean to the fellow who doesn't carry a slide rule as a status symbol? In the colourful prose of Don Stuck, experimental test pilot for McDonnell Aircraft, it's equivalent to the energy required to lift a five-ton elephant more than 3000 ft in the air, or enough heat to melt 146 lbs of steel!

To equate these images with something more practical, let's compare it to the BTU limitations of the brakes. The brake designer's biggest headache is the effect of heat on components; the components weaken with heat—something is going to give if things get too hot. The Bendix brake used on the 104 has a normal use capability of 50 stops at 7700 BTU and an emergency one-stop capability of 12,800 BTU. During the stop we described, the brakes generated one and a half times more heat than they are built to withstand during an emergency stop. It is important to realize, also, that the heat generated by brakes is dissipated largely by air flowing past the wheels, brakes, and tires, while the aircraft is moving.

At this point you may be inclined to say, "So, the pilot goofed—it won't happen to me". But before returning to the petite heat of Playboy let's have a look at another recent incident.

A CF101 crew were detailed to take part in a National Research Council noise level study. The exercise required them to line up at the end of the 10,000 ft runway, cut in the afterburners and immediately abort the takeoff roll. Four of these runs were made; each time the pilot employed maximum aerodynamic braking—quite effective on the 101. The aircraft rolled the full length of the runway on each run, then returned to the starting point. The brakes were used only on the first run and then very sparingly. On subsequent runs no brakes were used and only nosewheel steering was used for turning. As the aircraft cleared the runway at the end of the fourth run the brakes seized and were so hot they welded the wheels to the forks of the undercarriage!

Sure enough, the AOIs place a restriction on how far the aircraft can be moved without allowing a cooling period because of insufficient dissipation of the heat created by disc brakes, rolling friction and tire flexing. The restriction is there but it doesn't exactly jump out off the page at you. (In the meantime you may rest assured that a closer look will be taken at the information given in the CF104 and 101 AOIs.)

For those who are still skeptical that the problem of heat in the wheels of high-performance aircraft is worthy of consideration here is an even more startling case.

A civilian airliner's takeoff was delayed due to fog. The captain decided to lend Nature an assist by using the jet exhaust to heat things up a bit. A takeoff roll was commenced and aborted; the aircraft was returned to the takeoff position, by which time the fog had dutifully lifted. The aircraft got safely airborne only to crash a few minutes later killing all 80 persons on board. The investigation revealed that shortly after takeoff an overheated wheel exploded in a wheel well rupturing a hydraulic line and causing the aircraft to catch fire.

Got the message? We don't expect pilots to work out snap calculations of KE and BTUs every time they apply the brakes, but to avoid the stench of molten metal, smouldering rubber, and the slow burn of the supervisor, you should utilize, at all times, such decelerating devices as the dragchute, aerodynamic braking and reverseable thrust. These are your primary braking devices. When you do resort to wheel braking don't assume since you had no trouble stopping that you've got it made—maximum heat in the wheels is not reached until 25 to 30 minutes after the stop.

S/L GC Letcher

FROM AIB FILES

CF101
Dragchute Malfunctions

During the past summer we had a rash of dragchutes failing to deploy. Some failures were thought to be associated with FOD jamming the dragchute doors, some were caused by snagging and others were caused by the dragchute handle not being pulled to full extension. A clean-up program was instituted but further investigation indicated that most failures were a result of improper chute installation in the aircraft, namely a cocked "D" ring on chute risers.

An AMC message pointed out that if residual forces (tension) remain on the risers after dragchute installation the "D" ring can become repositioned or cocked during taxi or flight vibration causing chute deployment failure.

There hasn't been a failure reported since. A "Good Show" to you Maintainers and Installers of dragchutes.

Undercarriage Selector Level Modification

The landing gear control panel is being modified to preclude inadvertent landing gear actuations that have occurred in the USAF and the RCAF. The panel will have a new cam assembly on the undercarriage lever giving the pilot the protection of an overcentre device. The lever will probably feel the same when using it but the handle will either be full UP or DOWN; it won't be able to float in neutral as in the past. There is another advantage to this. You won't be able to obtain green lights unless the lever is fully down and locked.

The break-out forces on the lever are still the same, ie, 35 lbs ± 5 to raise the lever when the aircraft is on the ground and 10 lbs ± 2 to lower it when airborne.

After the incorporation of the modification it will still be good airmanship to do a shake-test before landing and to use the dragchute handle with care since your hand can come in contact with the undercarriage lever while stowing the handle.

CF100 and Sabre
Beware of Thunderstorms

As you read this the thunderstorm period is only weeks away and the old and serious problem of Orenda 11 and 10 engines grinding to a halt as a result of water ingestion is still with us.

Modification to prevent engine disintegration cannot be justified because of the relatively short life remaining for the aircraft. The proposed modification—the hardening of the compressor spacer rings—has not been thoroughly tested; the considerable lead time and extensive engineering necessary to produce the modification a major engine re-build makes the project untenable.

Under these circumstances, it is imperative that Orenda engine drivers understand the problem because arbitrary restrictions aren't going to prevent another serious accident. First, ordinary heavy precipitation will do you no harm. The amount of rain normally encountered while flying below cloud or in layer or heap type cloud has not been heavy enough to cause an engine failure—it is only after flying through or near, a mature thunderstorm that engine failures have occurred. This is not difficult to understand when one thinks of the unusual things that occur inside a thunderstorm, eg, water at altitudes well below freezing, great hailstones in perfectly clear air as far as five miles from the storm. No one, to our knowledge, has measured the intensity of precipitation in a CB but the amount must be enormous to cause 1/16 inch shrinkage to an engine compressor casing. The feat could not be duplicated on the ground using a fire hose under full pressure.

What have we learned from the loss of two Sabres and one CF100 and 24 engine failures as a result of thunderstorms? Well, we know that radar control is not a panacea, it has limitations and cannot give an accurate evaluation of the storm area. We know too that what you see with the naked eye is deceiving. One cell will be extremely black with only moderate turbulence, light precip and no lightning. The next one may not look bad at all but as soon as you penetrate it you wonder "wot happened"! At night attempting to tip-toe around cells is a dead loss, too.

This all means that with the characteristics of the Orenda engine, avoidance of thunderstorms is a matter of straightforward survival.

CF104
Emergency Nozzle Closure System Modification

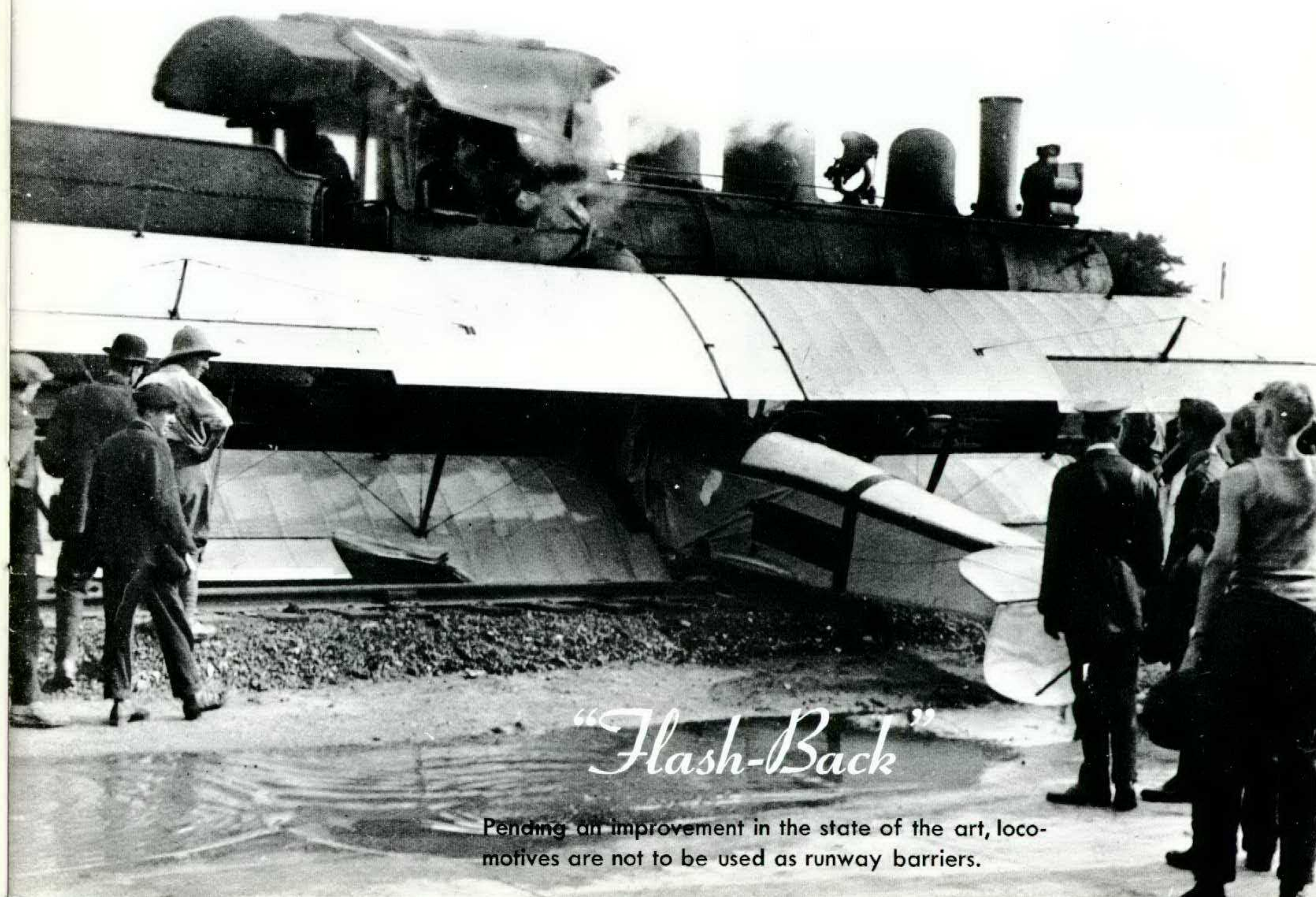
No change has taken place since our last report. Production of mod kits is proceeding on schedule and the hardware will have arrived in the field by 1 Jan. However, it is interesting to note that in the case of a recent nozzle failure the nozzle was successfully closed by use of current procedures and the present ENCS; which goes to prove that the original design would work, providing oil depletion was fast enough to avoid the complication of aerated oil.

Flap Selector Switch

This particular component has been a constant source of trouble although not generally known among aircrew. Originally an un-lifed item, Lockheed now has suggested that it be lifed at 250 hours until re-worked switches can be provided. Since very few spare switches were manufactured, replacement was to take place on a one-for-one basis. However, RCAF experience indicates that the switch is apt to fail at any time and that some types of failures definitely constitute a flight safety hazard. Procuring re-worked switches has therefore, been hastened and the whole fleet should be equipped with modified switches soon. In the meantime, if something odd happens when you make a flap selection, even though the fault can't be duplicated, write it up fully in the L14. For the technicians, intermittent flap failure will, in all probability, be attributable to a faulty "unmodded" switch. Steer clear of "ground checked and found serviceable"—replace the switch.

Lap Belt Re-reversal

It looks like our first report on this item was a bit optimistic. Battle lines are still being drawn and the pros and cons of the mod are still obscured in the fog of battle. However, if nothing else, the controversy has served to highlight the need for a better safety harness. On this point everyone is in agreement. As a result the Directorate of Aircraft Engineering is going full steam ahead (you can see that integration is having its effect) to procure a new lap belt that should dispose of the problem once and for all. In fact, by the time you read this, twelve of the lap belts (hand made, yet) should be in the field undergoing user trials.



"Flash-Back"

Pending an improvement in the state of the art, locomotives are not to be used as runway barriers.

GOOD SHOW

F/L HUDDLESTON

The CF104 was returning from a low-level training flight and was touching down for a full-stop landing. After a slight skip the aircraft settled with the right wing low. The starboard wheel had become detached separating immediately after touchdown. F/L D Huddleston maintained directional control by opposite braking and nosewheel steering; when directional control no longer could be maintained he pulled the dragchute to provide maximum braking. At about 20 to 30 kts the aircraft ran off the runway yawing violently and coming to a stop about 90° to the runway heading.

Considering the experience level of F/L Huddleston and the rapidity with which things happen in the landing phase, F/L Huddleston earns a "Good Show" for commendable on-the-ball aircraft handling.

SGT W CHESTNEY

Sgt W Chestney of 4 Wing RATCON is to be commended for his cool and competent handling of F/L Stacey's emergency appearing in this issue's Good Show column. Considerable reliance was placed on Sgt Chestney's controlling due to the reduced visibility of 1½ miles in haze. With this type of emergency in which time was the essence of success, delay or misjudgement could have forced F/L Stacey to bail out thereby losing a valuable CF104. A "Good Show" of controlling, Sgt Chestney.

SGT KL DAVIS

Sgt KL Davis AF Tech, 4 Wing, was on duty as NCO i/c snag crew, when a fire ignited in the region of the port brake of a CF104. A pilot had been authorized to do a landing without deploying a dragchute and because of an unserviceability, had parked the aircraft in front of the snags hangar. The crew chief, not realizing the brakes would be hot, signalled the pilot to cut his engine. The fuel vent ahead of the ventral fin dumped excess fuel; a strong crosswind carried the fuel to the port brake where it immediately ignited.

Sgt Davis dashed out of the hangar, advising the pilot of the danger and calling to the airmen to get the fire extinguishers and notify the fire hall. Without regard for his own safety and before any fire extinguisher could be brought to the fire, the NCO rushed under the aircraft and beat out the flames with his bare hands.

Flight Comment commends Sgt Davis for this "Good Show". His courage, initiative and positive action, without regard for his own safety prevented what could have been a very serious and costly loss to the RCAF.

F/L JN STACEY

F/L JN Stacey had been airborne for about an hour when he noticed a reduction in thrust and fuel flow followed by an oil low-level warning light. The nozzles had opened to position six and by employing the ENCS they closed to position two. F/L Stacey climbed to 11,000 feet jettisoning external tanks. During the climb, oil pressure dropped rapidly; a RATCON descent to base and a precautionary landing were carried out using takeoff flaps, without further incident.

An oil pump had failed, releasing oil into the engine area; the oil tank on shutdown was empty.

F/L Stacey is to be commended for his coolness throughout the emergency. He demonstrated a high order of professional skill in landing his comparatively heavily-laden aircraft under the strain of an imminent engine seizure resulting from oil starvation. The poor visibility (1½ miles in haze) made the emergency approach and landing more difficult. F/L Stacey earns a Good Show for handling an emergency in which hesitation or indecision could have easily resulted in the loss of an aircraft.

F/L GJ KEEPER and F/O C GOOSSEN

F/L GJ Keeper and F/O C Goossen were piloting their C119 at full takeoff power when just at liftoff speed a fire warning light on the main instrument panel and on the overhead panel caused them to elect to abort immediately. A clamp which secures the exhaust expansion sleeve to the #10 cylinder had failed, permitting exhaust gas pressure at takeoff power to force the exhaust assembly out of #11 cylinder and out of #2 PRT.

No further damage occurred to the aircraft and we are pleased to recognize F/L Keeper and F/O Goossen for a "Good Show".

CPL J SAWATSKY and LAC RC CHISLETT

Cpl J Sawatsky and LAC RC Chislett, of Station Portage la Prairie, were installing an overhauled engine in an Expeditor when they discovered an unusual case of FOD. They noticed a slight binding as the shaft of the engine was turned, and on further investigation discovered a nut inside the number 8 cylinder. The nut was jammed between the piston head and exhaust valve. The cylinder was found to have been damaged during a four-hour run-up at a civilian overhaul base. Had Cpl Sawatsky and LAC Chislett not discovered the fault the engine undoubtedly would have failed later possibly in flight with serious results.

A "Good Show" to both of these technicians in recognition of their alertness and technical competence.

LAC L CAIRNEY

LAC L Cairney, AE Tech at 4 Wing, noticed a CF104 take off with its tail hook hanging. Knowing this to be incorrect, and appreciating the possible serious consequences if the pilot was not aware of the condition, he immediately reported his observation to Wing Operations. An airborne check confirmed that the tail hook was down in the detent position. The pilot was advised and thus was able to land without incident ensuring that his touchdown was past the approach end barrier.

In this particular case, the hook had not fallen to the engage position and a normal landing could have been made. If however, the hook had been in the engage position without the pilot's knowledge, a serious mishap might have resulted from an approach-end engagement during landing.

A "Good Show" to LAC Cairney for his alert observance of this malfunction and his prompt action in reporting it.

F/L JN STACEY

F/L HUDDLESTON

SGT W CHESTNEY

F/L GJ KEEPER and F/O C GOOSSEN

SGT KL DAVIS

LAC L CAIRNEY

CPL J SAWATSKY and LAC RC CHISLETT

GOOD SHOW

Cpl M Shamachuk, Flt Tech — F/L DA Cove, Navigator — F/L AD Herbert, 1st Pilot — S/L P Bissky, Captain — F/L LG Turenne, Radio Officer — F/O RJB Vermette, 2nd Radio Officer — LAC JH Glenn, Trans Tech (not shown in photo)

S/L P BISSKY

"We were at 6000 feet, IFR in cloud, enroute Downsview to Winnipeg. There was a little turbulence and light rain and because of the turbulence I was having some difficulty keeping the props in synchronization. Our position was 60 miles east of Winnipeg.

I had just taken my hand from the starboard pitch control after correcting for a small increase; when the rpm jumped to over 2600. I ordered the co-pilot, F/L AD Herbert, to feather but it was to no avail, the rpm rapidly increased to over 3500.

The noise was terrific and I worried that the engine was about to part company with us. I applied METO power to the good engine, declared an emergency to Winnipeg Centre, and ordered emergency procedures for the rest of the crew. The C119 would not maintain height. I tried reducing speed to 115 knots hoping this would reduce the rpm of the run-away prop but it had no effect. We were still losing about 1000 feet per minute. At this speed, I nearly ran out of rudder control and thinking about it now, it could be highly dangerous to reduce speed under these circumstances. Despite AOI instructions to the contrary, I activated the starboard fuel oil shut-off switch, as a last resort. It took about two minutes for the engine to seize, and as it did the reduction gears must have sheared. The drag was considerably reduced and although the prop continued to windmill it was at considerably less rpm. Our rate of descent decreased to about 200 feet per minute and by increasing from METO to the absolute maximum power I thought we might make Winnipeg. Centre gave our position as 33 miles east and reported their weather as 500 feet overcast, visibility $1\frac{1}{2}$ miles. Full power (about 64 inches MAP) however, was no use; we still could not maintain altitude.

Finally we broke cloud and fortunately we had just passed a fair-sized field, the only suitable one for miles around. Winnipeg was advised that we were going to land at our present position. I then turned downwind for a short low-level circuit and made a wheels and flaps down landing. We came to a stop smoothly with no injuries or further damage."

Investigation revealed that the cause of the accident was the improper installation of the regulator filter plug by the contractor. However, RCAF groundcrew should have inspected this plug during engine installation. Had they done so, this "hairy" episode would never have happened. That it had a happy ending must be due in a large part to the skill and professional ability of S/L P Bissky. Flight Comment recognizes him as a most worthy recipient of a "Good Show". Following is the text of his official Pilot's Log Book Commendatory Endorsement:

"S/L Paul Bissky was Captain of a C119 for a flight, under IFR conditions, from Downsview to Winnipeg on 9 Sep 64. Approximately 60 miles east of Winnipeg the starboard propeller overspeeded, went out of control, and could not be feathered: a forced landing had to be made in an oat stubble field near Vivian, Manitoba.

"Because of the gallantry, leadership, and professionalism with which S/L Bissky handled this emergency there was no loss of life, no injury to passengers or crew, and no damage to the aircraft beyond that which caused the incident. The expertness with which the emergency was handled under far from ideal circumstances is clearly evident from the fact that after repairs to the engine were effected S/L Bissky flew the aircraft back to his base, where it was returned to service."

SOMEWHERE OVER THE RAINBOW

For many of us, the introduction of a piece of improved aircrew equipment—flying suits, knee pads, knives, gloves—seems as remote as the pot of gold at rainbow's end. The "why" of the remoteness is discussed in this fictional interview. (It is an attempt to answer some of your questions but cannot for obvious reasons be regarded as necessarily reflecting official policy.)

HOW DO I PASS ALONG MY IDEAS ON AIRCREW REQUIREMENTS?

The UCR is your best approach. Don't be bamboozled by the apparent complexity of this form; it is the surest way of getting your ideas across. All those who deal with the UCR have this one comment: if only the chap at the originator level would realize that his idea is not unimportant. One UCR on one inadequacy may be only a candle in a hurricane, but if your views reflect other opinions passed as UCRs, then there's a chance something can be done. Lots of times, too, a single UCR will point out an obvious deficiency that has not been noticed—or at least if it has been noticed, no one else has taken the trouble to do anything about it.

HOW LONG DOES IT TAKE TO PROCESS AN IDEA?

Assuming your idea is accepted as basically practical, the experts will be quick to respond—provided that the road is clear for the introduction of the new equipment incorporating this new idea. On the other hand, if your proposal is only a minor improvement to an item of which there are large existing stocks it becomes a matter of economics and thus a long time until your idea gets to the field. But don't be discouraged, your suggestion is still appreciated and may be instrumental in ensuring that the same mistake is not made when new items are procured.

WHY IS IT THAT NEW EQUIPMENT TAKES SO LONG TO GET ON THE SHELF?

Well, that's a tough one! A UCR arrives through the normal chain of command to headquarters. The idea is reviewed by the experts and if found feasible, will probably find its way to the agenda of the annual meeting of the Ad Hoc Committee on Aircrew Equipment. This meeting is attended by representatives from all commands and specialist units. Should these gentlemen accept your suggestion and if a comparable item is not already in production, it will then be submitted as a development project to, for example, IAM (Institute of Aviation Medicine). Samples are made for testing in the field. At this stage the bugs are ironed out—a process which may take about a year. Using the initial prototypes, a contract is let for the production of about 200 items for more extensive and formal user trials. This process could take up to a year particularly if the idea has seasonal application only; that is, summer equipment can obviously only be tested in the summer. Once the item has proven satisfactory, the specifications are passed along to DID (Department of Inter-service Development) where further investigation and detailed specifications are drawn up. The complexities of this process include such details as patent infringement, state of the art in industry, manufacturing techniques, and recent developments of new materials. About a year will pass when your item may emerge, fully described and suitable for tendering and contracts—a process which takes about three months. If funds are allotted, the contract is then awarded by the Department of Defence Production and manufacturing begins.

THEN HOW LONG UNTIL IT'S ACTUALLY ON THE SHELF?

If the item being replaced can still be used or if it is a completely new item that is only desirable, not essential, it'll be about three years—if all goes well! Large existing stocks mean long wait.

WHY MUST EXISTING STOCKS BE USED UP FIRST?

Well, it's primarily a matter of economics. The process described above is designed to make sure that when a new item is decided upon it will have a reasonable life before becoming obsolete. Thus large numbers can be ordered because large numbers considerably less cost per unit. Unless the replaced item is hazardous or completely useless we simply cannot afford to throw it away. There is then no alternative but to use up the old before getting the new.

DO YOU HAVE ANY WAY OF FINDING OUT WHAT HAPPENED TO YOUR IDEA?

Definitely, yes. You are entitled to an explanation of whether your idea was accepted or rejected. Every UCR must be answered and returned to the originating unit.

WILL WE EVER GET RID OF THE "TOO LARGE-TOO SMALL" ITEMS OF AIRCREW EQUIPMENT?

As a result of a five-year anthropometric study, the IAM have described and introduced 25 human sizes and shapes. This will ensure a better fit and lower the likelihood of the giant-midget remnants situation of yesteryear. The new summer flying suit introduced for user trials is the first item produced under this new system.

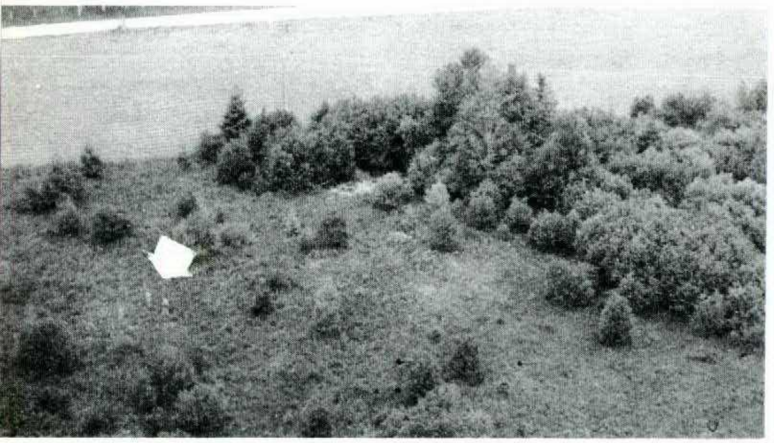
WHAT ABOUT "INTEGRATION"?

The inter-service complexities of new-item procurement will be somewhat simplified.

ARE THERE ANY RADICAL NEW IDEAS IN THE OFFING?

Computers and punch card indexing offer the possibility of monitoring service-wide requirements of clothing. Outside of this there seems little likelihood the system can be streamlined. The idea that each aircrew will have his own wardrobe of personal equipment on automatic issue via the punch-card system has been studied but human beings, unfortunately, don't stay the same size. The usual tendency to increase around the middle with age would require frequent updating and make the system overly expensive. ■

From 200 feet up



From 350 feet up

From 1000 feet up

DON'T - COLOUR ME ORANGE!

For several years some aircrew have recommended the adoption of the orange-coloured flying suit and a bright single or multi-coloured parachute; the conspicuity of these items, they point out, is an aid in the sighting of downed aircrew. This reason is valid against some back-ground conditions if the altitude of the search aircraft is not too great and visual conditions are favourable.

However, not all commands agree with the desirability of the bright-coloured suit or parachute canopy. For instance, those pilots who may be operating near, or over combat areas may not wish to be too conspicuous on the ground. Another objection by one of the major users of the orange flying suit was the tendency of eye strain due to canopy reflection during flight. Actually, most users wanted a flying suit darker than the French Grey one now in use.

The main reasons for selecting a darker blue are the ease of exact duplication of the colour by manufacturers, and the ability of the darker shade to hide spots and stains. User trials of the new lightweight suit are now in progress in the three services.

Similarly, it is difficult to satisfy all user demands on the coloured parachute canopy. The USAF, for instance, has attempted to overcome this problem by adopting a multi-coloured canopy by using white, green, orange and khaki sections. The logic of this policy is that aircrew can decide whether or not they wish to be seen and hence display the appropriate colour.

CFHQ's objection to the coloured or multi-coloured canopy has been its proneness to a build-up of static. It has long been recognized that a static build-up is possible and common in nylon, particularly during conditions of low temperature and low humidity. This phenomenon is more prevalent in coloured nylon and more serious in multi-coloured items where different dyes are used.

During RCAF trials in February 1964, burn holes about fist size resulted from several tests. However, the main concern has not been the burn holes in the canopy; what is more important is the possibility of a delayed canopy opening on a low-level ejection. This static phenomenon is a difficult one to prove and analyse scientifically without extensive research. Although not all military services have made studies, the Royal Air Force and the French Air Force have reported evidence of the static phenomenon in desert areas. To extend its investigation the RCAF proposes to conduct additional trials this winter using white, orange, multi-coloured and USAF multi-coloured parachutes.

Until the shortcomings of the brightly-coloured suits and canopies have been overcome there will be no change in current RCAF items. The primary reliance for finding downed aircrew will be based on the use of telecommunications and the many visual distress aids now provided. An additional visual detection aid now in the mill is an orange panel, nine feet by twelve feet, which will be put in all parachute back cushions.

The general emphasis over the past decade has been on the development of active detection devices (for example, the CPI/ADR)—the downed flyer, then, has been transformed from intrepid northwoods hunter to a radio transmitter operator and a pyro-technician! The active LOCATE AND RESCUE has replaced the passive SURVIVAL—the records have proven the wisdom of this philosophy.

W/C AM Halkett

LAMENT TO A LOST SUIT

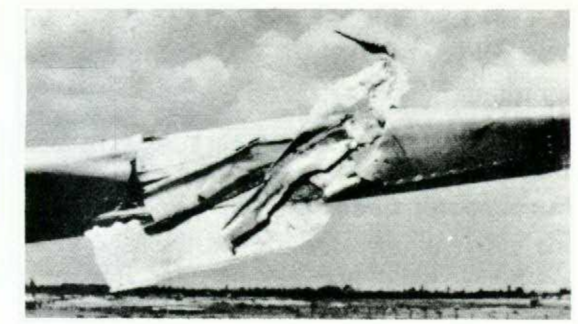
The aircrew all screamed,
And the Boss's eyes gleamed,
When they gazed on the new flying suit;
You could wear it at noon
In the mighty Neptune,
The Harvard, the Dak, or the Yuke.

The sizing was free,
It was comfy for tea,
And needed no mods to the shoulder;
It was handy for deer,
Even shed the odd beer,
And was warm when the weather got colder.

It felt nice to the touch,
Had large pockets and such,
And zippers that ran very free;
The collar was neat;
The cuffs vent the heat,
And the whole thing fit to a tee.

But the end of the story,
Is sordid and sorry;
And we had to cancel the gear.
For there was no doubt
The cash had run out—
But we'll try them again—next year!

Norn



ONE STRIKE - YOU'RE OUT

A Sabre flying as number two on a low level sortie received a bird strike approximately five minutes after takeoff. To quote the pilot's report ". . .A loud thump was felt on the port side of the nose, and a large bird was seen to glance down the port side of the fuselage. Section leader was advised of birdstrike and requested to close in and examine port nose and fuselage for damage. Section leader reported that there was no sign of damage, and as the aircraft after test was found to be flying and behaving in a normal manner, I decided to continue with the mission. . ."

Ground inspection confirmed that apart from blood smears no damage was caused to the nose of the aircraft. However, the port horizontal stabilizer was found to have sustained major birdstrike damage and required replacement.

This aircraft had apparently sustained two strikes simultaneously. Because of the mistaken belief that there had been only one strike, on the nose, the pilot doing airborne inspection was misdirected where to look for damage. It is also possible that damage caused initially by the strike was worsened as slipstream pulled back broken skin and members to the extent indicated in the photograph.

To quote the pilot again ". . .I made a wrong decision in continuing with the mission. Inspection of the aircraft in the air cannot be considered reliable. . ." and we agree entirely. Any pilot who is convinced that a birdstrike has occurred should return to base at a reduced IAS and land as soon as safely possible.

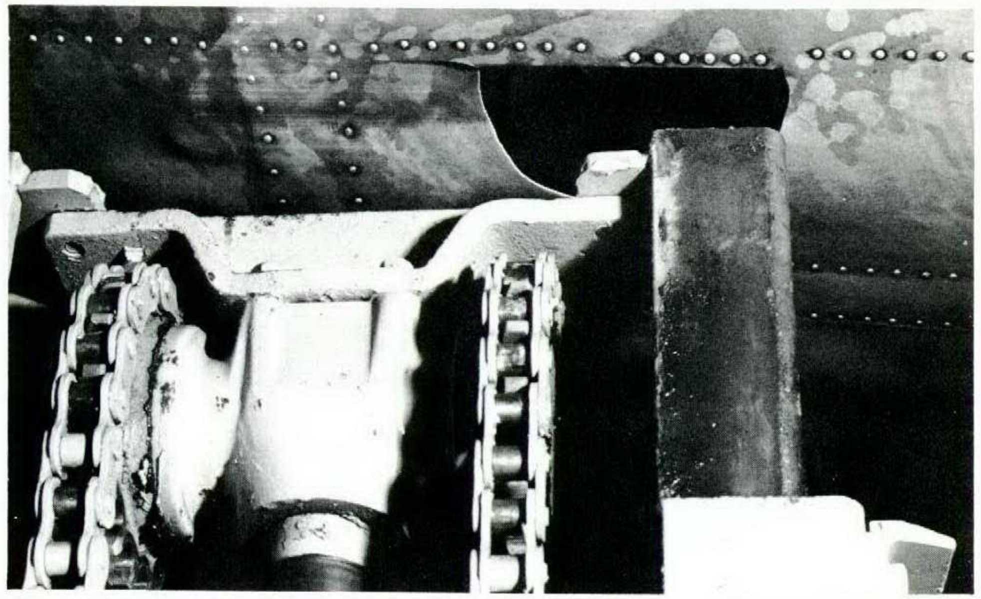
RAAF FLIGHT DIGEST

WANTED: A GOOF-PROOF FORKLIFT

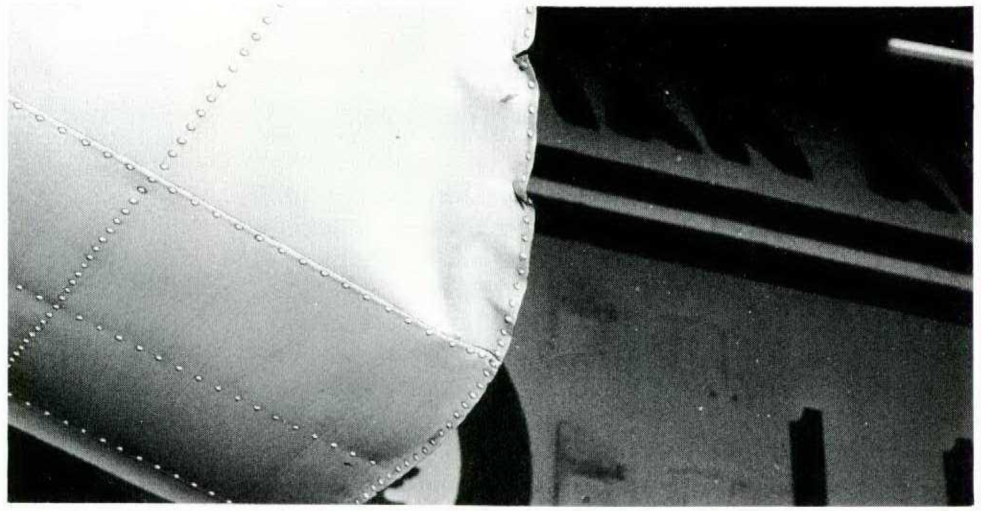
This gallery of "goofs" was gleaned from the last couple of years of forklift prangs. What must be said has already been said, so we present only the stark evidence with the actual quotes.

One school of thought has it that since forklifts inevitably wind up damaging aircraft why do we continue to use them? Regrettably the risk is something we'll be living with for some time—after all, it's a mighty handy piece of equipment. The forklift's continued popularity is assured because industry has yet to produce a loading vehicle with the economy and versatility of the forked menace.

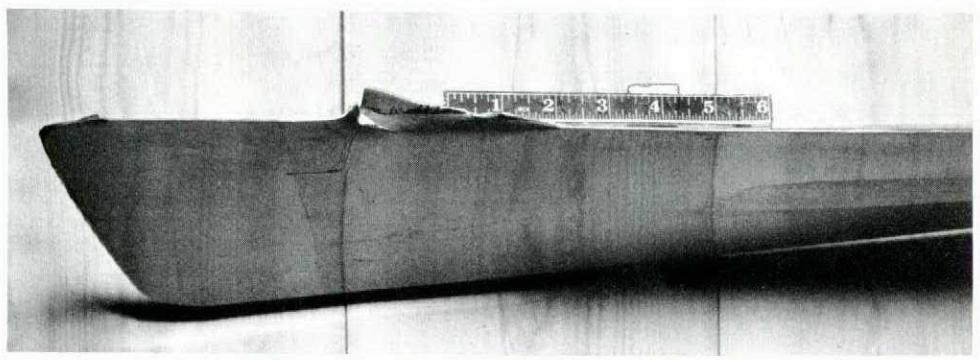
A look into the past shows lack of training, shortage of personnel, poor supervision, fatigue, and poor morale to have aggravated the problem. Comforting rationalizations aside, forklift truck accidents are caused; the sad fact is inescapable—is it not?



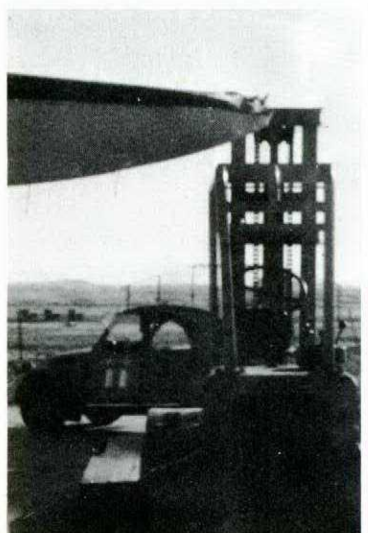
"The accident resulted from an incorrect selection of controls . . . because the forklift is new to the section . . ."



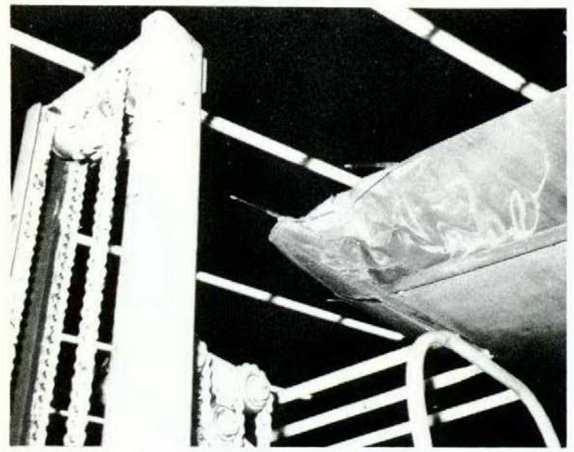
"I had a boil on the back of my neck so I asked LAC Doakes to drive. LAC Doakes complied."



". . . I misjudged my distance from the propeller . . . I struck #4 propeller with the top part of the boom."



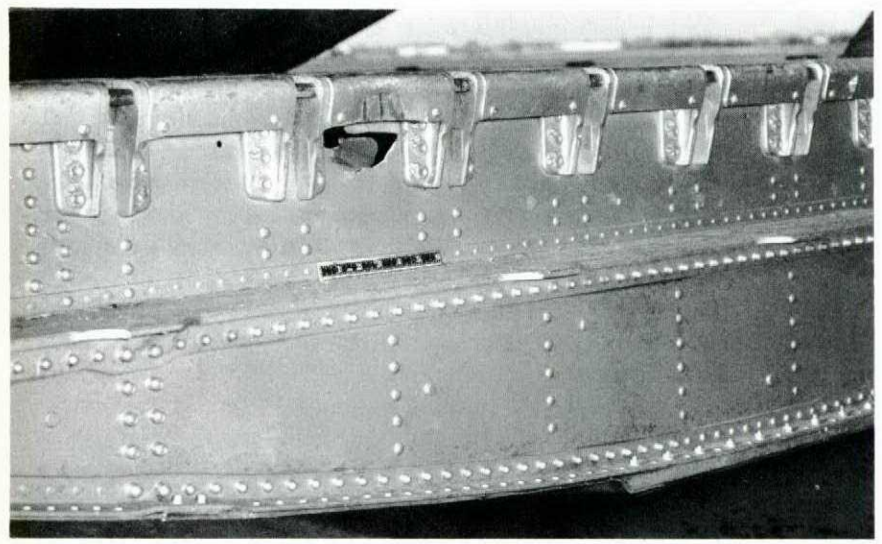
◀ ". . . my attention was momentarily drawn from driving . . . at which time I hit the port wing tip . . ."



". . . a check was made to determine the position of the aircraft in relation to the forklift, and then the undersigned caught a glimpse of the corner of the wing, but it was too late."

"I wasn't aware of the height of the hydraulic tilt boom on the forklift and I attempted to drive under the port wing."

". . . and I misjudged the height of the boom of the forklift, which struck the tail of the aircraft causing considerable damage."



". . . as I moved the forklift forward under the load I heard a "clunk" which indicated something was wrong . . ."

"As I positioned the lift, paying particular attention to the overhang to ensure clearance, the boom of the forklift scraped the side of the aircraft."

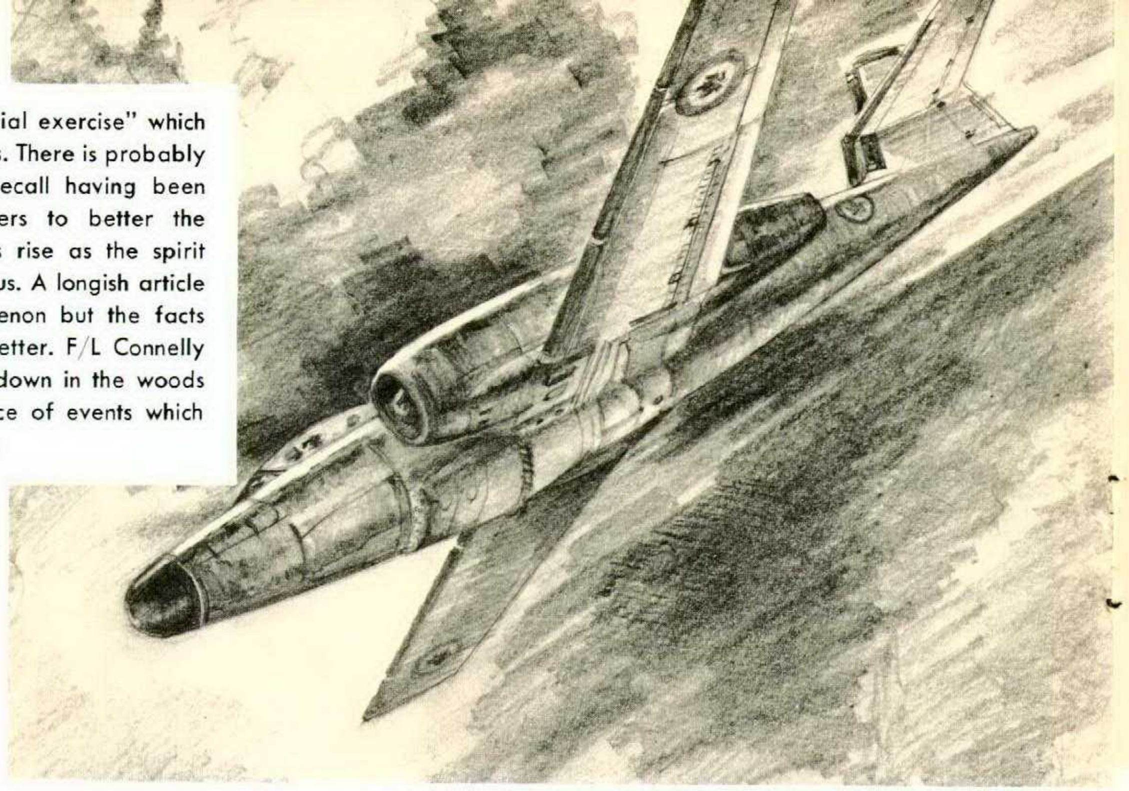
■

" . . . I tilted the forklift mast forward without realizing how close the mast was to the side of the aircraft."

■

"The weather was clear and the only excuse I have is that I was tired."

There is something about a "special exercise" which invokes a press-on spirit in all of us. There is probably not a pilot flying who cannot recall having been scrambled and not cutting corners to better the takeoff time. The taxiing speeds rise as the spirit of the occasion becomes contagious. A longish article could be written on this phenomenon but the facts of this case tell the story much better. F/L Connelly and F/O Lillie found themselves down in the woods the reluctant victims of a sequence of events which occurred only a few hours before.



- 1 CF100 crashed
- crew ejected successfully
- 2 CF100s landed in emergency conditions on one engine
- 2 engines failed in flight during the mission
- 2 engines were so badly damaged it was a miracle they kept operating long enough to permit recovery
- 2 engines failed $10\frac{1}{2}$ and 13 hours flying time after penetrating the same CB
- 1 engine removed and inspected and would have failed in the next 5 minutes of operation
- 10 engines changed.

IF YOU GO DOWN IN THE WOODS TODAY . . .

F/L T Connelly

The Exercise is On

Twelve CF100s arrived on a summer afternoon as a target force to be employed later that night. The Met briefing which was attended by all aircrew (but not by all the key personnel involved) mentioned thunderstorms in the area but they were not presented as a major problem. The poor weather at the destination base held everybody's attention.

At this point the story becomes confused since prior to and during the late meal and around the flight line, some people saw lightning strikes in the darkening sky and others did not. In fact, heavy rain showers and large barometric changes were present as the first aircraft taxied out for takeoff. The weather was up and down rapidly with poor visibility in heavy rain. Several crews reported turbulence and lightning on the climb-out and the fifth aircraft reported an engine failure. A few minutes later the sixth aircraft piloted by F/O Lillie reported an engine failure. This was followed two minutes later by the failure of the other engine. Flying was ceased and a taxiing aircraft returned to the ramp.

The grim story and toll in aircraft damage appears across the page. F/L Connelly's account of his bailout experiences raises a few questions and should spark a discussion or two.

"Bagotville Tower, Banjo 06, taxi instructions" This was the first radio transmission of a night flight that was planned to an IP 200 miles to the north and thence southwestward across Quebec, Ontario, Lake Erie to Patterson AFB, Ohio. There was a risk of fog forecast for the departure time, standard winds aloft and deteriorating weather at the destination, 1000 miles away.

A heavy shower during taxiing lowered the visibility to less than half a mile. The shower was a brief one and the visibility at the end of the runway had improved to five-eighths of a mile or more. During the short taxi time the altimeter had changed 100 feet. The tower controller confirmed the change, saying there had been several rapid pressure changes (that morning). The altimeter was reset and Banjo 06 was given departure instructions. Lightning flashed on the western horizon.

Our CF100 was airborne at 0412 hrs and we changed immediately to radar departure frequency. As we turned to a climb heading of 010 we entered what was later discovered to be a CB (cumulonimbus) and encountered, in quick succession, turbulence, rain and lightning. Airspeed was decreased to counteract the turbulence and the helmet "sun" visors were lowered to reduce the glare from outside. Hot moist air came from the heating system fogging up the canopy. My pilot was absorbed in his instruments. Departure had radio but no radar contact.

"Banjo 06, Banjo 05, over." 05, airborne before us, was in an emergency diversion to St Hubert due to the loss of one engine which had seized with a grinding sound and a loud explosion. My pilot and that of 05 briefly discussed emergency procedures. Minutes later we were in smoother air and continued to climb through cloud. By this time Radar had established contact. At twenty thousand feet there was a short resonance followed by an explosion as the port engine quickly unwound to fourteen percent rpm. Flames enveloped the engine intake. We reported the loss of an engine and requested a diversion heading to St Hubert. Two minutes later smoke filled the cockpit, the ominous sound returned, died briefly and returned once more to reach a crescendo in a second explosion. The rpm indicator galloped past 100 percent to the limit of the dial. With two gone my pilot ordered me to bail out: "You mean NOW?"

I pulled on the ejection D ring and was kicked with a momentous force of 25G and sent plummeting out of the aircraft into cloud in a fast deceleration from 300 mph. There was a slight delay as I fell strapped to my ejection seat to less than twenty thousand feet and then as smoothly as is the mechanical logic of an automatic escape system I was suspended from a billowing parachute. The emergency oxygen supply was soon exhausted, I shouted to my pilot and blew on the whistle attached to the Mae West. There was no reply.

In that nightmarish atmosphere of darkness, rain, snow and cloud I checked on the security of my parachute harness and found the quick release box 15° out of the fully locked position. For a brief eternity I held onto the parachute risers with one hand and returned the release mechanism to its locked position. Several minutes later and thoroughly soaked by the rain I saw one semi-circle of the chute canopy flutter. I began to oscillate like a pendulum and I offset each swing by pulling down on the opposite riser. It helped.

I descended through the bottom of the upper layer of cloud at about 6000 feet. In the darkness I couldn't recognize any terrain features below. Later, I thought I recognized numerous small lakes and prepared for a descent into water. I grew impatient with my descent and uncomfortable in not knowing my height. I dropped my outer helmet hoping it would make a splash; it quickly dropped out of sight. I again entered cloud and as soon as I recognized the trees I was already amongst them bouncing down a steep incline. My slide through the underbrush was suddenly halted when the chute became entangled in the tree tops. Fifteen minutes had elapsed since I bailed out.

I sheltered under an overhanging rock until day-break. I had landed atop a 1000 foot hill. To the east and beyond the nearest ridge I could see through the trees the interrupted line of the Paraboneа River. From the valley below came the noisy murmur of fast flowing water. I arranged the parachute as a ground signal and slinging the seat pack over my shoulder stumbled down the hill-side to a stream that was perhaps two feet wide and the breeding ground of a million black flies. In the first clearing downstream I opened the seat pack and activated the Sarah. The rain had stopped by now and I attempted to light a fire without success.

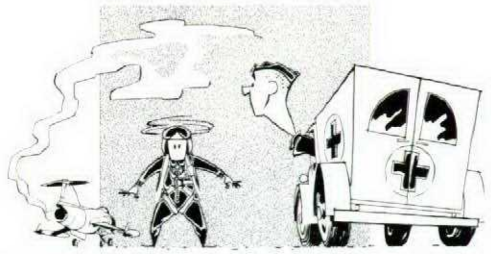
I set off downstream for a proposed three-hour reconnoitering trip. It was impossible to walk by the stream's edge and I chose to follow the mid-contour of the left valley. Within an hour my energy was spent and each fallen tree became a greater obstacle than the previous one. It took two hours to return the way I had come.

Back in the clearing by the stream, I was delighted to see an Expeditor pass overhead several times. I signalled with flares and presumed I had been located. I climbed back up the hill and recovered my chute which would now serve me best for shelter. Again I looked to the east and saw more clearly the long line of a wide river. Back in the valley I completed the framework of a shelter and draped the chute across the horizontal pole. I thought how futile all this would be and, since the nearest rescue place was merely beyond the next ridge, I should walk there and await a rescue aircraft. I packed my Sarah, survival pack and dinghy and set off once more.

A long time later I came into the next valley and, a beaver swamp. To the east was a second ridge previously hidden from view. I found the best vantage point on the slope above the swamp and decided not to move further without some positive indication from the aircraft above.

I switched on the Sarah beacon and immediately an Albatross began a search pattern turning over my position at the end of each run. At 3 pm a Quebec Provincial helicopter made a difficult landing a mile away. Directed by the Albatross overhead I met the pilot, a former RCAF Sabre pilot, half-way. Shortly we were airborne and on our way to pick up my pilot located earlier that morning and by now well refreshed by several cups of coffee. I was tired, wet and hungry and the millions of black flies had had a Field Day.

The search operations and my own physical well-being would have both benefited had I elected to remain where I had landed. Perish the thought, but if I had to do it over again I'd be much less inclined to hike about—I learned this lesson the hard way!



NEAR MISS

HOW DID IT HAPPEN?

Occasionally an incident or accident occurs to experienced aircrew that surprises everyone—and people ask—How did it happen? Such an occurrence took place recently when a flight safety specialist became airborne in a T33 with the pitot cover still in place. Here is the story.

We had been scheduled to fly to an East Coast station some days earlier but the trip had been cancelled because of fog. About ten days later we were again at the jet flight making preparations for another trip east—but again the weather was against us. Our own base was in low pressure area with reduced visibility, blowing snow, and a risk of freezing rain. The whole system was moving eastward and as the weather improved locally, it was forecast to deteriorate at our destination. After an hour and a half of checking "on again"—"off again" weather we decided to go back to our office and wait for a definite improvement. Finally, about eleven o'clock a clearing break came and we hastened back to the airfield, checked destination weather again, which was deteriorating steadily, and filed our flight plan.

Because of the poor weather and risk of diversion, a full fuel load was required rather than the part load we originally requested. Here started the chain of events which resulted in our incident. Because of the weather and no flying, the refuelling tender driver had gone for an early lunch; we waited impatiently for his return—the deteriorating weather at destination made our departure time critical. In a short time, (but it always seems like such a long time) the tender appeared. Refuelling got underway and the tender was parked immediately in front of the aircraft with the two hoses to the tip tanks passing each side of the nosewheel while I carried out my external inspection.

The operator was standing by his station manipulating valves as two men filled the tip tanks. Inspection of the nose gear area and removal of the locking pin was made awkward by the hoses but the external was finished just after completion of the fuelling operation.

The other crew member arrived—we climbed in and fired up. The last weather report for destination was for marginal conditions at the time of arrival but ample fuel was available for a letdown, overshoot and diversion. IFR clearance was as requested and there was no delay for takeoff. Wind was nearly down the runway at 20 kts gusting to 35 kts. During the takeoff roll the airspeed was fluctuating but this was attributed to the gusty conditions. After takeoff the airspeed increased to 160 kts then dropped to zero. Altimeter readings were accurate. To close the tale quickly the aircraft landed safely and it was found that the pitot head cover was still in place! I simply had missed it on my external check. But what contributed to such an obvious error? Here are some of the reasons:

a. The "on-again—off-again" weather was frustrating;
b. The in-to-the-office, rush-to-the-airport routine;
c. The slight delay of the refuelling tender;
d. The failure to follow established routines in that the L14 was taken to the aircraft;
e. The distraction of the refuelling operation during the pre-flight check; and
f. The urgency to reach destination when the weather was deteriorating and it was known that an elaborate program and meetings were jeopardized.

To make it even more embarrassing, I often lecture on just such episodes—and here I was caught by almost classic circumstances. The above story isn't an excuse—there is none—but it is an explanation of how circumstances can lead the best intentioned astray. Fortunately this was only an incident, the next occasion might result in an accident, and it might be you—read and heed. We learn each day.

DOUBLE CHECK

"Start-up and taxi were normal. Pre-takeoff check—you know: Hatches, Harness, Hydraulics—HYDRAULICS! I went through the procedure—moved the ailerons and checked for proper movement and momentary drop in hydraulic pressure. Everything checked fine, but I guess nothing registered.

Once airborne, I thought I was flying an ICBM! Control problems! The ailerons were so stiff I could hardly move them! Check aileron boost ON—roger, ON. Declare an emergency, start a gentle turn downwind and get this thing on the ground as soon as I can. What's wrong? Check aileron boost ON. Decide if I've got aileron control problems, best to turn the aileron boost OFF in case it acts up and flips me. Reach down to select OFF. Lo and behold it is OFF! Select ON, and the T-Bird flies beautifully. Cancel emergency and was thankful that my oxygen mask covered most of my very red face."

Our thanks to the anonymous author of this little story! It shows us that we humans are such creatures of habit that when we come to an item that is always (?) in the same position, our minds may automatically reject the possibility that it might not be correctly positioned.

The vital actions check is just that—vital. Each item must receive specific thought. Perform the cockpit check as if the bird had previously been used on static display for Air Force Day!

SPOTLIGHT VOODOO - A SHINING EXAMPLE

Man—what a stellar performance those One-O-Wonders, Scope Wizards and Medicine Men have chalked up on the venerable Voodoo.

Since entering RCAF service in Oct 1961, our 101s have flown over 55,000 hours, or 227 hours a month or 30 hours per aircraft per month while achieving an overall accident record of 7.20. That's just slightly over seven accidents every 10,000 hours and includes all categories, minor and major. What's even more spectacular is the write-off rate which stands at 0.360 for a total of two aircraft written off in three years of operation—and it can be argued that one of these was beyond the control of the RCAF.

During this time there have been only three other major accidents involving "B" category damage, and last but by no means least is the fatal accident rate of ZERO. This record is without precedent for the type of mission being performed and has never yet been equalled.

The risks inherent in service flying, in particular the type of operation conducted by ADC interceptor squadrons, introduce hazards that cannot be eliminated or avoided. The CF101 was the first century-series aircraft maintained and flown by the RCAF; aircrew and groundcrew alike were all learning at the same time, plus fulfilling the dispersal and readiness commitment—to get the bird airborne within five minutes of scramble time. Dirty weather conditions, upside down on your back at night at zero G, long hours of monotony, a shortage of personnel—and all accomplished with a declining accident rate from year to year. We feel a bit proud of outfits like that. Never once has anyone in the squadrons, on the stations, or in command used any of the hazards as an excuse for an accident.

In analyzing the seven major ADC accidents (the Viscount-Voodoo accident not considered) we find that five were caused by aircrew, one caused by ground factors—Air Traffic Control—and one by a materiel factor. The aircrew errors were:

- Failure to throttle back immediately, to clear a double engine compressor stall during a recovery from a supersonic high altitude snap-up;
- Landing in heavy rain with drift on, caused either by cross-wind or by action (or lack of action) of the pilot, then attempting to taxi back onto the runway through unsuitable ground;
- Failure to ensure that the undercarriage lever was in the full-down and locked position;
- Attempting to flare without sufficient power; and
- Flared out before reaching the runway and struck snow in the undershoot area.

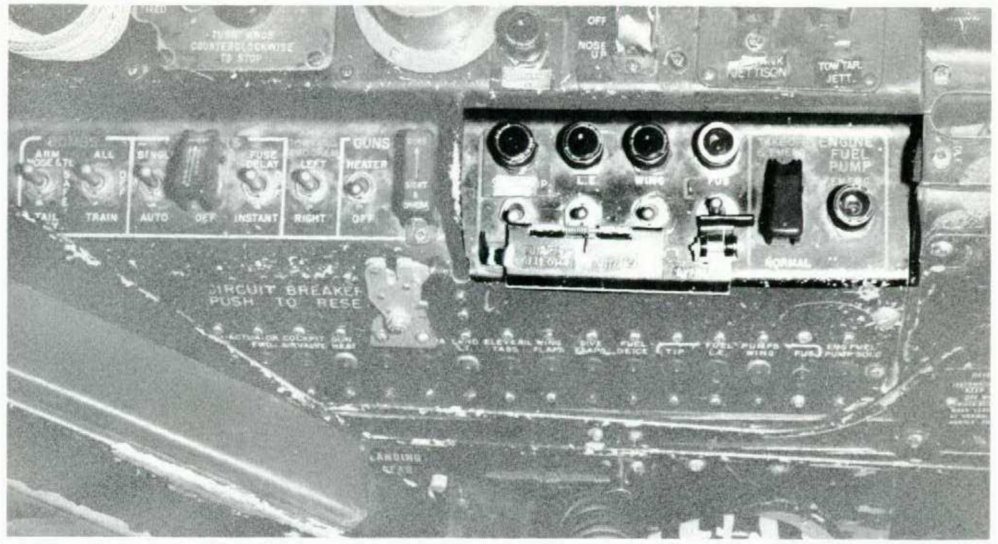
All these accidents occurred in daylight and with one exception inexperience was a factor. Note that four occurred during landing and one while taxiing. The accident assessed "Ground" was due to the runway remaining in use during snow removal operations. The Materiel accident was the result of fire in the aft fuselage insulation blanket. The time-expired blanket had become soaked with oil and hydraulic fluid and was ignited by heat from the afterburners.

All the accidents mentioned were avoidable and were caused by "people troubles". The record shows that the majority of ADC accidents resulted when someone did not comply with the stringent requirements associated with Voodoo operations. Accidents involving "people troubles" for the most part, are preventable—if everybody remains on-the-ball. Units and Commands have stayed ahead of the game, coping with the problems as they arose—and it has paid off impressively. Flight safety is accomplished by doing the job the right way; the Voodoo troops, fly-boys and groundcrew alike, have obviously been doing just that.

Well done ADC. You have corrected the easiest ones—the most difficult are those to come. And a note to the new generation—the squadrons are now well established and conditions are better; we're looking forward to more of the same—a tremendous record to live up to!

Two pilots departed on a low-level test flight—a test run was flown along the range at a briefed speed of 200 kts and 300 ft AGL—after about 10 minutes airborne, the captain said he had "flamed out". The two pilots ejected unsuccessfully. The fuel counter found in the wreckage indicated 85 gallons of fuel had been used by time of impact, approximately the required fuel to empty the fuselage tank.

The student was number 2 in a formation and had been airborne an hour. The formation was on a wide base overshoot from RATCON approach when the student felt a reduction in thrust, then engine flamed out—relight produced a slight rumble followed by another flameout. A second relight was attempted but altitude became critical—under 1000 ft. He ejected successfully. Reason for flameout—stuck wing float valve preventing flow from the wing tanks to the fuselage tanks. The student said he did not notice the low-level fuel warning light.



FUEL - THE WORD ON THE BIRD

How many of you T33 drivers have recently had troubles with stuck float valves? Stuck fuselage tank quantity gauges? Fuel fumes? Uneven feeding of the tips? Fuel venting from the caps? The problems associated with the T33 fuel system are many, and familiar to most T33 drivers. Some recent developments, however, may be of interest.

T33 Fuel System Operation

The fuel system on the T33 is fairly familiar to most of us. Tip tanks, leading-edge tanks, and main-wing tanks all normally feed fuel into the fuselage tank. The fuel is then fed from the fuselage tank directly to the engine. A by-pass system is fitted to allow fuel to be transferred from leading-edge or main-wing tanks directly to the engine, by-passing the fuselage tank if any malfunction occurs in this area.

Engine generated air pressure is used to force fuel from the tip tanks into the fuselage tank, and electrically operated booster pumps are used to transfer fuel from leading-edge and main-wing tanks to either the fuselage tank or, via the by-pass system, to the engine. The flow of fuel from tips, leading-edge and main-wing tanks into the fuselage tank is regulated by float valves contained in the fuselage tank. Therein lies one of our problems.

Sticking Float Valves

Sometimes one of the float valves sticks open or closed. They stick because of a variety of reasons, the two most common are:

▲ High fuel pressures in the main-wing fuel line jam the main-wing float valve closed.
▲ Internal failure of one of the float valves jamming the valve either open or closed.

A float valve stuck open will overfill the fuselage tank and cause fuel, in excess of that required for the engine, to be pumped overboard through the sabre drain. If the tip-tank float valve sticks closed, fuel cannot be obtained from the tips. If the main-wing float valve sticks, fuel can only be obtained by switching to by-pass. If the leading-edge float valve sticks closed, however, fuel will feed through the by-pass line and main-wing float valve to the fuselage. By-pass could be selected if desired but it's not necessary.

Tip tank and leading-edge float valves have proven quite reliable. Main-wing float valve failures, on the other hand, reached epidemic proportions during the first half of last year. High pressures were suspected to be the cause, and a modification (EO 05-50C-6AV/460) required a small hole to be drilled in a check valve in the main-wing fuel line to allow the high pressure to bleed off, and thus to allow the float valve to function normally. The number of reported malfunctions fell sharply after the mod was issued; (there still is no positive proof that failures were due to the high pressure in the first place).

CEPE was assigned to investigate the T33 fuel system and make recommendations for its improvement. Instrumentation of the main-wing fuel line revealed pressures as high as 90 psi rather than the 15-25 psi normal booster pump pressures. Although the investigation is not complete, it appears that the high pressures are caused by heat in the speedbrake area. Relocation of the fuel lines in this area will probably be required. So much for float valves; as long as the pilot realizes one is malfunctioning there usually isn't much of a problem. But how about sticking fuselage quantity gauges?

Fuselage Quantity Gauge

Sticking fuselage quantity gauges are rare, but when they stick the results can be disastrous. Most T33 drivers try to protect themselves from a fuel starvation flameout by closely monitoring their fuel system. This means they select the various tanks one at a time, and monitor the fuel counter and fuselage tank quantity gauge to ensure that each tank delivers the proper amount of fuel. Normally, the tips are used first because they hold the most fuel and a malfunction of the tip tanks is the most serious loss. The main-wing tanks hold the next most important quantity of fuel and are easier for the groundcrew to refuel and are therefore normally used next. If the float valve sticks or a booster pump fails, it will be detected early and the leading-edge and fuselage tank will still be available for recovery.

What happens, however, if the fuselage quantity gauge sticks? It means that any fuel feeding problem will go undetected until the engine flames out! If this should happen on the final part of GCA for example, altitude and airspeed may not be sufficient to permit either a re-light or an ejection. The results would probably be fatal. Let's look at the implications of a faulty fuselage quantity gauge again; it means that a pilot, even when monitoring his fuel system closely will learn of any fuel feeding problems only when he flames out, because he depends on the fuselage quantity gauge. And there is no use relying on the low-level fuel warning light—it works from the same sensor. If the gauge says erroneously that the tank is full, the light will also be out.

Investigations are now underway to improve the reliability of the fuselage low-level warning light, either by replacing the float with a better type, or by redundancy. In the interim, though, it would be advisable for T33 drivers of all experience levels to review their T33 fuel management techniques. It would seem reasonable that selecting the main-wing tank after the tip tanks while at altitude is still the best technique. This will allow the pilot to establish any main-wing tank feeding problems early; if the fuselage low-level warning light and quantity gauge do stick there will be lots of time for a re-light. During a letdown, however, it would be prudent to gangload the fuel switches. This way, if no fuel feeding problems have occurred at altitude when the tanks have been selected individually, then by gangloading for the letdown the pilot ensures that all the fuel available to him in the aircraft is feeding when he can ill afford an unexpected flameout.

Tip Tank Problems

Tip tank troubles have been with us for as long as we have had T-birds. These two troubles are most frequent:

▲ Fuel fumes feeding back through the air pressurization system at reduced engine settings.
▲ Uneven feeding of the tip tanks.

The tip tanks are pressurized by the air conditioning system which delivers from 6 to 60 psi. A reduction valve for each tip tank reduces and regulates the pressure to approximately 6.25 psi. Residual pressure can result in a higher pressure in the tip tanks than the engine is producing when power is reduced to idle. Fuel fumes can thus back-up into the cockpit air conditioning system; even raw fuel has been known to come splashing out of the foot warmers. To prevent this, a check valve was put in each tip tank pressurization line, and later, for double protection another was added. Although this decreased the incidence of fuel fumes in the cockpit, it created another problem—uneven feeding.

Uneven feeding was aggravated by the additional check valves. Any difference in resistance to air pressure in the lines will cause one tip to feed more quickly than the other. Trouble shooting this problem is difficult as uneven feeding can be caused by regulating valves, sniffle valves, or any of the check valves. The ground techs, on some occasions, virtually have to rebuild the system to finally pin down the cause of uneven feeding.

A modification with which CEPE has had some success is to bleed off air pressure closer to the engine thus assuring a minimum of 10 psi. This should correct the feedback problem. In addition, CEPE proposes the use of only one regulating valve and one check valve, both installed in the air pressure line before it separates to each tip tank. This should cure most of the uneven feeding. A side benefit is, that if one tip fails to feed because of an air pressure leak, both tips will not feed. This should reduce the number of tip tank jettisons when one fails to feed and over 100 gallons differential develops before the pilot is able to land.

Fuel Venting from Caps

One phenomenon of the T33 fuel system that remains disturbing is the large amount of fuel that can be lost through a venting leading-edge or main-wing fuel cap. Extreme venting has been known to cause the loss of approximately 250 gallons in about 20 minutes, and in fact, nearly all fuel aboard can go out through the one cap. The USAF had a case where the pilot discovered siphoning after takeoff; while flying in the local area to burn off fuel to landing weight, he was amazed to find that he had siphoned 257 gallons in 28 minutes and almost left it too late. When fuel is sucked out by a leaking cap, fuel will flow to that tank through the vent line system from all tanks except the tips. The fuselage tank will transfer fuel to the venting tank, and the tips in turn, will keep the fuselage tank full. If the fuselage tank could be stopped from transferring fuel through the vent lines, this would limit the amount of fuel that would be lost by a leaking fuel cap.

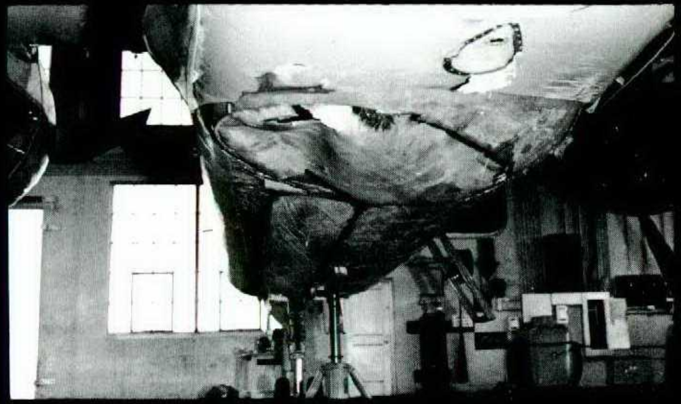
The vent line on the fuselage tank now enters the top of the tank near the rear wall; the end of the vent line is normally immersed in fuel. Units in the field and CEPE have proposed that the vent line enter the fuselage tank at the front of the tank (which is higher) and not normally immersed in fuel. Fuel would not be transferred to a leaking tank. The fuel lost would be limited to the fuel contained in one wing only or 107 gallons maximum.

The main-wing tanks and leading-edge tanks of each wing are vented together; thus all the fuel they contain could go out through the one tank. It's this vent line that dumps some fuel from the leading-edge back into the main-wing after the latter have been drained.

The trusty old T-Bird has been kicking around our air force for a good many years now, but there are many drivers (and old sweats, too) flying it regularly who don't understand the intricacies of its fuel system. Usually, a fuel problem is not serious but then, once in a while two or more failures occur together. That sudden flameout makes it seem awfully quiet!

S/L BT Burgess

WHEELS UP AND LOCKED



This Tracker article raises a few questions which we have attempted to answer. As the author points out, there's a point or two here which unquestionably will spark a discussion!

Most Tracker pilots were no doubt startled at a recent wheels-up landing on the west coast caused by an assumed fault in the emergency hydraulic system. The fix is on the way and by this time should be completed.

After attempting various methods of activating the emergency system (including liberal amounts of coffee and fruit juice), the pilot was left with the final decision to bring her in, as is. On the credit side, the weather was good, no wind (allowing a choice of runways), technical and spiritual advice available from the AEO and FSO in the tower, the crash crew on hand plus ample time to plan the approach. On the debit side, it was night (can't find golf balls in the dark so we might as well fly), flaps not available, and insufficient fuel to orbit the eight or nine hours until dawn.

The approach was normal (including a call to the tower requesting a "full stop"), lined up as closely as possible with the centre-line. Overhead hatches were released and props feathered as the aircraft crossed the threshold. The aircraft was held off approximately one-third of the runway length and settled in a spectacular blaze of sparks. The Tracker ground to a halt about 1600 feet later just off the port edge of the runway. The crew emerged safely and the mopping up began.

Most of us, in mentally rehearsing emergencies, figure we have a fairly comprehensive grasp of what the "real thing" will be like. However, some Monday-morning quarterbacking left us with some extra ideas and questions we thought worth throwing out to a wider audience. We hope it'll spark some discussion in your flight room.

General agreement was that the approach should be at the normal flaps-up approach speed, attempting to maintain as flat an attitude as possible. Props should be feathered as the aircraft crosses the threshold; this appears to be a good time to get rid of the third and fourth operators' hatches. The aircraft should be held straight and level until it touches, and then ride it out.

The reasons for being on or close to the flaps-up approach speed is straight-forward; flaps are not available and the higher speed will help obtain the flat attitude at impact. For this reason, it is also better to come in slightly hot even with flaps down, providing that the aircraft arrives in contact with the deck as level as possible. The flat attitude will ensure that the "Fosdick" will take the strain initially while the aircraft is slowing. The tail-Fosdick-nose type of three-point landing is more likely to break the aircraft's back. In this case, the Fosdick was ground away, leaving approximately two and a half inches with no sign of breaking on the runway.

We concluded for the reason stated above, that it is preferable to use a level or uphill runway; initial contact is more likely to be smooth and constant. There will, of course, be no choice of runway if there is a wind (a wind is an advantage). In a no-wind condition touchdown speed will be higher causing a longer slide; line-up is thus more critical. In daylight, line-up can be judged easily; at night after crossing the approach lights, we saw nothing but a big black hole.

There is no argument about the use of foam on the runway reducing the fire hazard but some pilots felt that the landing slide would be much longer and more erratic in direction. The consensus was that these extra three or four seconds of stark terror are counteracted by the added fire protection.

Once the aircraft is over the threshold with feathered props, you're committed. There's no further chance of line-up correction; any attempt at this stage to salvage an error in judgement will only later the sequence of aircraft parts hitting the runway. For a brief moment, time and ten tons of aircraft hang heavily on one's hands.

The idea of landing in the grass was mentioned and immediately discarded. One has only to picture the "grass" at some airfields to bring a shudder, and the thought of the Fosdick digging a furrow and causing the aircraft to roll tail over hardhat during the slide is not reassuring.

In addition, we have a few questions for the experts.

1. How far will a Tracker glide from fifty feet, 100 knots, no wheels, no flaps and props feathered? How far back on final should a pilot feather if he wants to put the aircraft down on the first third of the runway?

2. Does the inclination of the Fosdick cause the Tracker to fall to the left and then slide into a turn to the left? Marks on the runway at Pat Bay seem to indicate that it might.

3. If the aircraft is on fire by the time it comes to rest, should the crew stay with it until the crash crew arrives, or should they get out? Sounds silly at first, but our fire-fighting types say you have a better chance if you stay in the aircraft.

Lt AR Horner
Sqn FSO

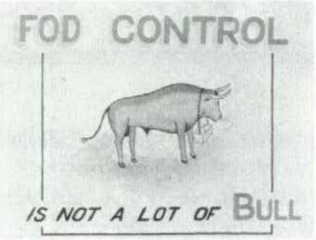
1. The answer cannot be found in the tables to MICN 3-35-11 or by using a slide rule. Too many variables exist, such as gross weight, speed at feathering, wind, to produce a fixed distance. It is suggested that a ballpark figure could be established by taking the aircraft to altitude, setting up the approach angle and speed with engines feathered and noting the rate of descent. It is simple mathematics from this point to obtain an answer in horizontal distance.

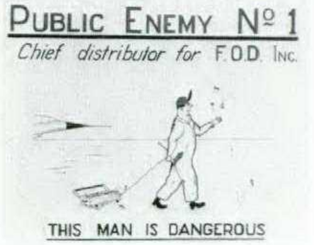
2. The Fosdick is centered on the aircraft and theoretically should not cause a turning slide in either direction. Again, numerous variables exist, such as assymetric loading, crosswind conditions at touchdown or a propellor blade striking the runway. Seldom, if ever, in a wheels-up landing will the aircraft slide straight to a halt.

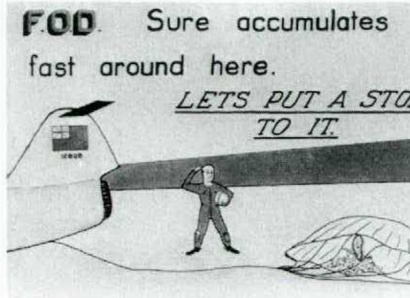
3. There are varying opinions on this one. It is this writer's view that if a fire exists when the aircraft comes to rest and the firefighting equipment is in position ready to fight the fire, then the occupants of the aircraft should remain where they are. If, however, the crash equipment is not on the scene when the aircraft stops, the crew should vacate, and fast; that fire is going to get much worse before it gets better.

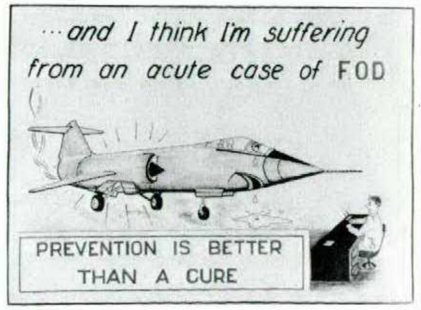
POSTER PAINTER PROMOTES PREVENTION PROGRAM

The FOD campaign at 4 Wing, Baden-Soellingen gets a continuing visual boost from a set of coloured posters displayed in maintenance and servicing areas. While the ideas of several persons are employed, the posters themselves are the work of LAC A Grennan who incorporated the suggestions and painted the posters. Looks like a red-hot project, and LAC Grennan is to be especially commended. Most stations have talented personnel—could be they might like to try a hand in something like this.









ARRIVALS and DEPARTURES

CF100, TWO MEN INJURED The canopy was removed to provide access for an intercom snag repair. The two sears which were uncovered by the canopy removal were by oversight or neglect NOT safetied. Apparently, during removal of the locking wire from the seat charge retaining nut, the sear was withdrawn from the canopy firing unit, resulting in the canopy firing unit being discharged, the canopy links fired and the canopy rails ejected.

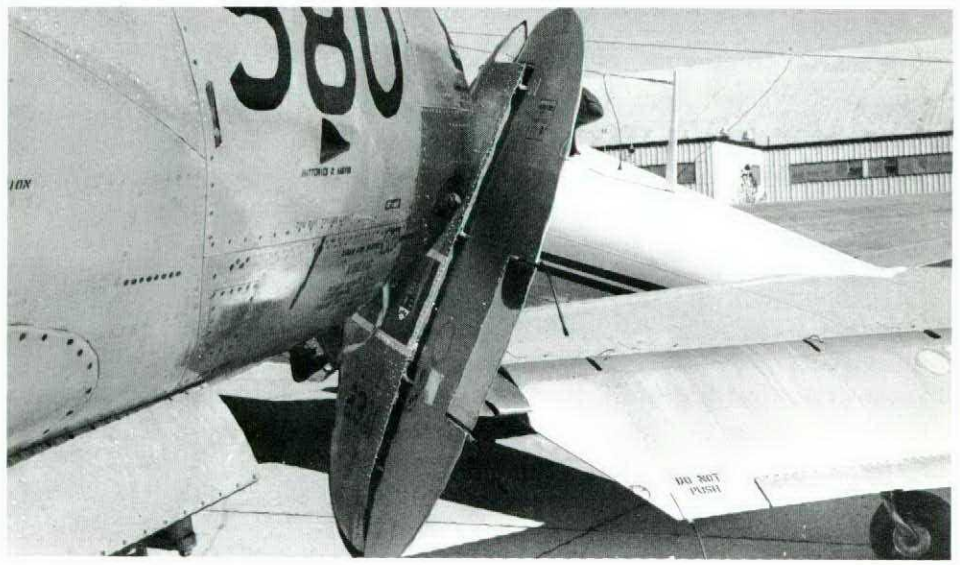
The explosion threw one man back on the wing; the rail struck the hangar rafters and rebounded striking another man in the back. To help us understand accidents of this sort it certainly would be of help to have a text book on "The Psychology of Carelessness" as the man at fault had removed many canopies before.

F86, NOSEWHEEL SNAPPED OFF While awaiting a planned takeoff time at the end of the runway the pilot engaged the parking brake. On releasing the brake, power was applied to commence taxiing. The aircraft with nosewheel steering engaged, started a turn to the right. The pilot thought he had lost his nosewheel steering and applied power and left brake to re-engage the nosewheel. In actual fact nosewheel steering had not been lost; the tendency to turn to the right was because the right parking brake had not been completely released. Thus the high power and left brake were forcing the still engaged nosewheel at right angles to the direction it was pointed and finally caused the oleo strut to fail.

While the pilot may have erred in applying too much power, this accident points up the poor design of the Sabre parking brake. Although there is normally little need for a pilot to use parking brakes in a Sabre, if he does, he should ensure that both release properly before taxiing.

EXPEDITOR, HIT A T33 Following a routine training flight the aircraft was landed without incident and taxied to the ramp with the instructor at the controls. A strong wind required the use of differential power in taxiing and as the aircraft was turned to enter the ramp area the wind effect tightened the turn. Opposite brake and power were applied; in fact full opposite power was applied with no effect. The aircraft had now gone through nearly 180° and in order to avoid striking a parked T-Bird head-on, the pilot elected "to intensify the turn in the hope that a collision could be avoided". The port wingtip grazed the tip of the T33 nose section and the aircraft was brought to a stop by the impact of the port stabilizer against the T33.

The accident occurred because the captain found out too late that he had little or no braking; he failed to establish this by braking to a halt after the turn off the runway. An abnormality in braking performance had been observed earlier by the student pilot but he had not informed the captain of this. Prescribed procedures, in this case a brake check following landing contains the collective wisdom of experience. Failure to perform this check is turning your back on the lessons learned by others.



CF104, FOD AGAIN! From an Air Div Flight Safety Bulletin: "On the start-up it was noticed that the rpm increase was unusually slow crawling up from 10% to 40%. At 40% the increase stopped completely for some 30 seconds before the rpm continued up to idle. The takeoff was normal, but during flight, speed and power seemed low in comparison with other aircraft. This oddity had been noticed on previous flights; four flights back the pilot noticed that he needed 2-3% more rpm than other aircraft to keep up with them. However, all pressures and temperatures were normal and a subsequent ground check including a run-up failed to indicate that any problem existed.

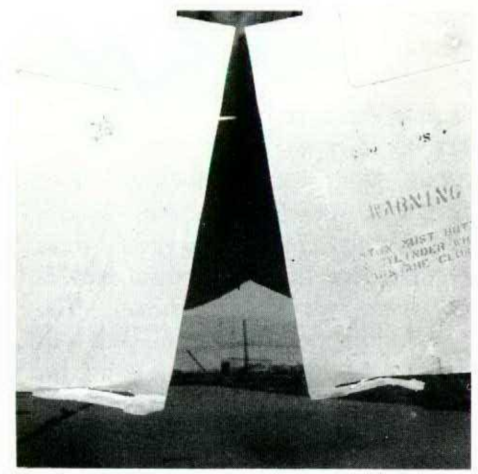
Shutdown of the engine was normal but because of the slow start in the morning the pilot requested that a start be carried out by the groundcrew during the BFI to ascertain whether the problem was in the aircraft or in the starter unit. When the groundcrew went to start the engine they found that it had seized during shutdown. Further investigation revealed that a number of turbine stator blades were missing.

The amazing lack of strong symptoms of this serious engine condition, which apparently had existed to some extent during four flights, calls for special attention. The aircraft had only 13 hours flying time since the last periodic inspection. Only chance—or benevolence—prevented the next inspection from being performed by AIB."

This is an excellent example of almost failing to recognize a warning that could have spelled disaster. When one aircraft performs much differently from all others there must be a reason—and that reason must be found even if the abnormality is within the limits prescribed in the EO. Failure to do so could result in a major accident. This applies to all aircraft, not just the CF104.

T33, WHEELS UP After completing a touch-and-go landing, control was handed to the man in the back seat and a closed pattern was commenced, the pilot at the controls, (they were both instructors) stated that he extended speed brakes, reduced power, selected flaps and reduced speed—something missing? As the aircraft crossed the button, control was returned to the man in front who proceeded to overshoot for another closed pattern. It was then that "a scraping sound was heard".

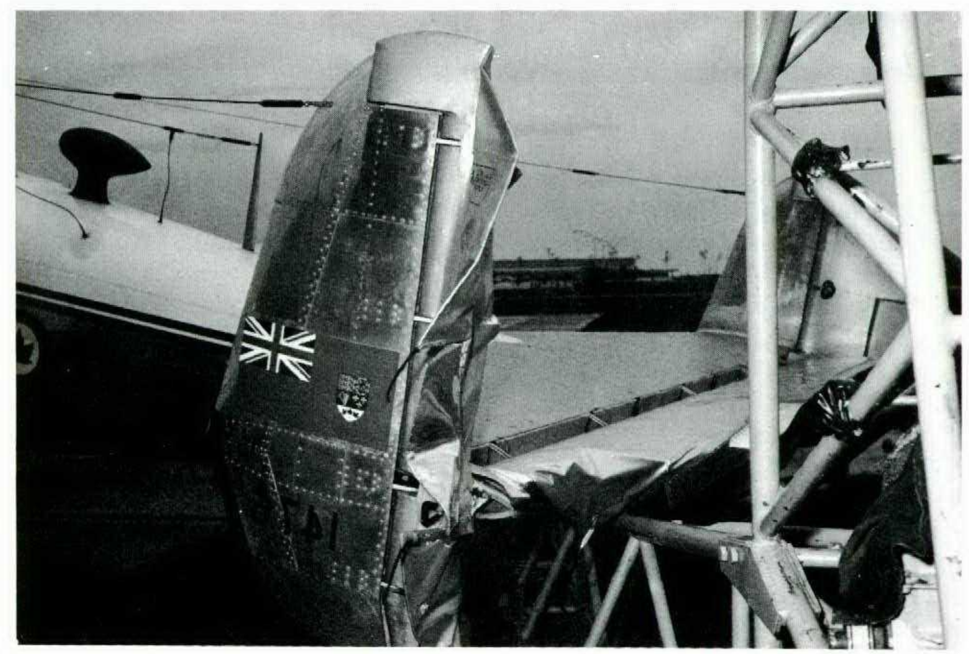
There is little that can be said at this late date about wheels-up landings or even about the old fiasco about who has control: it does seem unusual that two experienced pilots would get caught on this old-timer. In addition, over the button within seconds of landing is a poor time and place to be changing control.



EXPEDITOR, POWER-OFF TAXIING An Expeditor was taken out of the hangar and parked for a morning flight. The parking brake was on and two chocks were used: one for each wheel—one fore and one aft on the main wheels. About three hours later the aircraft was found to have "jumped the chocks" (?) and driven by a high gusting wind into a nearby crane. Extensive airframe damage to the tail section resulted when this aircraft was parked contrary to instructions.

The wind conditions were reported at 26 mph gusting to 37 mph. No warning of high winds, which had earlier been light, was issued by the MET section.

Looks like everybody dropped the ball on this one.

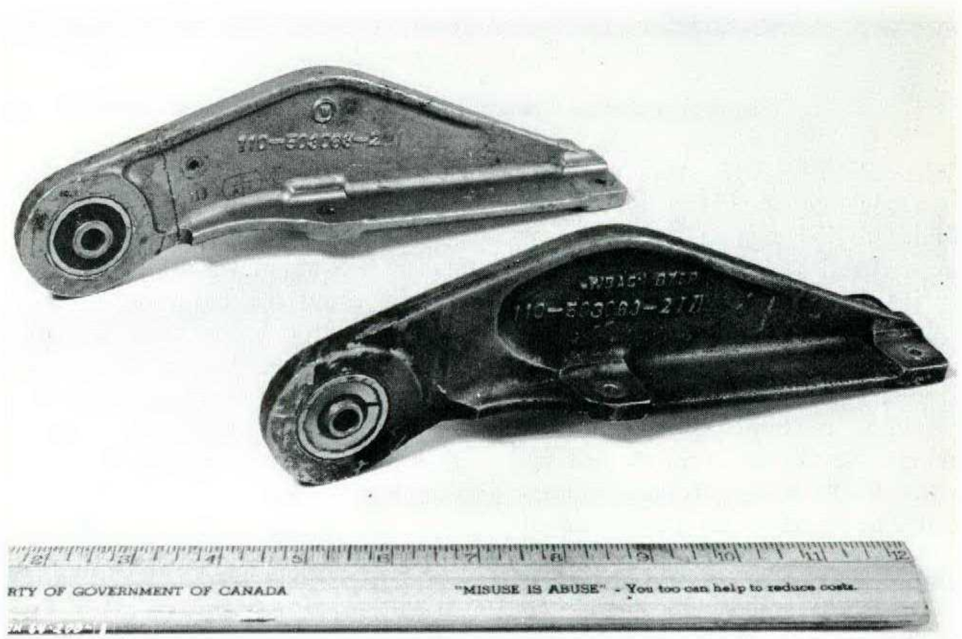


C47, NOSED OVER During a ground runup with an airman at the controls the aircraft's tail lifted in the air bending both the propellers. Despite the aircraft being parked into wind, a gust had lifted the tailplane causing damage to both engines and propellers.

A wind warning had been issued earlier in the day stating that winds could be expected to gust to 50 mph. The wind warning had been issued to aircraft servicing sections but had not been received by the Repair Section.

It had been difficult to assess the direction of the wind and gusts due to the proximity of the aircraft to the hangar. In any case, running up an aircraft in extremely gusty conditions such as this should be deferred. The time lost is surely better than the money lost and risk of injury.

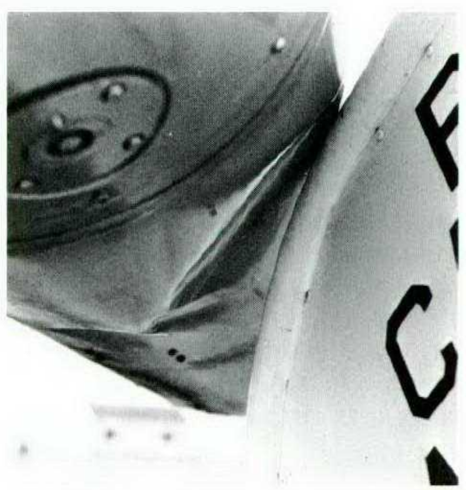
C119, U/C DOOR BROKE OFF It isn't only aircrew and ground personnel working on and around aircraft who cause aircraft accidents. Recently, a C119 pilot had to abort takeoff at 90 kts; when reverse thrust was applied, all three hinges of the port undercarriage door broke. Investigation of the hinges revealed that they were a type no longer in use and should have been replaced during a special inspection some twelve years before. The special inspection, now rescinded, was so old that the technicians who installed the door were not even aware of it. The cause was assessed as "Supply Depot Personnel—Carelessness". It is not often that Supply gets the direct blame for an aircraft accident but the hazard of issuing superseded parts ostensibly as new, is obvious.



T33, RUNAWAY STAIRS The T33 was parked, alone and defenceless, when across the apron hurtled a three-wheel loading stairs, driven before the wind. The perambulating stairs easily out-distanced several pursuers, who arrived at the scene of the accident in time to witness the impact as stairs and airplane collided. Someone had left the brake unlocked.

The high winds which had driven the stairs across the apron were noted as "not predicted": perhaps Met sections should bear in mind the possibility of wind accidents occurring in hangar areas.

Someone had left the stairs unattended with the brake off; that person is obviously the culprit in this case. But the high winds which had driven the stairs across the apron were noted as "not predicted". Admittedly freak gusts are almost impossible to forecast. On the other hand this accident points out an area that may merit special attention when the Met officers are forecasting surface winds. It can be very important to technicians responsible for ensuring that aircraft are properly chocked and not damaged by high winds and flying debris.



BIRD WATCHERS' CORNER

NO-KNEED SLACK LAP-STRAPPER

The Strapper, in his pre no-kneed configuration, put comfort before commonsense when flying, by cinching up the slack on the lap-strap with the shoulder harness. No-Knees' posterior then had the utmost mobility—essential for maximum circulatory comfort. Strapper found pins and needles intolerable. Now, crutches and recriminations are his sole support; the ejection was not a complete success. Strapper's posture slumped badly on bailout—an unbridled bottom slipped forward extending two knees into the path of the windscreen frame. From the hospital window Strapper emits his characteristic call:

CALL: KNEES, KNEES, CAN'TDOWITHOUTTHESE

Contributed by: S/L HE Brown

STOP

FOD

THIS DAMAGED AN AIRCRAFT