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ACCIDENT INVESTIGATION

Comments

■ The crash of an Argus aircraft into the sea off Puerto Rico in March was the tragic culmination of a virtually unblemished flight safety record in maritime anti-submarine operations. Since 1951, combat-condition exercises have not cost us a life - a record, and a tribute to the men and the aircraft they fly. At low-level and often under appalling weather conditions, over 350,000 hours have accumulated without a major mishap; it seemed not inconceivable that this remarkable record could be sustained. In spite of the operational rigours of anti-submarine warfare, the high competence of the crews and the proven reliability of the aircraft, statistics seemed to support our confidence for continued accident-free maritime operations.

What can we do now with that confidence? Abandon it to the "inevitability factor" philosophy with a fatalistic shrug of the shoulders? Of course, we cannot; this accident, the worst military air accident in Canada in nearly twenty years, should stiffen our resolve to continue the work of saving lives and planes. Tragedies such as this should make clear the purpose of our unending battle with a formidable foe - unnecessary losses of men and aircraft.

This catastrophe should cause some second thoughts among those who with the best intentions, suggest that "the flight safety tail wags the operational dog".



■ Recent conspicuity trials by a major military organization have led to their abandoning the requirement to provide high-visibility colouring in aircrew clothing. Conclusions of trials included a finding that coloured garments are not of much assistance for aerial search for persons on the ground or in the water. For this reason, we are told, there will no longer exist a requirement to provide aircrew clothing with this characteristic. However, this decision is made with the knowledge that aircrew are provided with other conspicuity items, such as a dinghy and a panel-type garment.

- 1 EDITORIAL
- 2 END OF THE LINE FOR NEPTUNE 115
- 5 GOOD SHOW
- 6 EVER PLAY RUSSIAN ROULETTE?
- 10 AN L14 FOR HUMANS?
- 12 FLIGHT SAFETY IN THE CANADIAN ARMY
- 18 FROM AIB FILES
- 20 ARRIVALS AND DEPARTURES
- 23 COMMENTS TO THE EDITOR

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ROGER DUHAMEL, F.R.S.C.
Queen's Printer and Controller of Stationery
Ottawa, 1965

With the introduction of the CH113A Voyager helicopter Canadian Army aviation enters a new era. No longer will the air vehicle concern only a few specialists in the Artillery and Armoured regiments but will be in almost daily use, one way or another by nearly every unit in the field army. Every staff officer will need to know the capabilities and limitations of this new and versatile vehicle. Commanders and staffs at all levels must learn to make the most effective use of available aircraft.

Modern war imposes an increasing responsibility on the Army aviator. Accurate and immediate intelligence about the enemy becomes ever more important and the reconnaissance and artillery pilots play an especially valuable part in gathering information. The transport helicopter is a vehicle which will play an essential part in logistic support of the field army, and which will permit tactical flexibility never before possible.

In war, the aircraft in the brigade group will be invaluable - and the circumstances will probably be such that they may also be nearly irreplaceable. A commander's aircraft will be among his most carefully husbanded resources. There will be losses enough due to enemy action. Losses due to accidents will NOT be acceptable.

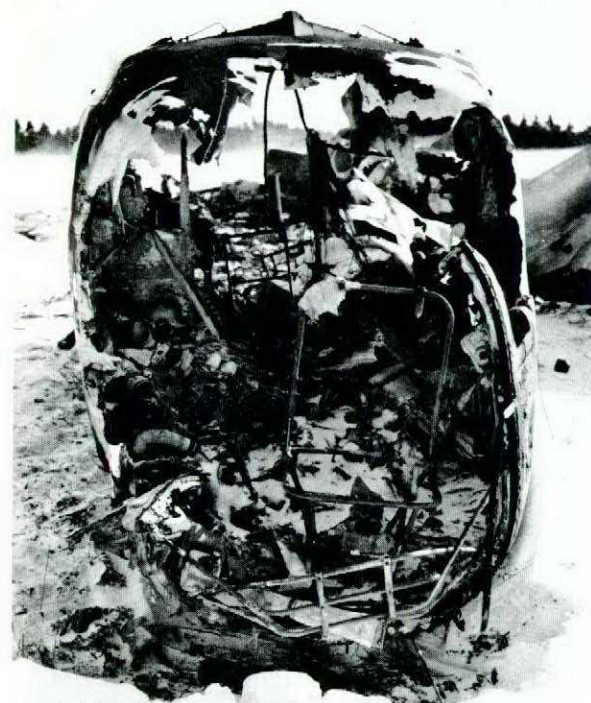
If we are to avoid accidents in war we must emphasize accident prevention in peace. Although the pilot and the mechanic who are working with the aircraft every day are directly concerned with flight safety, responsibilities for accident prevention does not rest with them alone. Commanders at all levels are responsible for the conservation and proper use of their own resources. They must ensure that their aircraft are properly used for the tasks for which they are intended; that excessive demands are not made upon their pilots; that their pilots are properly trained and briefed; and they must also ensure that the problems of the aviators receive reasonable consideration from their staffs. At the same time the engineers and the training organization are responsible for ensuring that they present the field force commander with aircraft equal to the task and for providing pilots who are well trained for the work they must do.

Flight Safety is now and will continue to be everybody's business.

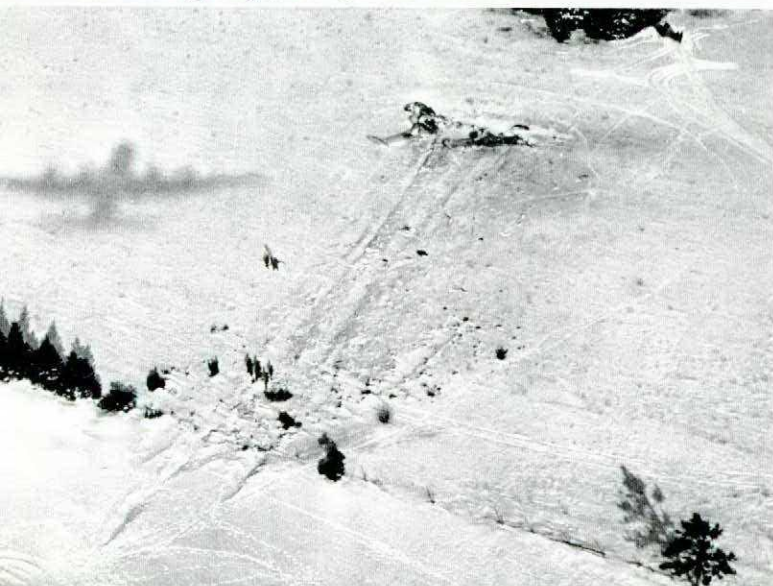
LIEUTENANT GENERAL JV ALLARD
CHIEF OF OPERATIONAL READINESS



At the edge of a small woods three men sit on a log staring across a snow-covered field at a slowly ascending pillar of black smoke like a gigantic black finger pointing at the remains of their Neptune aircraft. Of little comfort to them as they sit in the chill wind is the knowledge that this was the RCAF's first Neptune writeoff in more than 130,000 hours since its introduction ten years before. Now that it had happened, there was time to ask whether it could have been avoided.



Aerial view showing impact point, tree hedge, and in the upper right, the edge of wooded area.



END OF THE LINE FOR NEPTUNE 115

Actually, this one had been a long time coming. Looking back, there had been small indications over the years that such a sequence of apparently minor events could occur. There never seemed to be enough convincing evidence or enough statistical support to make an issue of it. It apparently depended on a coincidence too far-fetched to be believable.

It all began on a standard training mission - good weather, the aircraft at 3000 ft, and about 25 miles from base. The student pilot at the controls was demonstrating single-engine performance for which the port engine had been shut down and the propeller feathered. The aircraft was flown for about five minutes on a standard single-engine demonstration sequence with the jets at idle. With the single-engine flying sequence completed, and while cranking the starboard engine, the DC generator (#4) warning light was noticed to be on. This generator on the live engine, had been the only source of DC power other than the battery; the jets have no generators installed. The cranking was either discontinued when the light was noticed, or when DC power from the battery bus became insufficient; in either case, the eight-blade count was not reached. Two subsequent generator resets failed so the radios and other DC electrical equipment and the battery were shut off to con-



serve power. An emergency had developed but with a large margin of power available from those jets there seemed little cause for concern.

The instructor, now at the controls, had turned towards the station, and during a gentle descent to 1500 ft the Neptune approached its home base for a low pass by the tower. The flap was lowered by manual by-pass to about the 10 position; (the hydraulic selector valve, normally electrically operated can be manually operated). The battery switch was turned on momentarily and the jets adjusted to 70% rpm. (Throttle control of the outboard jets is available only through an electrically-operated remote control mechanism.) The power setting on the good engine was left at 2300 rpm and 28 inches manifold pressure (MAP). A low pass 300 to 400 ft on the circuit dead side signalled the emergency, and the aircraft was climbed back to 1000 ft to join the circuit. Undercarriage was lowered, the jets were again adjusted (requiring battery), and on the recip engine MAP was increased to 34 inches for the approach. Again, no attempt was made to increase the rpm.

So far, so good.

The approach was satisfactory and a good landing looked certain; once over the threshold the pilot called for jets off. He had it made - at least he would have - if the jets had responded. By now, the battery power, vital to the control of the jets was too feeble and they remained at 70%. Realizing that asymmetric reverse thrust could not be used on landing and with a possibly slippery runway the pilot decided he would have to overshoot. The undercarriage was raised by the manual by-pass method and overshoot power was called for. The flight engineer now attempted to increase the rpm to 2600 but it refused to respond and remained at 2300 - another victim of the power drain. Then it happened - about half way down the runway - the jets unaccountably quit and wouldn't relight. That feeble trickle from a dying battery had produced a double-whammy - the fuel had been shut off because the voltage, although too low to permit actual control of the jets, was nevertheless capable of closing the jet fuel valves. The system was later discovered to be designed in such a way as to accomplish this shut-off BY ITSELF when the battery

voltage had dropped to approximately half its normal output - regardless of this pilot's requirements to the contrary!

The pilot, now counting on his remaining engine set the MAP at 50" (above the limit for 2300 rpm), tried for maximum height, got to about 300 ft and then found he could not maintain level flight. The only hope remaining was for a descending 270° turn toward the nearest runway. Although the button was not visible, judging from his position in the turn the pilot thought that he might make it; however, a judder indicating an incipient stall signalled the end of any glide-stretching. A forced landing was inevitable. Ahead were two small fields with a wooded area beyond.

The aircraft hit the snow-covered ground, skidded through a tree fence, coming to rest uncomfortably close to a stand of large trees. The crew, uninjured, turned off the switches and quickly evacuated the aircraft which was now on fire and was soon to be a raging inferno.

What Went Wrong?

In a sense, this is a "classic" because the accident has many of the features commonly brought to light in crash investigations. Let's go back to the beginning and uncover the causes in sequence. We suggest you keep in mind your own operation looking for similarities and parallels.

Airmanship dictates that basic to all flight involving the scheduled or unscheduled loss of one engine is the requirement to set the live engine so that maximum power can be applied if needed. Yet in this case the live engine was NOT set up in this manner; contrary to EOs, the locally-produced training instructions recommend a lower power setting. The rpm (electrically controlled) could not be adjusted and so when the time came to use this engine it could not deliver the vital margin of power required to avoid the crash. Let's call this Briefing.

The pilot, realizing that the only source of DC power was his battery, rightly called for the DC services to be switched off, and the battery bus isolated. This was not done completely; the fuel tank boosters and two of the inverters were left on. In addition, and understandably,

the emergency inverter was selected on. This meant that each time the battery was put on (to adjust the jets) several power-hungry mechanisms leaped into life sucking vital power from the only DC source - a source that was sure to fail sooner or later. In this case, for example, large secondary inverters and the fuel tank boosters surged and cycled each time the battery was turned on. Turning all these switches off is complex enough to warrant using a checklist - in an emergency nothing can be overlooked - yet the complete contents of AOs are not available to the aircrew in this form. Let's call this again Briefing and Crew.

Up till the time of overshoot the pilot thought he was flying a four-engine aircraft, with three engines operational, ie, two jets and one recip. This turned out to be a dangerous illusion in an aircraft where the jet engines are remotely controlled by DC electrical current. You might call this Briefing since the Pilot Notes imply that failure of a recip puts the aircraft in a three-engine configuration - yet you might call it Design.

On the overshoot the pilot called for undercarriage "up"; this was done by manual by-pass. (The aircraft crashed with wheels down.) Had the pilot's control been left at the previous selection, the gear, after being raised by manual by-pass would return to down position immediately the manual selector was released, that is, with the battery switch on.

Another point comes to mind, such as a battery overload protection mechanism which would prevent the unnecessary and futile draining of battery power. Such a device could prevent the starter motor from drawing battery power following a generator failure - a possibility in this case. The inadvertent overlooking of other switches could also be a contingency covered by such a device. There's no question that the battery was not in top-notch condition - it's surprising it lasted as long as it did.

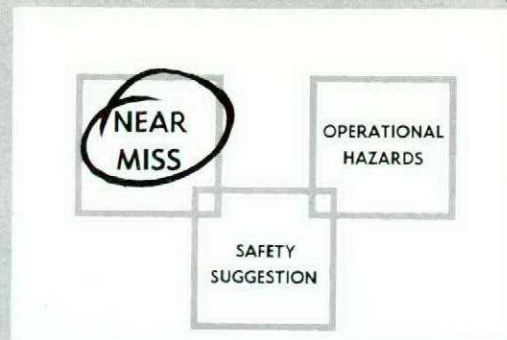
The salient feature of the accident is that not one of the occurrences leading to the loss of Neptune 115 was in itself either a major hazard or in any sense a pressing emergency. But put them all together and the result is a fire-gutted hulk sitting in a snow-covered field.

Expensive Lessons

At this stage, about the only things we can salvage out of the wreck are some lessons - expensive lessons:

- AOs and EOs are the prime source of operating instructions - the engine should have been set at 2600 rpm prior to feathering when ample DC power was available.
- complete checklists for all crew members should be derived from these orders and diligently used as is the practice on an increasing number of air operations. The checklist has acquired a respectability it didn't possess some years ago.
- known design deficiencies should be given maximum publicity; if they can't be fixed they should be constantly publicized as potentially hazardous.

What we have been getting at is this - Neptune operators can benefit from this accident, but the general lessons apply to all our aircraft operations. Those seemingly minor inadequacies, and all those small areas of confusion will, sooner or later, snowball as they did to the crew of Neptune 115. ■



IFRVFRIFRVFRIFRVFR

"My IFR clearance read 'You are cleared to the outer marker to maintain 3000 ft no delay expected'. Two Daks were practicing VFR-ILS approaches on the same runway and were holding altitudes as laid down on the chart (ie, 2400 ft). Clearance for the straight-in was received just before the old needle started to swing around but I couldn't commence descent as one of the Daks was already on the glide path, just inbound directly below me and slightly to the right. Meanwhile the runway was rapidly getting nearer and nearer and after some hectic RT with terminal the Dak below started his 360 left to clear the way for me (he was on a different freq). Swell, power off, gear down, full flap, stuff the nose down and we can still hack it. I looked down and to the left, yep, the Dak is clear, I look forward now and sort of mentally get set for the usual bugsmasher crunch...lookout...there is a Caribou head-on 500 yards away and heading for the outer marker, VFR? - natch. Crank 'er to the right swoosh, crank 'er back, switch freqs, landing clearance please... Rog."

Undoubtedly many more near misses happen than are reported and so we particularly appreciate this anonymous pilot's contribution. Entering a circuit busy with VFR traffic of many different types can be hair-raising, especially if you are on a different frequency and hence not sure of what the other aircraft are doing.

This brings up a point that probably all pilots are aware of, but tend to forget in these days of more and more IFR flying.

Innocently tucked away in article 11.11, CFP 100 (Flying Orders for the Canadian Armed Forces) is this statement: "An ATC clearance does not absolve the pilot from the responsibility to avoid other aircraft when flying in VFR weather conditions".

Pilots have seen and heard this statement many times and if directly questioned probably 100% would give the correct answer. Yet surprisingly, it seems to be known but not practiced.

Flying on instruments strictly according to an IFR clearance and assuming that other aircraft should take avoiding action that may be required, can be dangerous. The other aircraft may assume that you also are VFR and be applying the "Rules of the Air" - or worse still, it may be that he simply isn't looking. Even on top or in the block air space you can't be sure that you won't encounter some character who thinks he is legitimately VFR; this issue has another account of a near miss with a C119 and a fair-weather flyer.



GOOD SHOW

F/O RA REID

At the rotation point of his takeoff roll, F/O RA Reid, 409 Sqn, felt the aircraft nose section of his Voodoo vibrate, then heard a loud report. After reporting his problem to the tower, a CF101 who had departed only minutes before was vectored in for a close look, and saw no damage. The fuel load had to be reduced so the undercarriage was retracted and the intercept mission resumed. On returning to base another airborne inspection confirmed F/O Reid's suspicions of a nosewheel tire blowout; one wheel appeared to be smaller than its mate.

All other aircraft were recalled and landed to permit foaming the runway. An eight-foot strip of foam 4000 feet long was quickly laid between the 3000 and 7000 foot markers. F/O Reid carried out a perfect landing; the damage was confined to one blown tire only.

F/O Reid's quick thinking and good judgement reflect credit not only on his ability as a pilot but also on the training program of his squadron. "Good Show", F/O Reid.



CPL JF BOUFFARD

A general modification to install new improved air casings in all NENE (T33) engines had been ordered. Cpl JF Bouffard, NCO in charge of the engine bay at RCAF Stn Bagotville, noted that when these new casings were installed there seemed to be excessive clearance at the interconnectors. There was no reason to suspect the new casings but to play it safe, Cpl Bouffard decided to keep a close check on the first engine that was returned to service. On the next periodic inspection he found that the excessive clearance had permitted several of the seals on the interconnectors to become distorted and unseated. A check of three other engines in service with the new-type casings revealed that all three were in a similar condition. His suspicions confirmed, the corporal drew up a UCR and suggested that other T33 users should be warned.

Higher technical authority, however, was not convinced that there was any serious problem and explained that the seals had failed because they had been in use too long. Not satisfied with this explanation and for a further check, Cpl Bouffard replaced every seal on one of the engines and again watched them closely. After only 18 hrs flying time some of the new seals had popped out. He now submitted a second UCR and at last had the satisfaction of being proven right. Not only was the clearance excessive but also the interconnectors were slightly misaligned. This condition could well have caused an engine failure in flight.

Cpl Bouffard's technical ability and persistence has made a very commendable contribution to flight safety. His action brings to mind what is too often overlooked - our good safety record is due in large measure to the dedication and sense of responsibility of such men as Cpl Bouffard - "Good Show".

**Ever play russian roulette?
Too risky?
This man gambled, then
deliberately lowered
his odds.**

Only four trips to go - and then a pair of wings. With the long grind behind him, the young cadet was already beginning to feel like a fully-fledged pilot. All those long months of doing each exercise exactly as instructed; even on the solo flights there was little time to really enjoy the flying - nothing but practice, practice, practice until the sequences were perfect. Perhaps now was the time to relax a bit. His last low-level navigation exercise before graduation was scheduled for 1100 hrs the next day. Low-level flying had been his preference to other parts of the course: "If only my transfer after graduation is to 104s" he thought, "low-level flying should really be exciting then!"

The cadet, and a couple of friends, had had a "night on the town" and feeling a little hung over in the morning, had missed breakfast. However, as 11 o'clock approached he had begun to feel better, and since he would be airborne over the noon hour, was looking forward to a box lunch before flying. As eleven o'clock neared and still no lunch, his hunger gave way to his mounting enthusiasm for the low-level flying exercise.

The weather was perfect and the air smooth. As authorized, the trip was to be flown at 800 feet above ground but conditions seemed so ideal that surely there would be no harm in easing it down a little. Besides, as this was the last low-level solo it would also be the last chance for some "fun" before the end of the course. The chances of getting caught seemed remote; he was on a recognized low-level route and the ground below was sparsely populated.

As the aircraft flew lower, the sensation of speed became much more acute as the tops of the trees whipped by at five miles a minute. It was thrilling, but navigating at that height was much more difficult - the horizon narrowed and pinpoints were unrecognizable. In fact, just looking out ahead and watching for obstacles left little time for map reading and reference to instruments.

Finally, he spotted a railroad; a check of the map indicated right of track. He turned left and flew a little higher now concentrating on navigating to recover his track and timing. He found the turning point; by now, he was on time and on track. The next leg went well and the turning point, a large lake, was located without difficulty. Feeling sure of his position and timing, this third leg presented a fatal temptation.

He zoomed over a farm house just a few feet above the roof and was by, almost before he knew it was coming. With every sense at its peak of awareness he inched the aircraft lower and lower. The trees whizzed by underneath at terrific speed. Suddenly, with a sickening feeling, the cadet realized he was too low and pulled back on the stick. The rising ground seemed almost to zoom up, and in an instant the aircraft hit the trees. For 250 feet the T33 sheared through the treetops

and then climbed just clear. By then, out of control and flamed out the cadet ejected but the altitude was too low even to achieve seat separation. The aircraft came to rest completely broken up. Strangely, the cockpit area was in remarkably good shape.

Do tragic accidents like this happen only to the inexperienced? Statistics prove otherwise. Just three months later a very experienced jet pilot decided he would get his thrills and at the same time impress his friends by performing some low-level aerobatics. The show was all too impressive - all it took was a slight error in judgement at the bottom of a loop - we had another senseless fatal crash. Flying regulations don't just happen - they're created for a reason.

These rules evolve from the experience of many years of flying in the forces. But there are times in a pilot's career when the temptation to break a rule (usually for thrills or to impress someone) becomes very strong. The very experienced pilot may feel so confident in himself and his aircraft that he will take foolish chances. The inexperienced cadet similarly may think the latter phase of his training is just the time to cut loose. This is the time when a student may risk flying in a manner that he knows is dangerous - and exciting.

Let's put it bluntly - this cadet gambled his life against these odds:

- overconfidence
- inexperience
- slight hangover
- risk of hypoglycemia (near-starvation level of blood sugar) from missed meals.

Stated in this way, can any other conclusion be drawn?

LOOKOUT!

The captain of a C119 on an IFR flight plan from Downsview to Montreal spotted a light aircraft dead ahead at close range coming in the opposite direction. Both aircraft turned to their right and passed each other at close proximity. The C119 was cleared to fly at 7000 feet and the altimeter was rechecked and found to be set correctly. Montreal Centre had no flight plan and no contact with this aircraft although Ottawa radar were tracking him inbound. The aircraft was later identified as being flown by an inexperienced pilot who was "VFR" at the time.

The pilot quite rightly asked "Why was this light aircraft flying the incorrect altitude for direction of flight on an airway above a broken to overcast layer without an IFR flight plan?" It would seem that there's no satisfactory answer - except that everyone in the air must keep a sharp lookout.



Note the snug fitting neck and wrist cuffs.

**COVERALL
FLYING
ANTI-EXPOSURE
QUICK DONNING**



Perish the thought, but ditching into the deep may someday be your lot. Obviously, the sartorial inelegance of the man on the left invites not-so-funny quips, like, "It's in the bag, eh Harry?" Not that our man on the right (F/L Hal Fawcett of DFS) could feel *de rigueur* at a Governor-General's Ball, but for keeping his powder dry, looks like he's in good shape.

The time-expired ditching suit on the left is being replaced by a late-model US Navy item which we'd like to publicize. The quick donning anti-exposure suit consists of a coverall with hood and gloves, and is made of a neoprene-coated nylon cloth in "Indian Orange".

The suit itself is closed by a watertight slide fastener (dark lines on suit are the watertight rubber covers of the zippers). The neck and wrist seals are of cotton elastic webbing. The insulated gloves are three separate glove assemblies all of which fit within each other to form an integrated unit. Cotton elastic webbing is incorporated on the wrist portion of the inner shell. The hood, which is carried in one of the pockets, can be readily put on; a secure and relatively comfortable fit is assured by an inflatable chamber which can support the head in the water. The boots are part of the coverall and have adjustable ankle straps.

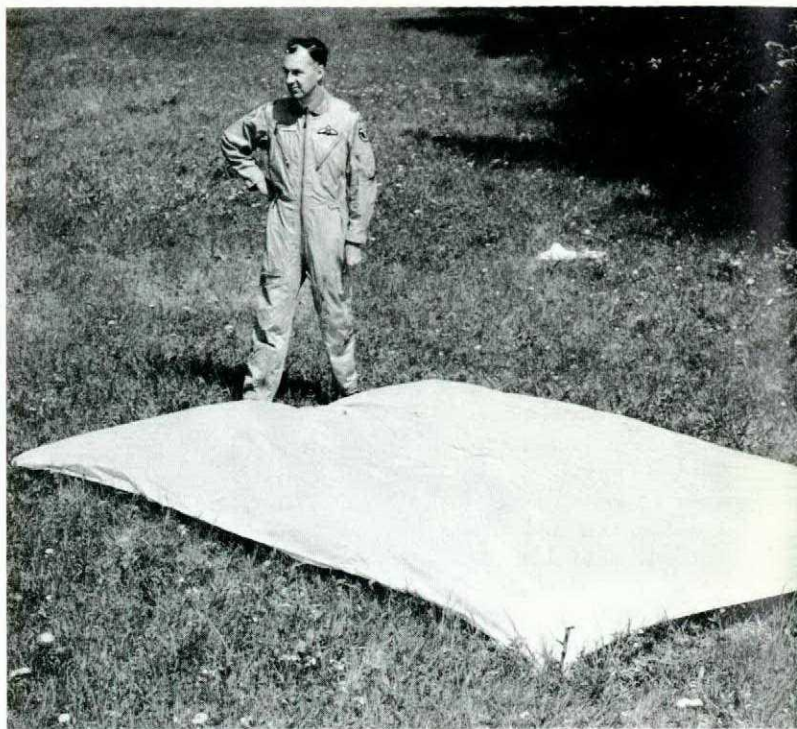
The pucker-up drawstring neckline of yesteryear would no doubt have filtered the fish from the water as it poured into the suit, but... Also, the inflated hood plus the waist belt should make the risk of the "feet-up float" just another grim memory. As to the colour... ahem!

CONSPICUITY PANEL

In a previous article on the orange flying suit (Don't Colour Me Orange) we mentioned that work was going ahead on an idea to enable downed aircrew to mark their location in as conspicuous a manner as possible. Despite a flying suit providing a very limited area of bright colour to spot, the philosophy of the day was "Well, it's better than nothing". Unfortunately, it's so close to being nothing that more conspicuity is needed.

Now, with this new rescue aid, a downed airman can lay out a panel of extremely-brilliant coloured nylon (day-glo), approximately 8 feet by 9 feet - or, about 10 times more area than a man lying spread-eagled on the ground. This panel is folded to form a shallow cushion and is fastened on the inside of the back-pack parachute where the optional cushion is now. As the photograph shows, this panel easily out-performs the orange flying suit! Besides providing increased conspicuity the panel can be utilized for shelter, signals, etc. Presently, user trials of these packs will determine their degree of acceptability as a back cushion.

We feel that this is the best answer yet to the conspicuity problem.



The relative reflectivity of orange suit and panel is shown.

HOTTER 'N' ...JP4

Dermal hyperaesthesia? Of course, but when your back's on fire ...

"We were planning an early morning takeoff for a flight from Goose Bay to Ottawa. The weather was good but due to the headwinds we wanted every drop of fuel the bird would hold. It was cold outside and we decided to do the external and strap-in while still in the hangar. We could then be simply towed out and started and thus avoid the discomfort of the below zero weather.

I am a qualified T33 pilot but was flying the back seat this trip. While the captain was doing the external, I thought it might be a good idea to double check the luggage carrier that was slung underneath because I knew of cases of it coming adrift in flight. While I was underneath the wing checking the safety clips, the captain who was opening each fuel cap to ensure the tanks were full, opened the cap on the port main wing tank. The warmth of the hangar had caused some expansion and as the cap was removed, about a quart of fuel ran down the wing. "Did any fuel get on you" he called. "I don't think so" I replied.

I stood up and the captain and an airman inspected my back. There was just a small spot and it appeared already dried. Thinking about it now, I imagine it was about a cup or two but as the winter flying suit is quite porous it had been immediately absorbed. I was well

aware that fuel-soaked clothing next to the skin can cause painful burns but in consultation with the other two, we all agreed that this didn't seem to be enough to bother about.

Takeoff and climb were normal and I had almost forgotten the spilled fuel until just as we were levelling off, I began to feel a little heat on my shoulders where the harness straps applied pressure. I discussed this over the intercom with the captain and remarked that my suit must have absorbed more fuel than I thought. But, if we returned to Goose Bay we would lose a lot of time, and there was the problem of getting another flying suit. I decided that it wasn't too bad and that we could carry on. As time went on, my back was getting hotter and hotter until about the time when we reached the point of no return, I realized I was in real trouble.

By now, I had undone the straps to relieve all possible pressure, but still the searing heat remained. It reminded me of my boyhood when my mother once left a mustard plaster on too long, but this was even hotter and there was no way I could get it off. I squirmed around trying to relieve all pressure of clothing off my back but it was impossible; complicating this I was wearing one-piece long underwear. The pain was becoming excruciating. I was really concerned not only because of the pain, but it felt like holes were actually being burned into my back right to the bone and I feared permanent disability. We were heading for the nearest suitable airfield (Bagotville) and I was beginning to wonder if I could last that long. The pain was so intense that I even debated bailing out figuring that the captain in the front could still land the aircraft safely without

the canopy. Had the terrain below not been so inhospitable, I think I would have. However, I managed to stick it out and we landed safely at Bagotville. You can bet that the first thing I did was strip to the waist in spite of the cold weather.

I went immediately to the station hospital for treatment, and was somewhat surprised in view of the pain that there was such little evidence of the fuel burns. There were two red blotches on my back, each about double the size of a hand. It looked like a bad sunburn. The SMO thought that I would probably be laid up about a week but fortunately it didn't take that long to sub-

side. However, my skin may be permanently discoloured where the blisters were.

Looking back at it now, I realize how foolish it was to take off with fuel on my clothing. I was well aware that fuel leaking from a lighter, for example, can burn the skin but I had no idea that such a small amount as apparently spilled on my back could cause such extreme discomfort. Believe me, if I ever spill fuel on my clothing again, I'll make sure that it is completely removed from the cloth before I go flying. I can't be certain but in this case, had I been solo I think I would have had to bail out."

"Flash-Back"

"After I had read the sign on the railway station I knew where I was ..."



AN L14 FOR HUMANS?

F/L DA Gordon
Area Social Welfare Officer, AMC

A board of inquiry sits pondering the evidence; witnesses, the aircraft specialist, the pilot's acquaintances - everyone, in fact, who can shed some light on the unexplained circumstances has had his say. It adds up to this:

- the aircraft flamed out in formation and was unable to re-light a good runway was nearby - it looked like a "no-sweat" operation
- he was escorted down by his number two who stated that the pilot appeared to be coping just fine
- the aircraft was too high on final and dived toward the end of the runway
- the aircraft crossed the button at more than twice the approach speed - the impact was so severe that the aircraft bounced for 3000 ft, crashed and burned
- the aircraft had no other unserviceabilities as far as could be determined from an analysis of the wreckage.

The pilot, experienced on type, had everything in his favour, yet by a misjudgement had put himself in a forced landing pattern situation which he could have salvaged with some straightforward flying skill but failed to respond. The story lacked a vital piece of circumstantial evidence until the investigation brought to light the fact that this pilot had serious personal problems.

Social problems may be the real cause of many more accidents than is generally realized. F/L Gordon's training and experience in social welfare make him well qualified on this subject. His article is well worth reading and should give pause for some serious reflection.

Most articles that appear in Flight Comment make the point that major accidents result from a combination of causes; the most baffling of these is the human factor. The complexity of the human machine often makes it virtually impossible to establish the degree or nature of human error that can be assessed as an accident cause. However, because the human

factor is complex and difficult to assess does not mean that it should be given lip service and then ignored. A pilot who observes a malfunction in an aircraft, writes his description of the occurrence in the L14 and expects corrective action to be taken. How about an L14 for humans when they show symptoms of malfunctioning?

We all have problems of varying degrees at one time or another but we each have a different tolerance or ability to respond to these problems. One individual's reaction to a minor personal matter may be as severe as that of another person with an obviously distressing personal problem. If a man's wife or child dies we recognize his grief and do not expect him to shoulder heavy responsibilities until he has dealt with his grief. In fact, in our culture we are critical of a person who does not display the expected amount of public grief. This is a very humane and sympathetic attitude but also a very practical one. We do not expect a grief stricken person to return immediately to productive work and it is recognized that he could do untold harm if obliged to work under such stress. On the other hand, we do not expect a person to get unduly shaken up over a very minor situation. Our work as welfare officers brings us in contact with persons who are attempting to fulfil their professional responsibilities while trying to cope with a distracting personal problem. These problems vary in degree - what would your response be to these typical situations?

- Your wife announced she is leaving.
- You finally admit to your increasing dependence on alcohol.
- You feel unwanted and rejected, a misfit at work and in barracks.
- Your debts have piled up to the point where you don't know where to turn and the seizure of your car and furniture is imminent.
- Your son is to appear in juvenile court for theft.
- You are discouraged and despondent at lack of advancement.
- A member of your family is ill and you have to leave on TD or course for several weeks.
- Your son leaves school and runs away.
- Your parents are dangerously ill.
- Your wife says she won't accompany you on transfer.
- You lose confidence in yourself, are discouraged and see no purpose in life.
- You have been separated from your family for some time and there is no prospect of finding accommodation for them.

Social welfare statistics for 1964 show that 2148 RCAF personnel faced these or similar problems. This represents 4.4% of total strength - a high figure when you realize it takes only one person to cause an accident.

We may know someone who has continued to operate with apparent efficiency when labouring under terrific personal obligations. To a person beset with problems, work may be beneficial as therapy if he can "lose himself" in his work, but can we really count on this person turning "off" his mind? We can get away with day-dreaming in many of the routine tasks but what happens in an emergency when the "routine" disappears and instant decisions are made? I have airmen tell me they have worked all day on the line and were scarcely aware that they were there. This is the man who can clutter an aircraft with FOD, who can forget a normal routine procedure, who can be the cause of your next accident. That man might be you.

I recall a pilot who had serious drinking and domestic problems which had been well known to his superiors for several years. He seemed determined to destroy himself through alcohol and given a few years more he had a good chance of making it. One day I received a call from his wife that he had been home for lunch and threatened to "take an aircraft up and go straight in". I reported this threat to his supervisor informing him of this man's periods of depression and his irrational and irresponsible behaviour towards his family. Unfortunately, the supervisor failed to acknowledge the very significant relationship between the officer's social and personal conduct and his ability as a pilot, and he rejected the suggestion that restrictions might be considered. A few months later this pilot was killed in the crash described at the beginning of this article. Several factors contributed to this accident including, of course, mechanical failure in the aircraft but possibly of prime importance was the human factor involving a chronic alcoholic who had previously expressed suicidal thoughts.

In his book "Human Factors in Air Transportation", Dr Ross A McFarland writes, "...stresses may be cumulative, and under such conditions airmen may be more subject to inattentiveness, lapses of memory, and errors of judgement than if they were physically ill". In discussing a problem with a fire fighter he told me he was unable to concentrate on his work and began to catch himself making mistakes in his routine duties. This reminded me of a fire fighting display that I witnessed once. The NCO built a monstrous fire of debris and gasoline and when it was burning

furiously he proceeded to demonstrate the efficiency of his fire extinguishers. Unfortunately, none of the four extinguishers worked. This was embarrassing to the NCO and amusing to the spectators but would hardly appear humorous to a pilot who needed an extinguisher in a burning aircraft.

A few years ago a pod of rockets fell to the runway from a taxiing CF100 and subsequent investigation revealed that it had been improperly attached. A check of the remaining aircraft showed two cases where proper procedures had been overlooked. The same thing occurred the next day and the airman responsible was taken off the line. It developed that he had serious domestic problems which gave him so much concern that he had been unable to eat or sleep properly; his mind was constantly on his personal affairs. He quickly deteriorated from a very efficient tradesman to a man who could not be trusted. The circumstances of his marriage were most unhappy, and offered little prospect of improvement.

It would be naive to suggest a simple remedy to the problem of accidents caused by human errors. However, a few comments based upon considerable experience in observing individuals working under the stress of social problems are perhaps in order. My strong impression is that supervisors and section heads too often know very little about the personal lives of their men. The standard phrase on assessments, "He has no known financial problems and his family affairs appear to be above reproach" really means "I can recognize him at work but I don't know a damn thing about his personal life". A supervisor may be able to recognize the black and white emotional situations but how about the gray in between? The person who is emotionally upset for reasons not apparent on the surface can be miles away from his job mentally and a real threat to flight safety.

The individual himself is often fully aware that his effectiveness is reduced when he is worried or upset. He may even decide to remove himself from responsibility during periods of emotional stress; I have known airmen to take leave because they just could not concentrate on their work. However, many of us will attempt to continue on the job even when distracted by personal troubles. The value of a skilled supervisor

who is sensitive and alert to personality and behaviour changes is of utmost importance here. A good supervisor will know his men well enough to be able to detect personality changes in them.

When a supervisor suspects that one of his men is emotionally upset or struggling with a personal matter he has a responsibility to become involved - not only for the welfare of the individual but in the interests of flight safety. He has an obligation to help resolve the problem as quickly as possible. The section head or NCO should closely monitor a man with known difficulties and must decide when a man's absorption in his own affairs makes him a risk on the job. The supervisor can seek professional assistance in making his assessment by consulting the Medical Officer or Social Welfare Officer. It might be wiser to give a man a few days off or put him in a less responsible position rather than risk an accident caused by distraction and lack of concentration.

The human machine also needs maintenance and in this context a good preventative maintenance program pays for itself in greater happiness and efficiency. If you over-stress an aircraft it may need repair - the L14 entry will guarantee that it will be returned to serviceability. An L14 for people sounds like a good idea - those with unrectified entries owe it to themselves and the lives of others to arrange for some preventative maintenance - NOW.



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FLIGHT SAFETY IN THE CANADIAN ARMY

Major GM Henderson

Flight Safety in the Canadian Army got off to a poor start. At Camp Petawawa on 2 Aug 1909 the Silver Dart, which was demonstrating the potential of the aeroplane as a military vehicle, crashed. The Army Council concluded from this that flight was not only unsafe but impracticable. Things have changed since then and the Army is finding more and more uses for aircraft. Three different operational roles are being performed by Canadian Army aviation: artillery observation, reconnaissance, and forward area transport. The purpose of this article is to describe the employment of these aircraft, with particular emphasis on the hazards inherent in operations, and the safety measures used to counter them.

Artillery Observation

One of the first military uses of aircraft was for the observation of artillery fire, and this job is still with us. The air observation post troops of the Royal Canadian Artillery are equipped with the Cessna L19, which is used to elevate an observing officer above terrain features to get a better view of enemy territory. The troops are an integral part of the artillery regiment, and deploy and move with the regiment. Only in this way can aircraft and pilot provide the close support and quick response that is required. It follows that the aircraft landing ground must if possible, be in the regimental deployment area. The operational hazards are of two kinds; those encountered on the ground, and those encountered taking off, flying and landing.

The troop on the ground, with its vehicles and aircraft, must remain concealed from the enemy air observer, as must all forward area army units. The tracks made by the aircraft in landing, taxiing and taking off are most difficult to conceal since they must be on an open area. While the aircraft is on the ground it must be marshalled into cover and camouflaged. All servicing and maintenance must be done under camouflage. Since the unit must always be ready to move at short notice, maintenance must be done so that aircraft are ready to fly with the least delay.

The artillery observation aircraft must take off from and land on an unprepared area, often confined. The departure route and approach must be done at such a low level that the enemy ground observer will be unable to

locate the landing ground through detecting the movement of the aircraft. Ideally, approaches and departures should be carried out in such a way that the aircraft stays in the ground clutter of enemy radar, although improved radar makes this increasingly difficult. Wind shear is always a hazard in confined areas and in low, slow approaches; a technique for a low reconnaissance or "dummy run" has been developed so that pilots will discover difficult wind effects with the least hazard.

The Air Observation Post pilot is responsible for three primary tasks: general visual reconnaissance, observation of artillery fire, and air photography. The airborne observer is in a better position than any other in the regiment to get a commanding view of enemy territory, although his viewing time is relatively short. Targets discovered will be engaged by the guns of his own regiment under his direction, and additional guns may be made available if the target warrants. In addition to impromptu target engagement, a pilot may be sent up to spot specific targets at specific times as part of a planned fire program. The L19 aircraft is equipped for photography and the troop has its own processing and printing facilities so that air photo cover can be produced quickly and at short notice. It is in the nature of things that most of this photography will be oblique rather than vertical.

When airborne the artillery pilot must maintain a nice balance between his desire to observe his target closely, and the need to keep his aircraft beyond the range of enemy ground weapons. At the same time he must keep an eye open for enemy fighter aircraft and stay clear of the trajectories of our own artillery and other ground weapons. The technique which has been developed consists of flying at very low level over friendly territory and popping up to observing altitude briefly and in different places and at irregular intervals. This gives the pilot a series of short looks and it is essential that he make the best possible use of them. Therefore he must be sure of both location and orientation before starting his climb to observing altitude. Since the pilot flies the aircraft, works the radio, does the observing and manages his own map it can be seen that he is fully occupied. A rear observer is carried to act as eyes in the back of the pilot's head, and prevent him from being surprised from the rear by enemy aircraft.

Reconnaissance

The armoured reconnaissance element of the army employs the light helicopter to enhance the speed, effectiveness and flexibility of the armoured car in the reconnaissance role. A troop of six helicopters is an integral part of the brigade reconnaissance squadron and it lives and deploys as part of the squadron.

Many of the problems encountered by the L19 troop in the artillery also beset the helicopter reconnaissance troop which is equipped with the Hiller CH112. Helicopter downwash can make a lasting impression in grass and can give away landing areas. When on the ground the aircraft must be concealed, but must always be ready for a quick getaway. The reconnaissance squadron normally works farther forward than the artillery deployment areas and therefore ground fire - both our own and the enemy's - is even more of a hazard.

In the reconnaissance role two helicopters are normally teamed with two armoured car patrols in executing



While aircraft is on the ground it is marshalled under cover and camouflaged.



An L19 takes off from a road during training at Camp Gagetown.



Helicopters are teamed with armoured car patrols in reconnaissance operations.

The pilot of a CH112 discusses an operation

the various tasks allocated to the squadron - forward or flank reconnaissance in the advance, covering troops in the withdrawal, route reconnaissance and rear area security. The cars and helicopters work intimately together supporting one another with fire and observation. A helicopter will move forward covered by fire from the cars. When the helicopter pilot finds the way clear he brings the cars forward. The helicopter is unarmed and if it is engaged by fire the cars should be able to provide counter fire to cover its withdrawal. On occasion the helicopters may operate independently without the support of the cars.

The helicopters may also be used for more passive reconnaissance, area surveillance, target acquisition, and the crew should be capable of directing artillery fire when required to do so. They can be used for radiological survey, casualty evacuation, and command liaison and reconnaissance as secondary roles.

In this type of operation the "nap of the earth" is the environment in which the aircraft must work. Pilots depend on the features of the ground for cover from observation and fire, and achieve their purpose through stealth, surprise and speed of movement. Sorties can only be planned in the most general way, and the detailed movements of the aircraft will vary with the terrain and the circumstances which the patrol encounters. Accurate navigation requires great skill by the pilot and of the sergeant observer who accompanies him.

New Transport Helicopter

The most recent addition to army aviation is the Transport Helicopter Platoon, Royal Canadian Army Service Corps, operating the Vertol CH113A "Voyageur" helicopter. This aircraft can lift up to 25 troops or as much as 8000 lbs of cargo, and for the first time gives the Army an air vehicle for moving supplies and ammunition or troops in the forward area.



The CH113A cargo helicopters are capable of short haul airlifting 26 troops or up to 8,000 pounds.

Many of the problems that beset the artillery and reconnaissance flyers will affect the transport operation. Security from detection and attack lies in staying close to the ground, and the larger aircraft demands even more accurate judgement by the pilot. Loading and unloading operations bring the aircraft into close association with transport drivers and troops who are not necessarily familiar with aircraft. This large helicopter, either hovering or at rest, is most difficult to conceal from the air observer or air camera.

Forward area low-level navigation is again a critical problem. In the case of the routine transport operation, routes can be selected in advance but they must be followed with precision to ensure that the helicopter is not unnecessarily exposed to enemy fire. When deploying troops, absolute accuracy of navigation and timing are necessary.

Training

In summary, it can be said that the flying hazards encountered by the Army pilot are mainly caused by having to operate close to the ground from concealed landing grounds. The chief dangers are obstacles, especially ones which are hard to see such as wires, difficult wind effects close to the ground, confined landing areas and the difficulties of very low-level pilot navigation with the minimum of aids.

To surmount these hazards requires skill, practice and judgement. The training at the Army Aviation Tactical Training School (AATTS) at CJATC, Rivers, Manitoba, is designed to this end. Students reach AATTS with 80 hours Chipmunk experience gained at PFS, Centralia. After a 46-hour conversion to the L19 aircraft the student pilot learns the basic skills of flying in the army pilot's environment through a course of 78 hours flying, concentrating on low-level work and operations from unimproved and confined fields. Although the Army operation is primarily a VFR one, instrument training is given throughout with the intention of giving a pilot the basic ability to get home when caught unexpectedly by dirty weather.

Pilots destined for helicopter training go on to the Basic Helicopter Training Unit, also at Rivers. After conversion to helicopters the pilot returns to AATTS for 100 hours of tactical work in light helicopters, or conversion to the cargo helicopter.

Hazards to Cope With

Pilot navigation and low flying make a poor combination, for the unsuspected obstacle often looms up at the precise moment that the pilot is consulting his map. Maintenance of orientation is often difficult on dull days; at low level a landmark missed by 200 yards may never be seen at all. Low-level reduces the range of any radio aids which might be used.

To find some ideas which might help the pilot the Army has enlisted the help of REF Lewis of Defence Research Medical Laboratories. He has run three extensive series of trials, two in L19s and one in a CH112, the latter so recently that an analysis of results is not yet available. The L19 trials indicated that during a solo low-level navigational trip the pilot would reach 92% of the targets to which he was required to fly, and would be less than 50 feet above obstacles half the



Out of the hide after a periodic inspection. The courtyard of a farm complex served as a field maintenance hide.



A damaged undercarriage inspected and repaired on an AOP landing ground.

time. However, during the entire trip his eyes would be in the cockpit about 25% of the time - which accounts for the fact that the investigator riding in the back seat, had, on a number of occasions, to warn the pilot of an impending wire strike. Some slight reduction of "eyes down" time was effected by use of an eye level map presentation but further research into equipment and techniques is necessary. In the meantime a sobering assessment of the extent of the risk has been achieved.

Maintenance Problems

The maintenance of aircraft, particularly helicopters, requires a smooth running organization of highly skilled tradesmen, good tools and test equipment, the best accommodation, ample time and no interference. At least these are considered to be normal requirements for an efficient aircraft maintenance organization. Not all of these optimum conditions can be met when an army takes to the field. Not only must the aircraft operate and be maintained away from normal industrial support but those who fly and fix them must do so within the usual wartime ground environment. In order to survive on the modern battlefield, the Army must move dispersed, from cover to cover, usually at night, to avoid detection and avoid presenting a target.

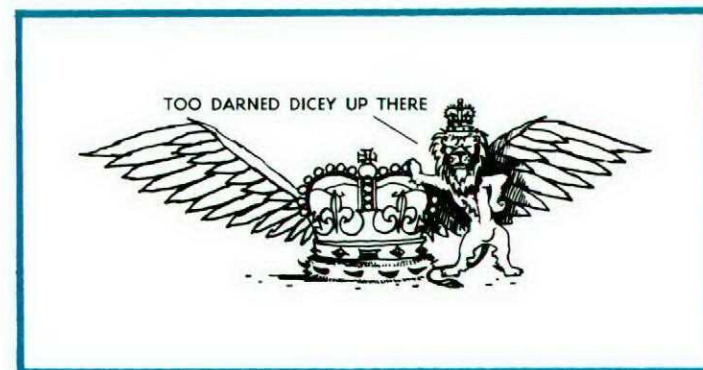
The system of maintenance used in the Canadian Army is based on two lines of support - "Unit Repair"



An unserviceable CH112 is carried by truck to nearby maintenance unit.

and "Field Repair". Unit repair is performed by Royal Canadian Electrical and Mechanical Engineer (RCEME) tradesmen under command of the operating unit. It consists of servicing, tests and adjustment, replacement of minor components and performance of primary and supplementary inspection. This allows the unit a wide degree of flexibility of employment and location. The second line of support - Field Repair - is done by the aircraft repair platoon of the Field Workshop, RCEME. This consists of all types of maintenance and repair normally performed by RCAF base maintenance. It includes exchange of major components, repair of minor assemblies, patching of "skin" damage, modifications and periodic inspections. The aircraft are usually flown or brought in for repair but mobile repair teams can be sent out to make repairs on site.

An exception to this organization is the Transport Helicopter Platoon (RCASC), which has both the unit and field repair elements under its command. This organization is used because the Transport Platoon is likely to be deployed further to the rear of the formation than will the aircraft repair platoon of the Field Workshop.

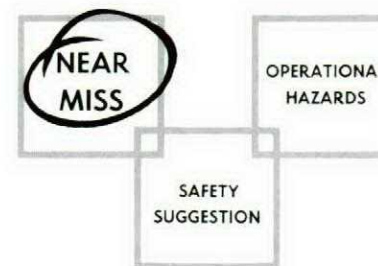
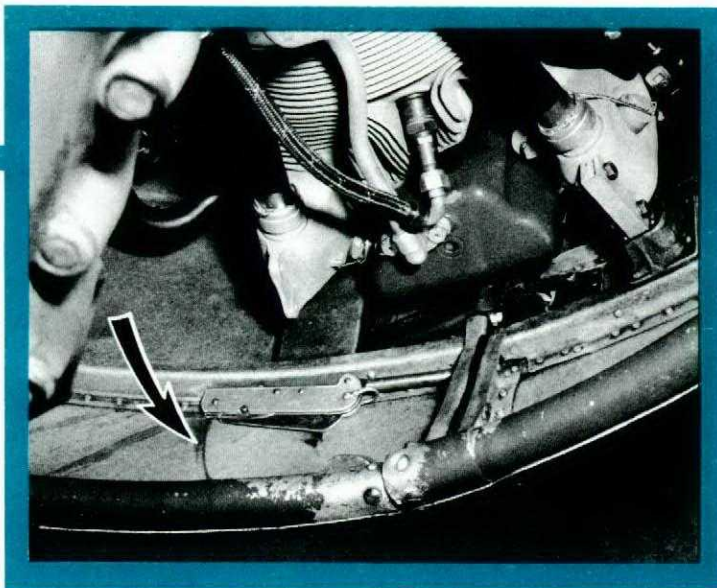


Pocketknife, anyone?

A sharp-eyed pilot saw this knife in the bottom of the engine cowling while airborne. Someone's tool count was down one knife. Fortunately no FOD occurred!

Using a section of the aircraft for a tool tray is just asking for trouble. The circular scuff marks shown by the arrow show how active this tool had been trying to free itself and start on its way into the aircraft.

F/L AL Seward
121 KU, Stn Comox, BC



POOR WALK-AROUND

It was to be just another routine trip in the faithful "Gooney Bird" and I was detailed to be the 1st officer.

For the hangar crew this was to be the second C47 departure of the day, the first one at 0600 hrs. Because of the previous day's flying both aircraft had to be BFI'd and refuelled in the early dawn in a very short time. Two of the three members of the aircrew, including myself were unavoidably late for met briefing. A further delay and more phone calls were necessitated when the in-flight rations were late arriving. Frustration was evident.

Finally we were ready to go. My walk around inspection of the aircraft was, as usual quick, but quite inadequate as it turned out. Later, it was also obvious that our crewman had not carried out his pre-flight checks as per unit SOPs.

Takeoff was normal, and passing through a thousand feet I looked out to check for venting. I was amazed to see four of the five DZUS fasteners on the cowling and two on the engine nacelles unfastened! After notifying the captain, the condition was assessed as unsafe and we returned for a landing without further incident. The DZUS fasteners were secured while the aircraft was on the runway, another ATC clearance obtained, and a second, this time successful departure, effected.

In retrospect, we can be very thankful that all this cost was a 15 minute delay, in lieu of a serious accident.

I have learned the hard way that a quick cursory walk-around inspection is not good enough. So next time you are doing your walk-around (even if you are late and it is the old reliable bird), CHECK THE AIRCRAFT PROPERLY. It may cost you more than a fifteen minute delay if you don't.

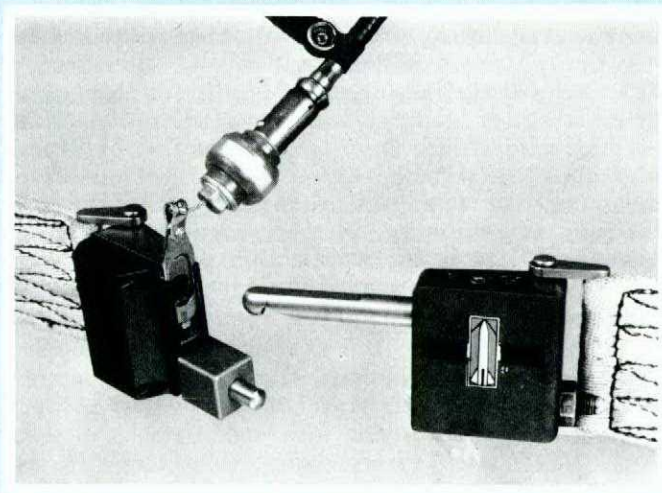
It is refreshing to receive this kind of "Near Miss" - people who will admit their mistakes in writing so that a lesson may be learned are all too few. Our thanks to this pilot for sending it in and we think he has a good point, too - Ed.

NEW AUTOMATIC LAP BELT

By now, we hope that a few Tutor and CF104 units will have on user trials, the new lap belt mechanism shown here. The shortcomings of the MAG lap belt have been the subject of continued complaints from aircrew since its introduction. Modifications were produced; it was uncomfortable, so a large leather backing pad was attached, to soften the irregular contours of the linkages. The danger of releasing the safety harness by snagging the manual latch lever prompted the adding of a safety tab - a safety device for a safety device. The most serious deficiency was the parachute automatic release attachment (or lack thereof) which enabled aircrew to complete the strap-in and overlook the lanyard. Our information is that not every aircrew remembers this item on every flight.

Note that the mechanism of the new lap belt (see photo) cannot be locked unless the parachute lanyard key is in place (Murphy's Law). During ejection, the design provides positive opening by means of gas pressure - it does not require belt tension to open. Another safety feature is the anti-snag recessing of the manual release thumb slide. Manual opening is fast and positive, with a single movement.

The mechanism has been designed to operate when the belt is subjected to tension up to 2000 lbs, and to remain closed even under shock loads of up to 100 Gs. The device was tested on recent RCAF sled trials on the Tutor and CF104. It came through with flying colours, providing good seat-man separation on seven consecutive ejections.



Should the user trial results prove to be satisfactory it is hoped to provide the device for the Tutor and the CF104. The belt is adaptable to all jet aircraft; its adoption throughout the force would be a major step towards the ideal - standardization of all aircraft safety components.

W/C AM Halkett
CFHQ/DASEng

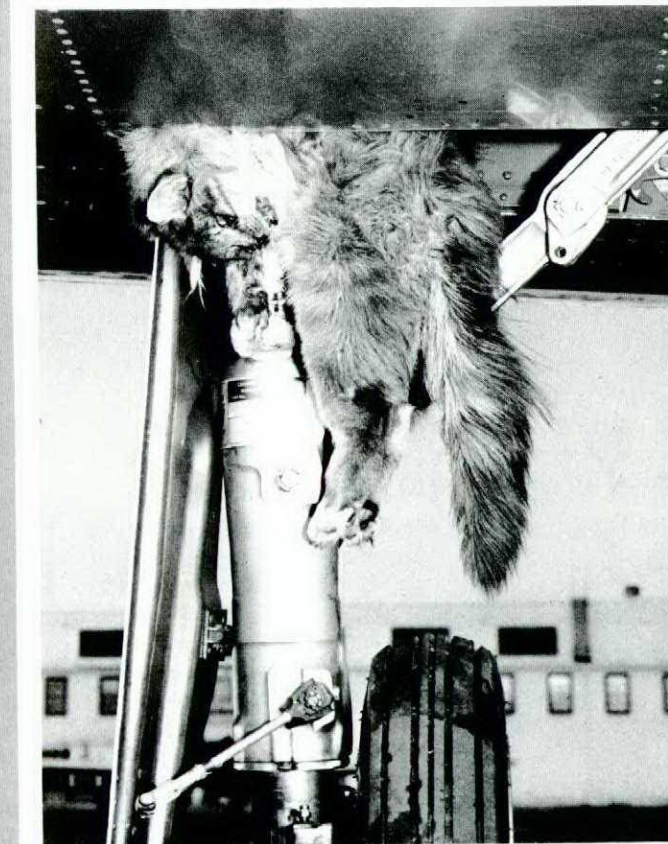
*"Ding-dong bell,
Pussy's in the wheel well..."*

It happened during a flight officially recorded as the "first Tutor cat * ride"; the aircraft escaped possible major damage - regrettably, we can't say the same for the cat who never recovered from his experience. The cat, it was thought, had leaped into the wheel well intent on giving birth to some airborne kittens, but this theory quickly succumbed to veterinary testimony to the contrary. In any case, FOD control has taken on a new dimension at Moose Jaw!

Actually, the cat for reasons unknown, hopped aboard a parked Tutor and for about an hour rode around the sky on a test ride. Following a touch-and-go landing the gear indicated unsafe; two reselections failed to rectify the situation. A chase pilot in formation spotted the cat, and the gear was confirmed as properly down and locked. The aircraft landed without further incident.

Examination revealed a cat nipped between the port shock strut and wheel well structure, a victim of catastrophic skeletal failure.

*Category Ride, ie, instruction qualification test ride.



FROM AIB FILES

CF104

The 104 was in descent on a TACAN letdown. As the pilot began to level off in cloud at 4000 ft, he realized that something was wrong - there was just not much urge from the engine although there were no detectable symptoms of trouble such as warning lights or abnormal engine noises. The aircraft was sinking and still in cloud. At MIL power setting the nozzle was wider open than normal but the EGT of 595°C was too hot for the problem to be nozzle failure. The pilot selected full afterburner with no results. He jettisoned the external tanks, manoeuvred to avoid a built-up area and some 45 seconds after the problem first became apparent, successfully ejected - quite close to the ground.

AIB investigation showed the cause to be jamming of the inlet guide vane (IGV) feedback cable in the teflon-lined conduit in a position corresponding to IGVs fully open. This resulted in the IGVs being commanded to the fully closed position where they remained until impact. The sequence of events was probably this: at altitude with a high power setting the IGVs would be fully open. When the pilot throttled back for descent the IGVs would be scheduled to an intermediate position. However, the feedback cable had jammed, indicating to the MFCU no change in IGV position. The MFCU would then continue attempting to close the IGVs in response to a fully open signal; the IGVs were thus driven fully closed and the telescopic unit at the end of the feedback cable collapsed. Nothing could then be done by either pilot or machine to move the IGVs from the fully closed position. The reduced airflow through the engine meant that the thrust at MIL power setting was less than one-fifth of normal.

The cause of the cable jamming was found to be the use of the improper lubricant molybdenum disulphide (Molykote 77) which had eventually collected at a low point in the conduit and became tightly packed between the cable and the teflon liner. The IGV feedback cable and conduit had been replaced at the unit as required by Mod EO 10B-10C-6A/36. The NRC and RCAF Materiel Laboratory in addition to identifying the lubricant, found that particles of Molykote 77 will become embedded in teflon and when tightly packed as in this case, a form of physical attachment takes place.



The IGV feedback cable in the teflon liner showing the tightly packed Molykote 77 lubricant.

The correct lubricant is Dow Corning 33 silicone grease and the cable is so lubricated at the factory. Lubrication of the cable was not listed as a step to be performed, per se, by Mod 6A/36, but both the Mod leaflet and EO 10B-10C-2 referred to a dry film lubricant. Actually, "dry film lubricant" was reference to a factory process wherein a lubricant is baked on the 6-inch solid part at the end. Since Molykote 77 is used on the nozzle feedback cable and has the appearance of graphite which is sometimes used as a "dry film lubricant" in other cases, the opportunity for error is obvious.

C119 Structural Problems Non-Destructive Testing

Although the C119 may well have reached the end of its career by the time the reader scans this issue, a few words of explanation regarding the temporary grounding of the C119 fleet during Apr 65 may prove of interest. Routine checks for structural integrity of wing sections on selected aircraft were carried out at specified intervals during 1964. X-ray was one of the non-destructive test methods used to accomplish these checks. Assessment of the exposed film indicated that in some cases crack progression was present in an area of the wing which had been previously reworked on all aircraft. This finding resulted in an X-ray inspection of the potential problem area on all aircraft. Also, a visual check was made to confirm the X-ray results. In addition to the cracking in areas of fasteners shown up by the X-ray, some buckling of the corrugated underskin, which is attached to the ribs and upper wing skin, was found. This problem, of course, was resolved by the overall modification scheme.

This is just one more example of the importance of non-destructive test procedures; a serious accident potential had been detected in time.

T33 Fuel System

The CEPE investigation into T33 fuel system problems was completed by 25 Apr except for the final report. Recommendations to rectify the many fuel feeding problems will include:

- modification of the tiptank air supply line to increase the engine-supplied air pressure and reduce fuel fumes in the cockpit.
- removal of all but one check valve in the tiptank air line to reduce uneven feeding.
- relocation of the fuselage tank vent line to reduce the amount of fuel lost from leaking fuel caps.
- replacement of obsolescent fuselage tank float valves with new ones.
- wiring the fuselage tank low quantity warning light to an independent float.
- removal of the pistons from the fuel transfer valve.
- installation of a pressure relief valve in the main wing fuel line.

We can anticipate approval and implementation of the CEPE recommendations - and we hope to say goodbye forever to fuel problems in the trusty T-bird.

YUKON AND COSMOPOLITAN Braking Technique

We have reviewed D14s and studied the AOIs to determine a reason for unexplained tire failures occurring during braking at high speed. It was suggested that in some cases the Maxaret units failed to function. However, our investigations failed to reveal any component unserviceabilities.

The available braking varies directly with the weight on the wheels. If the lift exceeds or is equal to the weight of the aircraft (speeds and angles of attack producing unstalled conditions in ground effect) the weight on the wheels will be close to zero, even with the wheels in contact. Bogey bounce coupled with negligible braking force occurs in this region. Under these circumstances, if the brakes are applied, the Maxaret units would sense a condition equivalent to that existing during a bounce. Skid protection should be provided for a maximum of four seconds; however, if this condition persisted beyond the four-second limit, the brakes would lock. This would explain the apparent failure of the Maxaret units to function as designed, and the consequent blown tires.

To prevent this, use only aerodynamic braking (ie, propeller discing or reversing) during the initial landing roll. As much of the aircraft weight as possible should be on the main wheels before applying the wheel brakes; eg, raising flaps should be considered.

ALBATROSS

The outside air temperature (OAT) was 3° to 4°C when the aircraft landed on the water, lowered the wheels, and carried out a beaching. The pilot then took off and flew for an hour at -10°C, and landed on two more lakes where the OAT was 4° or 5°C, remaining about 15 minutes on each lake after which he took off for a five-minute flight to a land base. Both tires blew on landing. Although no ice was noticed on the outside of the wheels, there was ice on the inside of the wheels 3-1/2 hours after the accident. The pilot had skimmed the surface of several lakes before he found one where the surface OAT was above freezing.

The conditions were right for ice formation - and damned if ice didn't form!

OTTER

There has been yet another accident when a pilot found himself in an awkward situation and got no engine response when he made a rapid application of power. In this particular case, full engine power might have reduced the damage but in all probability would not have prevented the accident. As it was, he hit with about 660 rpm, the engine accelerating only after impact. Tests indicate that the carburetor was lean and slam accelerations would produce balking and backfire.

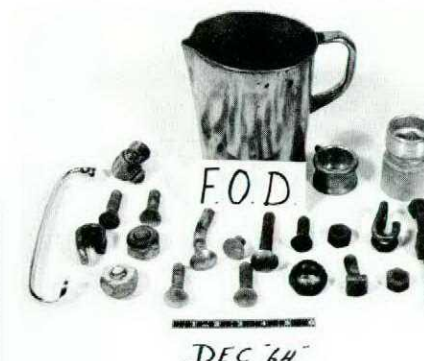
The P&W R1340 is known to be sensitive to mixture adjustment, and most pilots of Harvard, Otter and H19 aircraft learn at an early date to manage the throttle accordingly.

DISTRACTED?

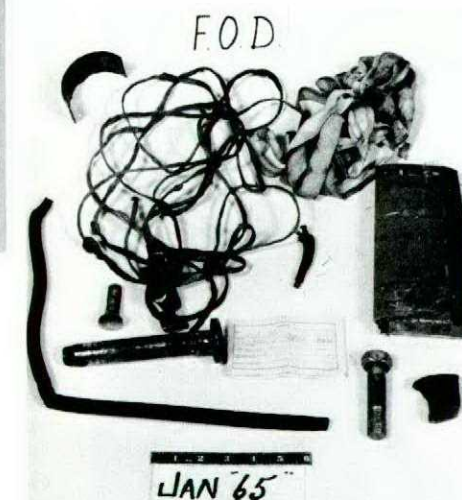
A recent very costly accident was caused by an airman's "lack of care". Considered by his supervisor to be of above average ability, "He was undoubtedly under considerable mental strain at the time". Two days prior to the accident in which distraction appeared a possible cause, this man had killed a civilian pedestrian in a car accident. The report states: "although no blame was attached to for the accident, it must certainly have been a severe shock to him and could have accounted for his lack of attentiveness which caused the accident".

The supervisor continues: "this incident is in my opinion a vivid example of the value of the Human Reliability Program. To prevent any similar emotional disturbance from being the cause of an accident, a system has been implemented at this Unit which will use the HRP machinery to alert section heads to the danger and ensure that the individual has time to recover his stability".

This station's experience and its response are worthwhile noting - our article "An L14 For Humans?" discusses this very point. ■



Two months' collection of foreign objects off runways, taxi strips and ramps at Goose Bay.



ARRIVALS and DEPARTURES

L19, UPSIDE DOWN Having landed in a small field selected as an advanced landing ground this pilot was faced with a decision on how to fly his L19 out again. A takeoff into wind meant flying straight for a wall of trees at the edge of the field so he elected to take off downwind - after making several computations. These computations, however, were incorrect; the performance figures used were not those in AOs. The tailwind was 5 mph and "occasionally" more; this would mean a ground run of at least 400 feet. The pilot, thinking his ground run was less, actually got

the aircraft airborne in 327 feet and understandably was "behind the power curve". In this condition, the aircraft was unable to gain even enough height to clear a 40" stand of grain in the adjoining field. The cereal dragged the aircraft to earth. Beyond the small area of grain a newly-ploughed field brought the aircraft to a halt - upside down. The wheels had dug into the soft ground flipping over the light aircraft.

The pilot unnecessarily compromised his chances by not using all aids available:

- a hand-held anemometer was not used
- 20° instead of 30° of flap was employed
- a dangerously low level of fuel existed with possible engine failure the result
- under the circumstances, some excess baggage could have been removed.

Flying under marginal conditions such as this requires everything to be in the pilot's favour - 24" into the air with full power just isn't enough to make the flight worthwhile.

L19, UNDERCARRIAGE COLLAPSE

The pilot with a passenger on board landed his aircraft on a field strip at the end of a reconnaissance flight. On the final approach wind was "gusting" and from the right. The descent was normal but just prior to touchdown and still over the undershoot area - it happened. The pilot states "as my approach lowered me below the height of the trees the air gave way and I felt the aircraft falling through". Full power was applied to recover, the pilot attempting to "cushion the inevitable contact with the ground", but it was not



sufficient to save the undercarriage which collapsed on impact.

The aircraft C of G was found to be beyond limits, to be overloaded beyond limits for field landings, and the whole exercise carried out in over-limit wind condition. This type of flying, that is, operating in what most of us would label a hostile environment in any aircraft, calls for the pilot to exercise extreme caution. The hand-held anemometer was not used, neither was a trial approach flown as prescribed for landing on unknown ground.

T33, NIGHT FRIGHT During the starting cycle for a night dual mission the instructor pilot in the rear cockpit stated, "I saw a brilliant orange glow flare up from the tail section...and I observed the airman starting the aircraft, move rapidly away, a startled look on his face".

This was enough to spur the pilot into immediate action. Quickly shutting down the engine the pilot jet-

tioned the canopy using the alternate handle.

By actual test, this enabled the crew to abandon the aircraft only a few seconds sooner than using the normal canopy opening. The understandable apprehension of this pilot led him to a rather drastic act - the torching of the T33 is a known phenomenon, but apparently not well known enough!

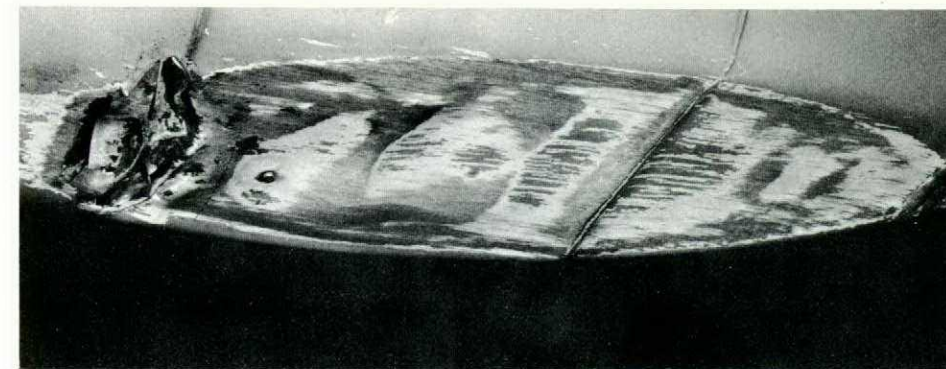


T33, UNDERCARRIAGE UP TOO SOON Two instructors had completed a training mission and were on a normal touch-and-go landing. On the overshoot the pilot in the rear seat "without thinking" retracted the undercarriage handle instead of applying power. His first reaction was immediately to slam the undercarriage handle down and apply full power.

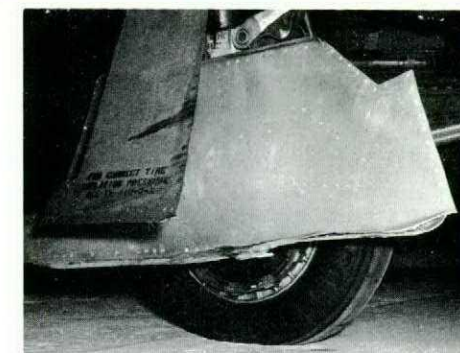
The left wing of the aircraft started to drop - full aileron was insufficient to prevent the tip tank from striking the runway. Also damaged was the port undercarriage door.

By this time both pilots were struggling to regain control using brake, rudder and aileron. Finally, they got it airborne, did a circuit, and landed without further damage.

This experienced instructor's mistake is impossible to explain since he admits to simply activating



the wrong control on overshoot. A witness to the accident stated that "at the time of application of power the aircraft was extremely nose high, so nose high in fact that I expected the aircraft to stall back onto the runway, and I was amazed to see it fly out of the nose high configuration". From this remark, he was close to witnessing something a good deal more catastrophic.



CF104, COCKED MAIN WHEEL

The mission had been routine and the final approach to landing was normal. But on touchdown the aircraft suddenly began a violent left swing. The pilot, S/L GL Fitzsimmons, quickly lowered the nosewheel, engaged nosewheel steering and with the aid of hard right brake managed to straighten the aircraft and bring it to a stop on the runway.

Investigation revealed that prior to landing, the port bellcrank assembly in the wheel positioning mechanism had broken and caused the wheel to be approximately 45° out of



line. In fact, just as the aircraft was landing the duty pilot in the tower noticed that the wheel was out of line, but too late to warn the pilot or order an overshoot. On touchdown, the out-of-line wheel caused a strong tendency to turn and the tire scuffing finally caused a blowout.

Since the bell-crank broke due to improper rigging during manufacture, the cause was assessed against the contractor. The pilot, we think, did a good job of handling the aircraft on the landing roll.

F86, FLAMEOUT The pilot stated "...on final the approach was poor due to excessive crosswind from the south so I decided to overshoot". This was enough to set this pilot up for a series of embarrassing errors. On overshoot he applied full power and started to clean up the aircraft. At about 200 feet above ground and just past the button of an alternate runway he realized his airspeed was beyond gear-down limitations and abruptly reduced power, inadvertently pulling the throttle back to fuel cut-off position and the engine flamed out. The pilot could not relight and

attempted a landing on the alternate runway, lowering his gear at about 130 kts. The aircraft floated the first 3000 feet and the harsh braking required to stop the aircraft blew the left tire.

This pilot was fortunate in having an alternate runway to land on; our Nov-Dec issue carries the story of a pilot not so fortunate. In that case the pilot also pitched into a strong crosswind and wound up too tight on final. But instead of overshooting he tried to salvage the obviously bad approach; the aircraft stalled and he was killed in the crash.

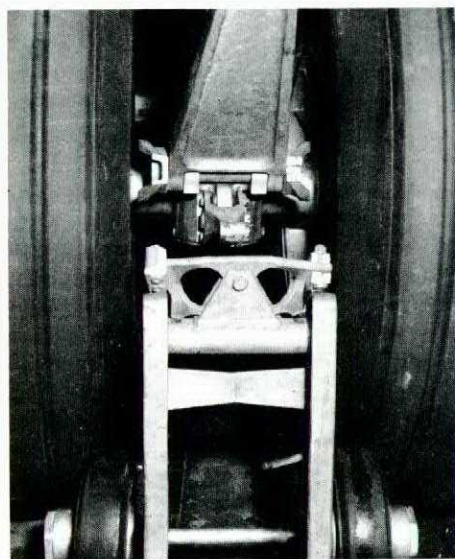


YUKON, PROP DAMAGE ON LANDING Two student captains were at the controls with the instructor positioned between the two seats monitoring the approach. The crew were warned that the surface wind was "very close to limits"; as it turned out, the wind was gusting to slightly above aircraft limits. During the GCA, moderate turbulence was experienced, and just prior to touchdown the port wing rose causing an initial touchdown on the right main gear.

In the opinion of all three pilots, "nothing untoward" had occurred

during the landing; however, the starboard outer propeller was discovered bent to approximately six inches up the blades and the telltale gouges in the runway confirmed the accident had occurred just at touchdown.

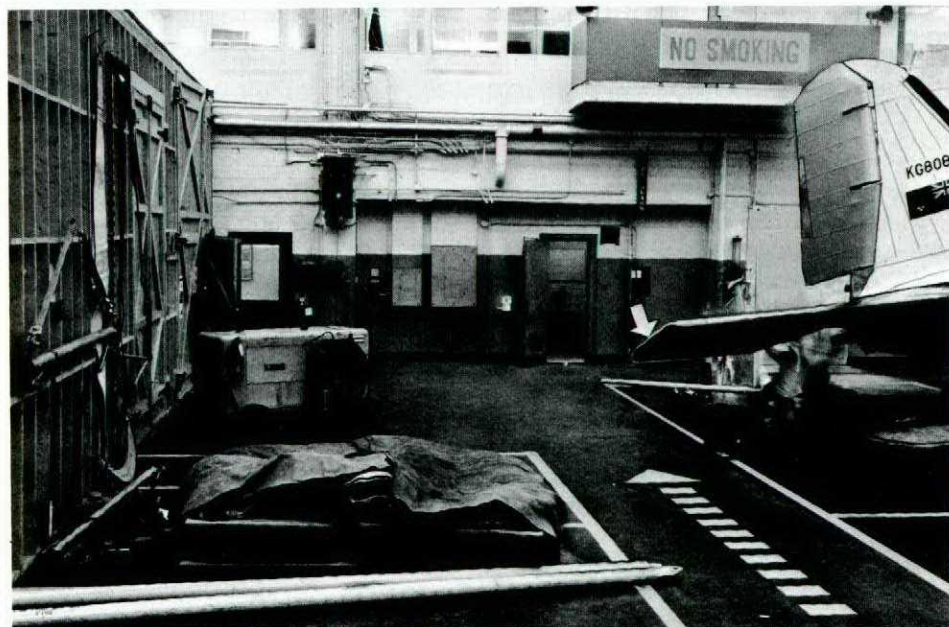
A line drawn from the main wheels through the outer propeller arc comes uncomfortably near the wingtip; the pilot had come dangerously close to damaging the wing on landing. The instructor placed too much confidence in the student captains and in the aircraft itself by pressing on in obviously marginal surface wind conditions.



HERCULES, TOWING The towing crew were properly stationed around the Hercules and ready to push it backwards out of the hangar. The airman on the mule yelled "brakes off" but the airman in the cockpit had trouble releasing the parking brake and shouted "hold it". The mule driver thought he heard "OK" and applied power. The aircraft, however, would not move and suddenly the tow bar snapped, the mule lurched forward, and the tow bar jammed into and damaged the nose-wheel. Thus, another needless accident through a misinterpreted word.

The mule driver on his own initiative, assumed command of the towing operation from the corporal-in-charge, by giving the order "brakes off". Furthermore, it was later discovered that the airman was not even qualified to drive the mule or tow aircraft. The NCOs present assumed he was qualified, from the fact that he had climbed into the driver's seat.

Initiative and enthusiasm, although normally good things can occasionally get out of hand. Supervisors - is there a man in your shop whom you only "assume" is qualified?



C47, TAIL DAMAGED The photograph shows the layout, and the arrows tell the story. A D8 shop mule was to tow out Dak 808 which was parked in a congested corner of the hangar. The right rear fender of the D8 struck the tail plane causing skin and frame damage. This accident is the driver's fault, but it would appear that to his right and left were obstructions which narrowed the lane. The driver had the opportunity to call for assistance - he obviously required it.

Comments

TO THE EDITOR

Dear Sir;

The armistice seems to have been violated and once more the eternal saga of the flying suit is to be the subject of debate between aircrew and the sinister forces of evil. Pity the poor, flogged, dead horse, but it was you dear Editors, and not I, who dragged his poor battered body onto page ten of your Mar-Apr issue.

Don't colour us orange you say. Unfortunately your magnificent black and white photographs were not that revealing... Who would have ever thought that there was a couple of lost souls in those nasty orange flying suits standing right in plain sight against all that grey foliage? It's just lucky for them that they were in a combat zone that abounds in black and white vegetation or they would surely have been spotted...

Well it's comforting to see that our own people have now hit a solution to the whole sticky problem. Why, just the other day somebody passed out at least a dozen or so nice, new, itchy, navy blue flying suits for us to try. I was so happy and excited to get a brand new flying suit of my very own that I didn't even get annoyed when my assortment of check lists, let-down books and so on wouldn't fit into the leg pockets. What the heck, I thought to myself, man has only been flying for a little over half a century and look at the strides he has made in some of the other phases of aviation. Besides, it was made in Canada, by golly, and the trim fit is in vogue this year. Who knows, maybe some day they may even get around to designing a shroud line knife to fit in that clever shroud line knife pocket on the thigh.

With tears of gratitude streaming down my face I rushed out to complete the necessary forms so that I

could have wings and braid sewn on my new possession. When I got back to work I found that I was just in time to line up with the rest of my colleagues who were in the process of returning the new suits to the mysterious donor. We consoled ourselves by reminding each other that the suits would have only gotten dirty had we worn them flying. Besides, our valiant brothers-in-arms who were off in some navy blue combat zone probably needed them more.

I put on a brave smile as I went back to my dusty locker to retrieve the faded orange flying suit that I had stolen from an American. Choking back a tear I put my assortment of check lists and let-down books back into my pockets...

After reading your article the other day I must admit that I have been feeling a little guilty and conspicuous in my orange flying suit. I even tried to get one of our old grey ones from supply but I haven't been able to get there during the 15 minutes issue period on the second Monday of each month. I've even considered throwing my orange one away and wearing my mess kit as a gesture of loyalty but I found that the mess kit pants wouldn't go on over my mukluks. Besides, I've heard a rumour lately that we are going to get our wives to sew our own flying suits out of old army blankets as an economy measure. At any rate, I've decided to hang onto the one I've got until something more firm is announced, or I run into another American who might swap me his suit for a bottle of V.O.

F/L PG Davidson
409 AW(F) Sqn
Comox BC

We decided to give the author of "Don't Colour Me Orange" a chance for rebuttal. He replied as follows.
- Ed.

Dear Sir;

In these days of the "Great Dialogue", it is refreshing to find an aircrew member who will stir from his writing lethargy and take pen and paper as weapons of castigation. Perhaps this is the orange coloured glimmer of hope on a grey horizon and someday we will be surprised, and indeed delighted, to receive an Unsatisfactory Condition Report. For years the intelligensia here at Defence Forces Headquarters has wracked (I almost wrote wrecked) its brains for some means of galvanising the boys from the squadrons into action. Now we seem to have found it - an itchy flying suit!

When you wrote about pockets, we detected a note of annoyance, a condition which we often experience when our friends to the south change the shape of their letdown books to which we subscribe. These were once robust, full-fashioned publications, which have now, it seems, also come under the cult of the "slim look". It takes three years, if you will pardon the levity, to get a flying suit off the ground, and with constant changes being made in the size and shape of these publications, there is just a chance that one of the frequent changes we are forced to make in the dimensions of pockets will hit it just right.

You are right, of course, about the shroud-line cutting knife for which we had sufficient insight to provide a cunningly placed pocket. However, we are now computer-controlled in the logistic cells, and when that Air Materiel Command colossus with the iron brain insists after a frantic rattling of its innards that there are some 30,000 hunting knives loose amongst 5000 aircrew, with another 5000 in the depots, we just have to approach this monster with temerity and, hat in hand, respectfully suggest due consideration for a new aircrew knife.

To get back to colour, if you wish to obtain a new orange coloured flying suit, you had better contact your VO-loving friend soon, since the latest word on the hot line is that they are now going out of fashion in that Great Republic to the south.

In conclusion, may I quote the words of that famous Persian poet Omar Khayyam and with him fervently hope: -

"Could you and I with fate conspire,
To grasp this sorry state of things entire,
Would not we shatter it to bits and then,
Remould it nearer to the heart's desire?"

"Don't colour me Orange"

Dear Sir;

I must agree with the author of "Don't Colour Me Orange" (Mar-Apr 65) that a conspicuous flight suit is undesirable in an operational theatre. But, what proportion of our services is involved in aviation over hostile territory? The proximity of Air Defence Command establishments to the 'Cold Front', or future assignments in peacekeeping operations may well warrant a camouflage-type suit. However, the flight clothing problem to be solved today is for the numerous aviators in Training and Operational Commands within our own national boundaries and in operational units embarked upon the high seas with intentions purely peaceful.

The problem of eye strain due to canopy and instrument reflection is worthy of much consideration, but in the RCN the present mae west is at least as bright as - if not brighter than - the USN type Indian Orange Flight Coverall. Further, the orange reflection is noticeably mostly mae west.

The orange panel to be carried in parachute packs is a fine idea, but if an RCN aircraft were to ditch, Davey Jones would have an attractive nine by twelve orange panel to add to his locker.

It becomes apparent that a requirement exists for two flight suits of different colours or, perhaps, a reversible flight suit: orange on one side and dark blue on the other. This conclusion is not rendered to enhance the aircrew wardrobe, but to satisfy the demands of operational units openly engaged in hostilities vs the demands of flight safety in training and operational units during conditions of world peace. I fully concede the probability that oversimplification of the problem cannot

resolve the true needs of unit operational requirements.

A primary consideration of our air forces during training and post-training exercises is constant flight safety, thus, safety of the individual. Any loss of life or aircraft is too great when all measures have not been taken to ensure the longevity of aircrew and aircraft.

Were I to go down in flames - victim of an attack no more hostile than engine seizure or fire in the air - I would greatly appreciate a flight suit readily discernible by Search and Rescue crews.

Colour Me Orange, Please
Sub-Lieutenant JE McGee, RCN
Shearwater, NS

Dear Sir;

Your article entitled "Don't Colour Me Orange" was most intriguing but was it not a little pe-remptory in its dismissal of the orange flying suit? The CEPE trial Report 1700, Aug 63 and the ADC user trials were positively most favourable toward it. Eyestrain and reflection problems were discounted as negligible by the trial users. The colour may blend in with a few survival backgrounds but it is admitted to be effective, being selected for the new parachute panel. Admittedly, aircrew operating in special theatres and some of the other commands may not go for technicolour apparel. Perhaps the crowning act of propaganda was the publishing of black and white pictures to show how orange stands out from grey!

To obviate any charge of being parochial let me say now that the new blue flying suit shortly to be issued looks very smart, and should be cool, comfortable, and convenient. Furthermore, the large orange panel to be carried in the parachute should be a most effective aid to location, and equally as important to aircrew morale. We are glad to note the reliance on "manual" as well as automatic devices for the survival situation.

F/L EMW Robinson
PSEO, ADCHQ

P.S. What happens to the orange panel after the aircrew has had his parachute hang up in a tree?

Unfortunately, budgetary limitations preclude our using colour photos. Our grey photos did make some people see red, however! - Ed.

Dear Sir;

I was interested by the article entitled "Tutor-Jetwash on Final" in your Jan-Feb issue. You raise a very important point when you state that "the susceptibility of an aircraft to jetwash is proportional to its wing loading". (I assume, of course, that you mean inversely proportional). Now once this fact is accepted, an examination of the approximate wing loading figures (in pounds per square foot) for a few aircraft might be useful.

Tutor	33.4
Jet Provost T4	34.2
Cessna T37C	41.8
T33	70.7
Republic F105D	125
Lockheed F104G	151

These figures show quite clearly that while the Tutor will have approximately the same reaction to jetwash as other aircraft in its class, its reaction could come as a real surprise to anyone who is accustomed to flying jets with Century Series performance.

Since there must be a lot of pilots converting down to the Tutor it might be worthwhile to emphasize a new Golden Rule: The susceptibility of an aircraft to jetwash is inversely proportional to its wing loading. This might save a few bent wheels.

F/L RC Chambers, RAF

Dear Sir;

Reference the article "The Other Side of the Fence" Jan-Feb 65.

A bouquet to the servicing types everywhere and in particular Station Bagotville. I for one, agree wholeheartedly that co-operation from all parties is necessary in the execution of our daily tasks whatever they may be.

Being a desk-bound jockey for the last eight years and doing the majority of my quarterly flying from A to B has only increased my respect for the men who keep me in the air.

S/L GR Hollinshead
TCHQ Winnipeg

Dear Sir:

Re, "Expeditior Power-off Taxiing", in Flight Comment Mar-Apr '65. I quite agree; it looks like everybody dropped the ball on this one... including the fellow who printed the picture in reverse....

LAC B Burke
1137 TSD

.thgir os er'uoy - Ed

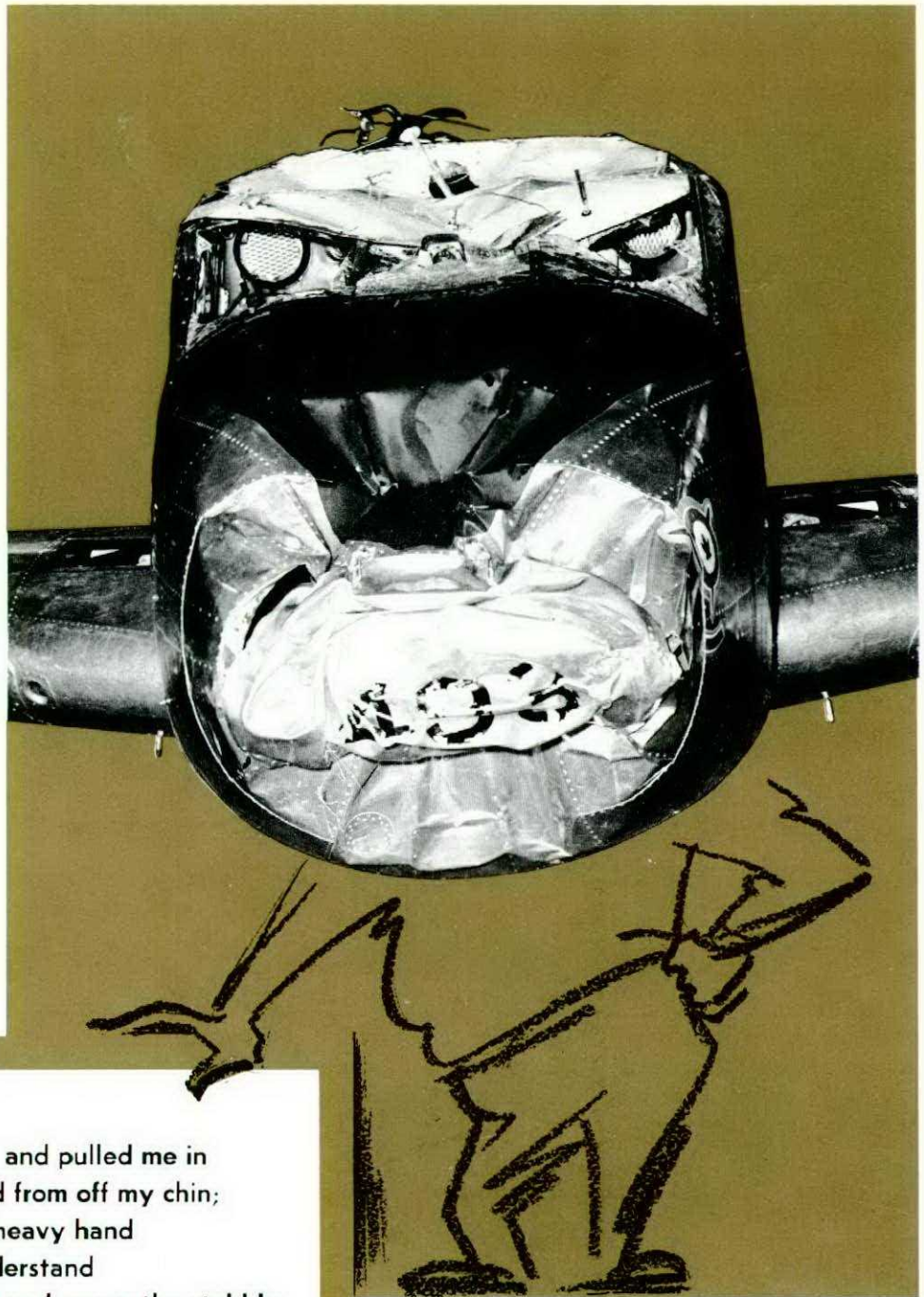
BIRD WATCHERS' CORNER



UNWARY WINDSHEAR WOBBLER

Having learned to confine himself to low altitudes to escape the larger, hostile birds the Wobbler flits about overland from bush to bush and field to field, occasionally daring to soar to as much as 1000 feet before making a spectacular and stomach-clutching dive to safety. Unlike most of his species the Unwary Windshear Wobbler has not completely adapted to his near-to-the-ground environment and is readily distinguishable by his tendency to ignore wind vagaries. Winds, as the Unwary tends to forget, are like women—inconsistent, sometimes blowing up, sometimes down, or not at all. Consequently, just when he needs it most, that "updraft" turns out to be going the other way. Red-faced and ruffled the Unwary Windshear Wobbler returns to his nest after dragging his wings or tail across fields and through hedges warbling his characteristic song:

NOLIFTTODAY THEAIRMUSTUVGAVEWAY



They tipped me up and pulled me in
And wiped the mud from off my chin;
The pilot with the heavy hand
Simply couldn't understand
How, out-of-control and across the stubble
Could get one into all that trouble.
So - here I am for all to see:
YOU could wind up with a face like **ME!**