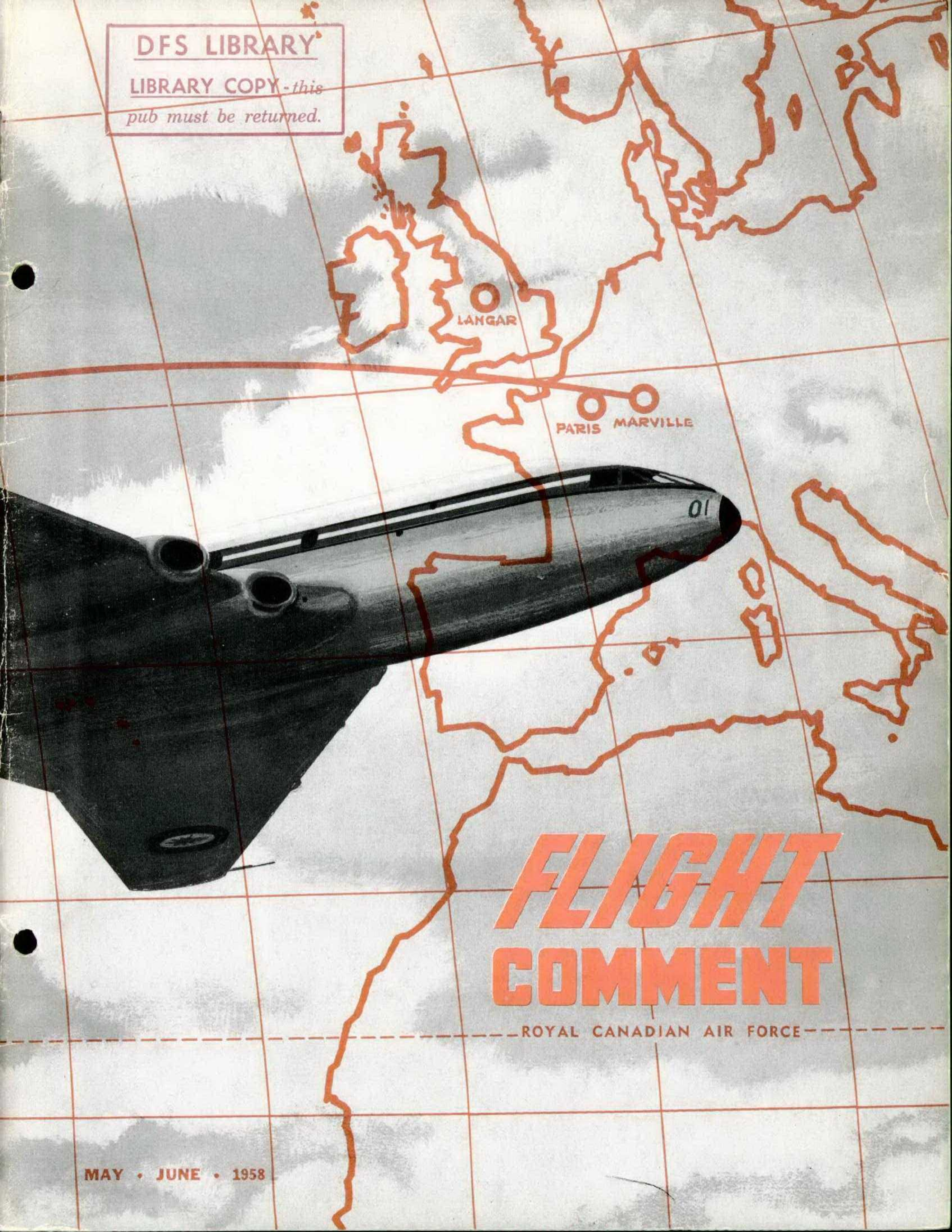

FLIGHT COMMENT

ROYAL CANADIAN AIR FORCE

MAY • JUNE • 1958

FLIGHT COMMENT

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

MAY • JUNE 1958

C O N T E N T S

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Editor
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Circulation
Flying Officer Peter Bremner

Artists
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OFFICIAL INFORMATION

Edmond Cloutier, C.M.G., O.A., D.S.P., Queen's Printer and Controller of Stationery, Ottawa, 1958

F/L S. T. ORSER

F/L Orser was taking off in a Sabre aircraft as No. 4 in a four-plane formation. The weather at the time was "sky partially obscured, visibility three-quarters of a mile in haze." At 200 feet, when he throttled back to maintain position, the engine flamed out because of a faulty PFCU (proportional flow control unit).

F/L Orser quickly switched to instruments, commenced a gentle climb in order to gain as much altitude as possible, and allowed his airspeed to drop back to 185 knots. He then retarded the throttle to idle, selected emergency fuel and activated the air-start switch. The engine relighted, and the pilot opened the throttle gradually to 85 percent, formated on his number three, and made a successful GCA approach and landing.

The speed with which F/L Orser obtained a low level, low speed relight under actual instrument conditions was an indication of how thoroughly he understood his aircraft's emergency systems; and the manner in which he took advantage of the excess speed to gain altitude was a demonstration of excellent airmanship. F/L Orser is to be congratulated for a job well done.

WHEELS UP

S/L G. L. Sheahan

It's a beautiful morning. The cool, crisp air makes a man glad to be alive. The T-Bird squatting on the tarmac is raring to go. Go where? Anywhere your little heart desires.

You do a preflight check. OK. You strap yourself in the driver's seat, give a thumbs-up to the line crew, and watch the needles start to move. Man, it's a great day! Radios check, then taxi clearance. Line up, power on, TOE-switch on, and the T-Bird quivers to get upstairs. Brakes off—and away we go! Airspeed is building up nicely, increasing rapidly. Man, what a day! Airspeed 70, nosewheel coming off the ground, speed passing 100 knots and increasing. Just look at that sunrise. Airborne. Wheels up.....

Ye Gods! What's the matter? Stick full back! Check power 100%...............CRUNCH!!

What happened to that beautiful sunshine? What happened to YOU? You know better than to retract the undercarriage too soon after takeoff—of course you do. But look at the trouble you've gotten yourself into. And consider the expense.

Let's consider the expense. On an average it costs $100,000 to repair an aircraft after it becomes involved in a premature undercarriage selection accident—and 18 aircraft were so involved during the last 2-1/2 years: 3 Canucks, 1 Expeditor, 1 Lancaster, 1 Neptune, and 12 T-33s! Simple multiplication tells us that these accidents alone cost the RCAF and John Public almost THREE-QUARTERS OF A MILLION DOLLARS A YEAR in repair bills! On the average, one accident every two months is caused by selecting the undercarriage up too soon during takeoff.

The "good book" (POIs) and common sense say that the wheels are to be raised when the aircraft is safely airborne. Safe flying speeds are outlined in the dash-1, so on the surface there would appear to be no problem. But a cost of $1,830,200 for 18 prangs presents a major problem.

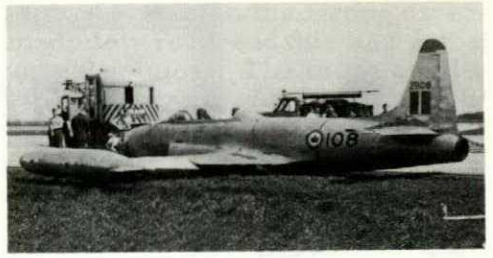
Now when do we retract the gear on takeoff? When the aircraft is safely airborne, yes—but how do you know when you're airborne? Airspeed! That's it; the EO states that at all-up weight the aircraft will leave the ground at 122 knots. OK, so we had 122 knots on the clock; but the bucket of bolts still refused to climb and settled down to the concrete. Why? On a long runway a change of temperature could be the cause—or a change in wind velocity, or a small instrument error in the ASI, or a combination of all three. What chance has a driver got with the cards stacked against him that way?

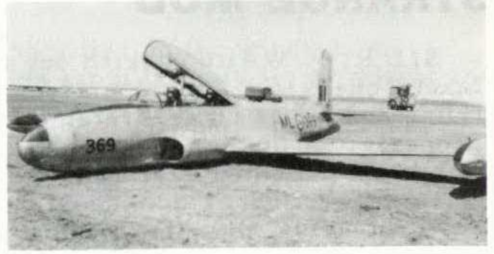
I think most jockeys feel that on takeoff the wheels must be raised immediately. This has been drummed into all of us since flying training days. With the advent of high speed, high powered aircraft, we are constantly reminded that excess speed causes damage to the hydraulic lines—so we are urged to get them up out of the way.

This is all very true, but let's have a second look at "excess speed". For example, take the T-33. The EOs state that at maximum all-up weight the takeoff speed is 122 knots. They also state that the maximum speed for lowering the undercarriage is 195 knots. It follows that if it is safe to lower the wheels at 195 knots, it is also safe to raise them if the airspeed is anywhere between 122 and 195 knots. But we also have takeoff flap, and as the flaps have a lower maximum speed than the wheels, we can use the flap speeds to figure out a logical and safe takeoff speed at which to raise the undercarriage. The flap speed is 174 knots.

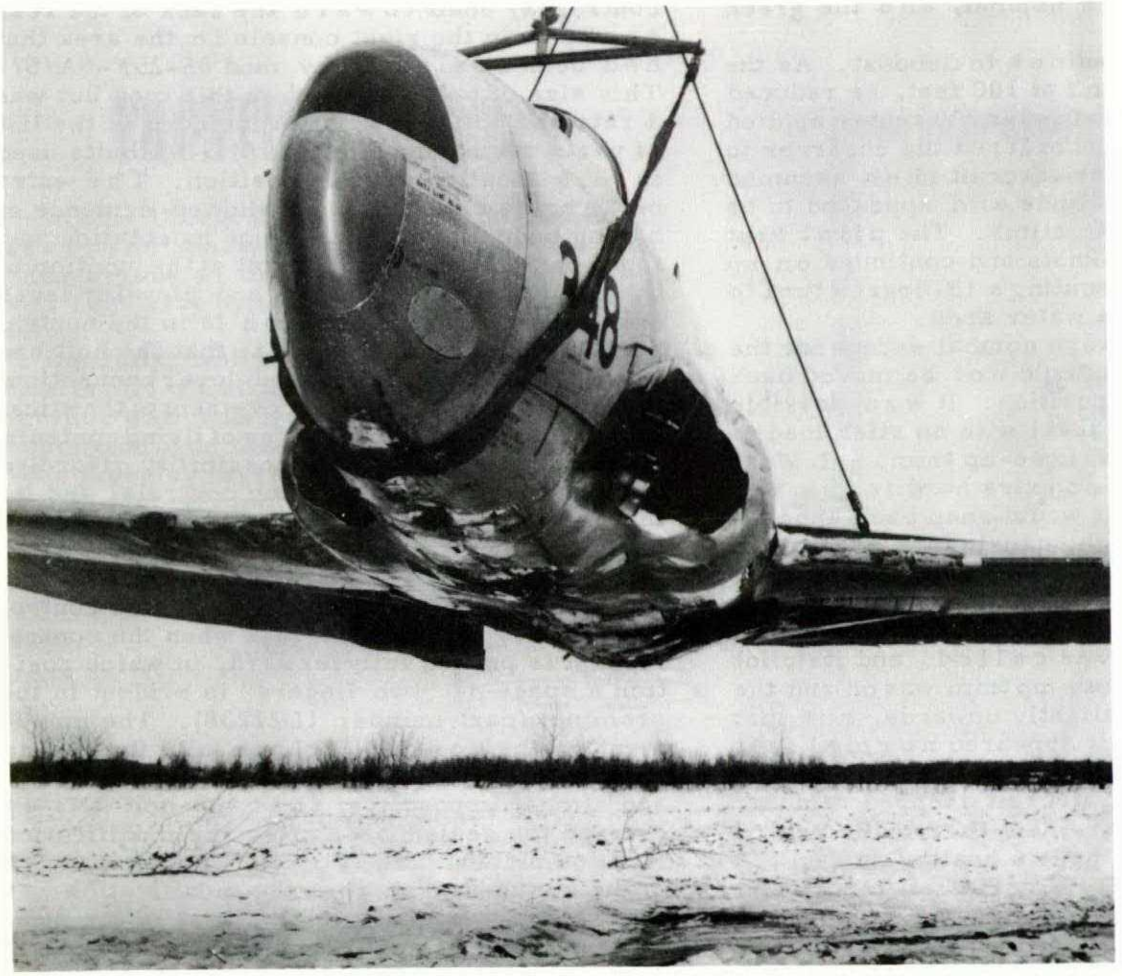
Now to review our procedure for selecting gear up. Instead of using the 122 knots for takeoff, let's say the wheels must be selected up at a speed somewhere sufficiently below 174 knots to give the gear time for retraction and the pilot time to select flaps up before 174 knots.

How about getting back to that first takeoff? Starting from zero, it's still a beautiful morning and that sunrise makes a man feel young again. The T-Bird is straining on the brakes. She's 100%......brakes off......accelerating nicely........70 knots, nosewheel up........ 100 knots......120 knots, and airborne...... check.......climbing nicely.......135 knots, wheels up.....checked up.....flaps coming up. Man, what a day this is!





Pulling the wheels up early involves considerable risk.



STRANGE MOD

S/L R.B. West carried out a normal pre-takeoff check in a Canuck and found all controls, trims and pressure systems functioning properly. A further check on the runway prior to takeoff indicated everything normal.

However, just as the wheels were retracting after takeoff, the pilot found it impossible to move the control column back past the neutral position. All other controls were normal, hydraulic pressure normal, and the green light OK.

S/L West decided not to deboost. As the aircraft levelled off at 100 feet, he reduced power to hold the speed under 200 knots, applied full nose-up trim, and ordered the observer to prepare to eject. The aircraft then assumed a slight, climbing attitude and appeared to be maintaining a gradual climb. The pilot kept the speed under 200 knots and continued on up to 7000 feet while executing a 15-degree turn to port to get clear of a water area.

The controls were normal except for the elevators, which could not be moved back beyond the neutral position. It was possible to fly straight and level with no stick load at 200 knots by using full nose-up trim. S/L West also found that when an extra hard force was applied to the stick it would snap back approximately one half-inch, causing the aircraft to jump and buffet. This action was repeated a few times in an attempt to clear the control, but to no avail.

A chase aircraft was called, and its pilot confirmed that full nose-up trim was on and the elevators deflected slightly upwards, but that otherwise the aircraft appeared normal. At this point a turn to starboard was made, during which the nose of the aircraft dropped rapidly.

In a last attempt to remedy the trouble before ejecting, S/L West gave a healthy pull on the control column. After a series of very rough snap-like vibrations on the control column, the aircraft's flight path changed rapidly up and down—and the elevator control became normal.

To regain control it was necessary to retrim very quickly. S/L West then climbed the aircraft to 8000 and checked at approach speeds with gear and flaps down. The Canuck acted normally and a landing was made without difficulty. S/L West is to be commended for his coolness in handling this situation.

Investigation revealed that an AN3-4A bolt was loose in the sealed section of the flying control lay shaft toward the back of the rear cockpit in the right console in the area that had been sealed off by mod 05-25F-6A/67. This size of bolt was used on this mod but was a retained bolt and was not included in the list of parts required. The two AN3-4A bolts used in this location were in position. The extra bolt appeared new, and showed evidence of having been jammed. A deep indentation was found on the floor of the cockpit at the junction of the elevator control rod and elevator lever (when the control column is in the neutral position) which would indicate that the bolt had been lodged under the rod-and-lever connection, thus preventing backward movement of the stick.

Mod 05-25F-6A/67 (sealing of flying controls) was issued to eliminate the possibility of foreign objects jamming the flying controls, and its installation was completed by a mobile repair party two months prior to this incident. After this modification is installed, there is no way for a foreign object to enter the sealed control assembly unless it enters when the control column is pushed fully forward, in which position a space of "two fingers" is evident in the grommet (part number 1D22238). The movement of the control column fully forward in flight is not too probable. It is very unlikely, and almost impossible, that the bolt AN3-4A entered the sealed area after the modification was completed. Most likely the bolt was left in the compartment when the modification was being fitted. If this is so, it is one of the most serious cases of negligence or poor workmanship that we have seen.

Can you visualize a crew installing a modification intended to seal flying controls in order to prevent the possibility of a foreign object jamming the controls, and then leaving a foreign object inside the sealed area?

CONFUSION AFTER DARK

I was on a T-33 night crosscountry exercise from Saskatoon to Cold Lake, with a jet range approach scheduled at Edmonton. I was in the front seat, with a student in the back.

On overshooting the range approach we were instructed to remain VFR in the Edmonton area until clearance was received. I took control and circled east of the aerodrome between three and four thousand feet. The cloud base was approximately 4500' indicated.

When the clearance was received I stopped the turn and began climbing, entering cloud almost immediately. Then I looked down to check the radio compass. On looking back at the instruments, I found that I had 90° of bank and that the aircraft was in a descending attitude with the airspeed about 320 knots and altitude about 5000 feet. At this time I had a very definite impression that I was still in a normal climbing attitude.

I began to apply aileron in the wrong direction, then immediately reversed this and pulled back on the control column. The move applied two or three G to the aircraft. Bank was reduced to about 20 degrees but I found it impossible to bring the wings level. (I realized afterward that the aircraft had been going straight up.) Since I was completely disoriented, I handed control over to the student who carried out a vertical recovery. The aircraft was brought to a normal attitude at about 9000 feet. My disorientation began to disappear as soon as I handed over control, and it was completely gone by the time recovery was effected.

I feel that the factors contributing to the incident were as follows:

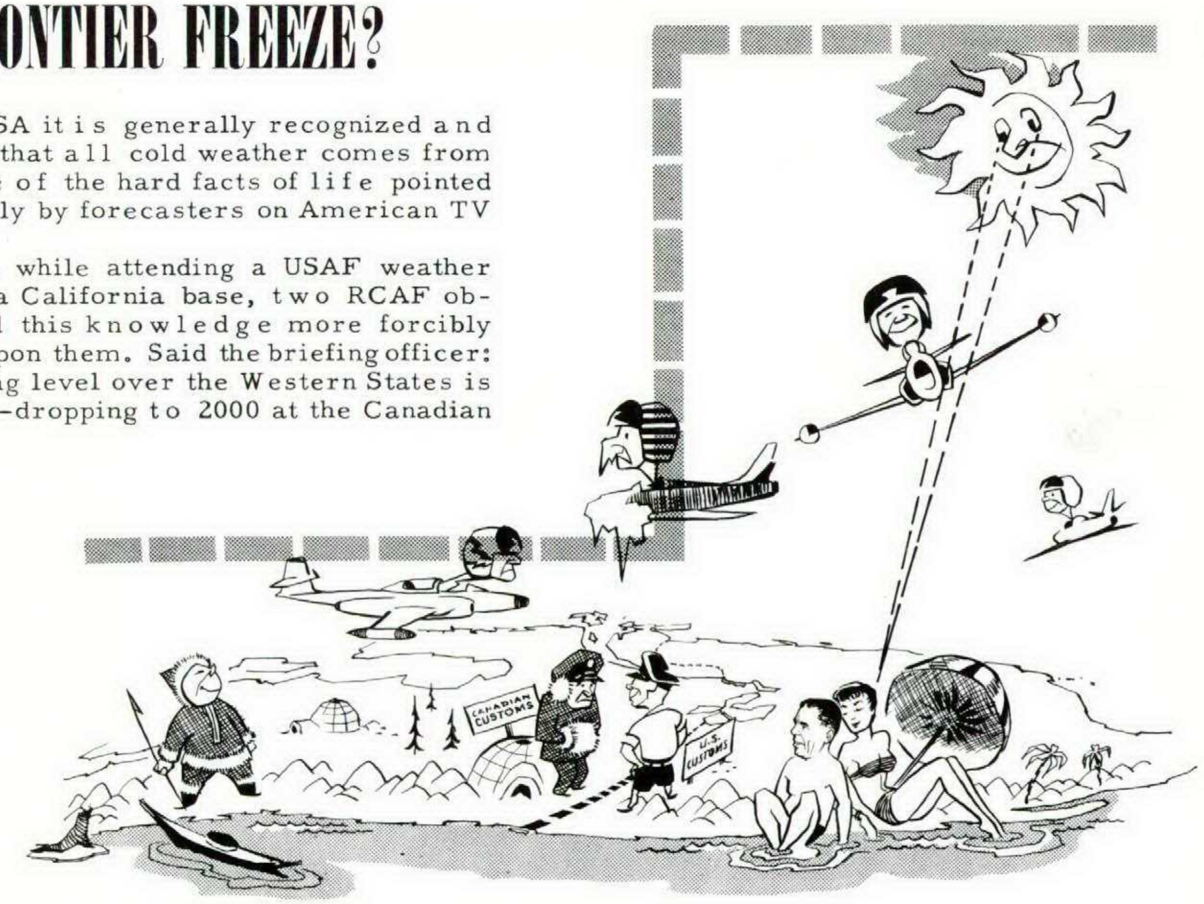
- I was flying while fatigued
- Glow from the city lights, and a similar glow from the Aurora through a break in the cloud
- St. Elmo's fire on the windscreen
- An effect from the city lights during the period of VFR flight over the city
- Transition from VFR to instruments was fast but perhaps not complete.

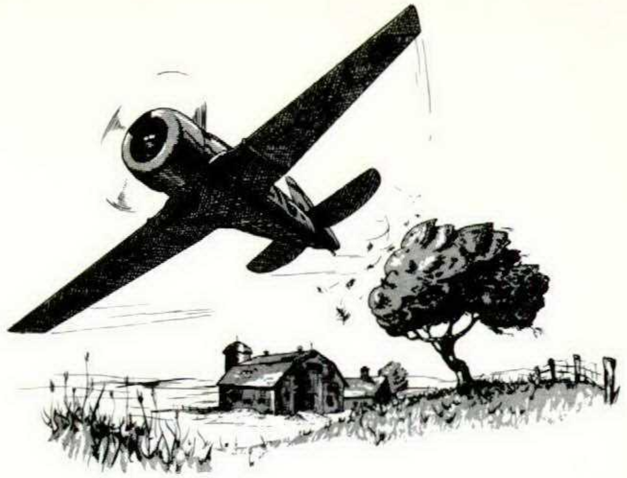
Apart from the disorientation, I felt no nausea or other ill effects at any time—except for nervousness when it was all over. The trip was completed without further incident.

FRONTIER FREEZE?

In the USA it is generally recognized and accepted that all cold weather comes from Canada—one of the hard facts of life pointed out regularly by forecasters on American TV networks.

Recently, while attending a USAF weather briefing at a California base, two RCAF observers had this knowledge more forcibly impressed upon them. Said the briefing officer: "The freezing level over the Western States is 11,000 feet—dropping to 2000 at the Canadian border."





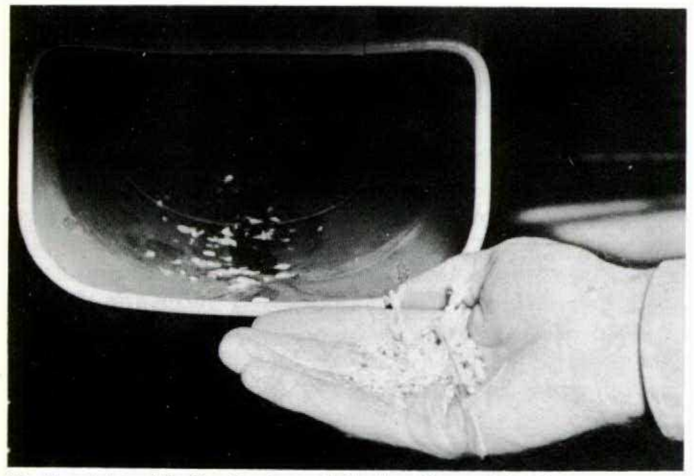
1000 TOO LOW

S/L G. L. Sheahan

When we were young lads we liked to stroll around the house with something in our mouths that resembled a pipe or cigarette. We wanted to imitate dad. Then, as we grew older, we met the boys behind a garage or down a dark alley to smoke a cigarette we had slyly acquired somewhere. Years later, when we were old enough, we joined the Air Force to learn how to fly aeroplanes. Today, as budding young pilots, some of us still get the urge to taste forbidden fruit—in this case unauthorized low flying. It's the old story of youth's impatience, daring, and love of excitement.

But by now we should be mature enough to realize that learning to fly is a deadly serious and expensive business. We should be able to curb our impatience and resist the temptation to try that forbidden fruit.

The Air Force is strict about unauthorized low flying, and for a very good reason: it is extremely dangerous, especially for an untrained pilot. There are times and places in the training schedule for low flying, but some of us just can't wait. Like the lads with the cigarette, we sneak off and low fly. We know all about this flying game.



You're right. That's wheat—and that's a Harvard intake.

But do we? According to the statistics section of the Directorate of Flight Safety, the answer is a large and emphatic NO! The truth is, unfortuna.ely, that far too many of the pilots who engage in unauthorized low flying have a serious crack-up—and an even larger percentage of them receive grave or fatal injuries. Occasionally their irresponsibility leads to the death of a fellow student. Quite a price to pay for a few moments' thrill.

Let's look into two authentic cases of unauthorized low flying, both of which led to a court martial. These cases happened some time ago and are used so that the pilots, students and places will not be identified. Recent cases have followed the same pattern, and, with the exception of the first case, the results have been just as serious.

The first was known by many in the RCAF as "The Case of the Cherry Tree", and it reads like a detective story. It turned out to be a case in which even the great Sherlock Holmes, with the aid of his assistant, Dr. Watson, could not have secured a conviction.

The first case involved a young lad who was well advanced in his training as a Harvard pilot. He was doing well, according to his instructor. He was also keen and enthusiastic—just the type that would make an excellent Air Force Officer.

After briefing the student for a crosscountry exercise, the instructor checked over his route and monitored his preparations. On the surface all was well. However, the student's first turning point was a short distance from his parents' farm—and after that he had plans of his own. He intended to ignore the instructor's briefing and give his folks a demonstration of his prowess as a flyer.

Soon after takeoff he arrived over the old homestead. Then the fun began. He dove down to "beat up" the farm. Next he performed a variety of stunts all over the area. It was going beautifully. "What a pilot!" he sighed to himself as he hurtled nonchalantly through another roll at nil altitude.

At that moment he hit a cherry tree. It was in a field three lots from his father's farm. The student made a successful crash landing with only slight injury to himself. The Harvard was badly damaged.

During investigation of the accident, the student explained that he had experienced engine trouble and had been forced to land. But the investigating officer found branches of a cherry tree caught in the cowling and fuselage of the aircraft. He traced the flight of the Harvard and discovered such a tree on property next to the father's farm. Careful notes were made of its exact location, and a photographer was called in to take pictures of the crashed plane and the tree.

When the photographer arrived, the cherry tree was gone. Where the investigating officer had said it was standing, there was just a shrub covering a stump. Gremlins had spirited the tree away. Evidence given at the court martial was insufficient to prove that the plane had hit a cherry tree because no such tree stood there. Accordingly the student was not convicted.

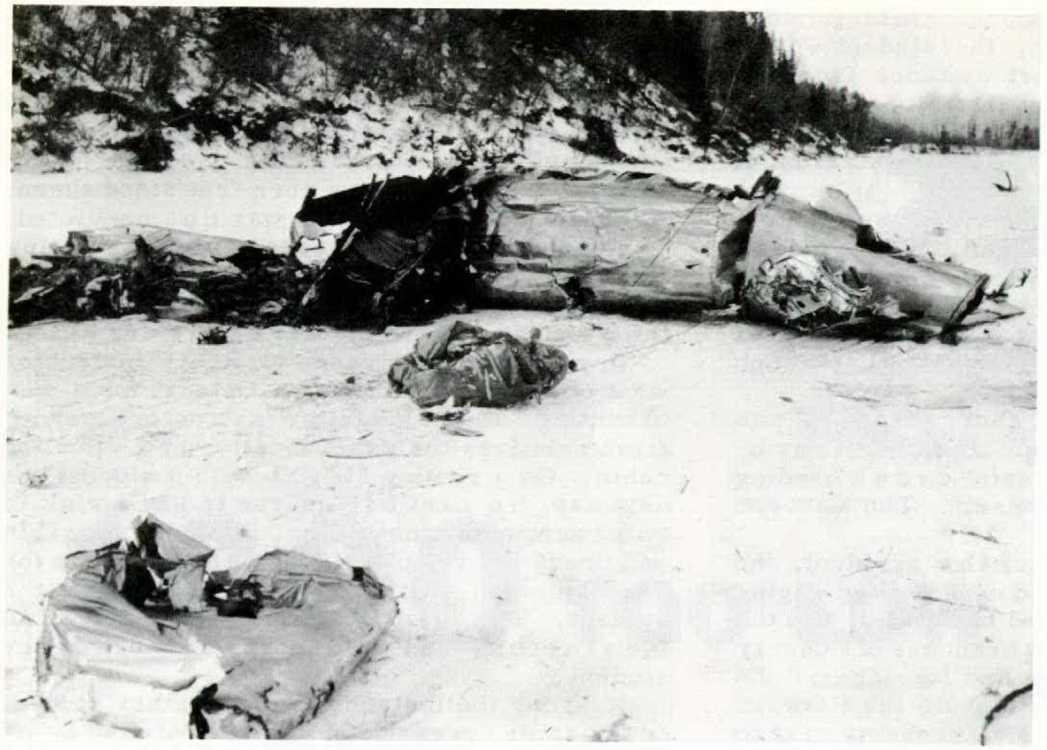
Needless to say all cases of violation of low flying rules do not end up quite as happily as this for the pilots involved. In many instances the occupants of the aircraft are killed.

In our second case, an RCAF instructor went on leave in Northern Ontario for a spot of hunting. One of his fellow instructors learned from relatives the exact location of the hunting cabin. On a routine flight with a student the next day, he went off course to pay a visit to the vacationing instructor. He found the cabin and "beat up" the place. It was great fun for him, though a little nerve-wracking for the student. The "beat up" over, they returned to the station, and no report was made by the student.

Next day the instructor took another student on the same course, and over exactly the same spot he told the student, "All right, I'll take over now. I want to visit a friend." He didn't know that his friend had not watched the exhibition over the cabin the day before, nor that at the time he was out in the bush, miles away.

Spotting the cabin again, the instructor began his exhibition of rolls, dives, and low passes.

Too low again. Mother Earth didn't budge a foot.



This was a Mitchell that flew a shade too low.

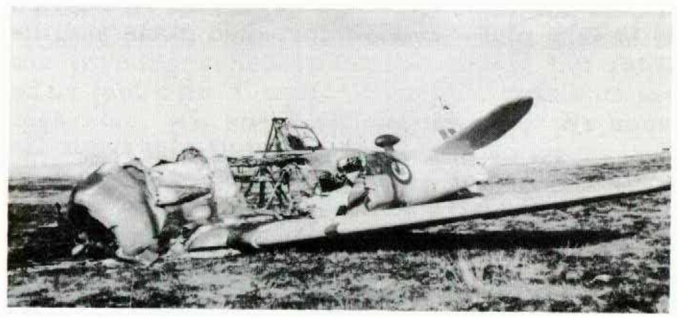
But to-day was to be a big day, with something added to the previous day's performance. After several dives, he began throwing rolls of toilet paper out of the plane, aping the ticker tape displays which New York puts on when celebrities arrive in town.

Down went the plane in a power dive, and out flew the toilet paper in one lovely arc after another. Mission accomplished, the instructor brought the plane out of the dive. As he started to climb, it suddenly went out of control and plunged nose first into the ground, killing both student and instructor, and scattering wreckage for 200 yards.

For those of our readers who remain unmoved in the face of gentle persuasion, here are a few harsh statistics covering the last two years: The RCAF had ten cases of unauthorized low flying accidents. Of the ten aircraft involved, six were complete writeoffs! Five of the pilots were killed! Four of the pilots were seriously injured!

Not impressed yet? Think of it this way. Of the aircraft involved in these accidents, 60 percent were written off! Twenty-eight percent of the pilots were killed! Forty percent of the pilots were injured! Figure it out for yourself. Don't you agree that it makes Russian roulette look tame by comparison?

Even authorized low flying can be hairy enough without tempting fate further. In the last two years, the RCAF had nine accidents occur while personnel were engaged in authorized low flying. The result was three aircraft written off, two pilots killed, and two pilots



The end of an authorized low flying crosscountry exercise.

injured.

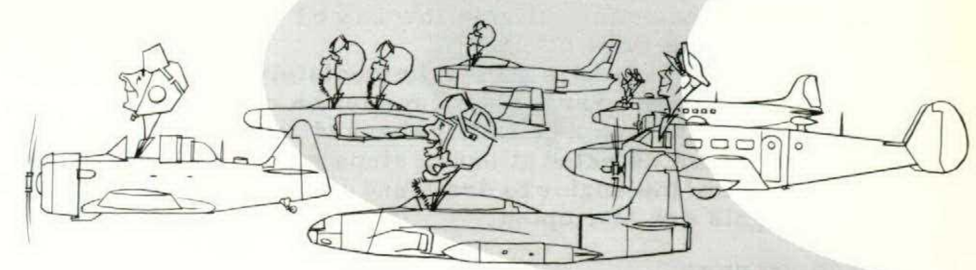
The comforting old saw, "It can't happen to me", is all wet. It CAN happen to you. So, whenever you get the urge to add that kind of excitement to your flying, go back and land. Better pilots than you have been killed at it.

To put it bluntly: your chances of "getting away with it" completely are just about zilch. Even if you don't write yourself off, you may have to suffer a lot of unnecessary pain—or go through life a cripple. Maybe both! If you aren't killed, and don't get hurt or crippled, you still have to face a court martial and dismissal from the Service.

Any way you look at it, the price is too high for a few minutes' extra excitement. Why take an insane risk? You don't have to engage in unauthorized low flying to have a stimulating career. Our advice to pilots is simple, unqualified, and permits no alternate course:

DON'T LOW FLY

HEADS-UP FLYING



LASSO

The undercarriage of a Mitchell aircraft could not be fully retracted after takeoff. The main gear came up about half way and the nosewheel unlocked. Hydraulic pressure stood at 1000 psi.

F/L W. Mitchell, captain of the aircraft, made several up-and-down selections and finally succeeded in locking the main wheels down. However, the nosewheel down-lock would not engage, although the hand pump and emergency hand pump were both used. An effort was made to engage the down-lock through the hole in the nosewheel bulkhead, but it was too small. Crewman Cpl J.F. Sheppard managed to enlarge the hole with a fire axe, and then a loop of microphone cable was used to pull the down-latch into place. The method succeeded and a safe landing was made.

Investigation revealed the hydraulic fluid contaminated with water and a disintegrated "O" seal. The outside temperature at the time (14° F) was sufficiently low to cause separation of the moisture in the hydraulic fluid.

Both pilot and crewman displayed an excellent knowledge of their aircraft, and it was undoubtedly this factor which prevented a serious accident.

[EO 05-55B-6A/95, dated 13 June 57, provides a means of manually engaging the nose gear down-lock when the nose gear has failed to engage properly. This aircraft had not been modified.—ED]

EXCESS FUEL AND RELIGHTS

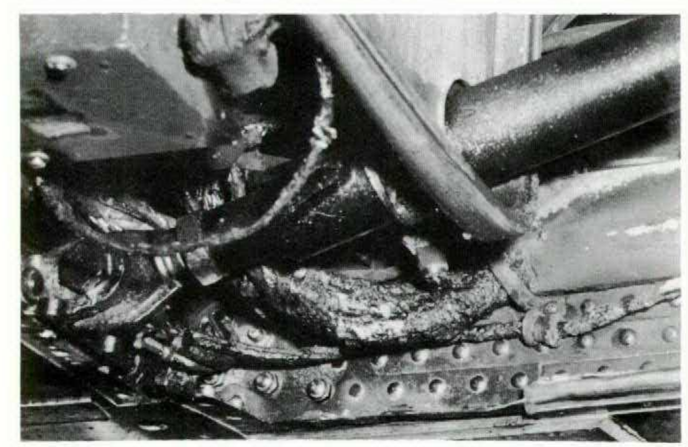
Flying a Canuck, F/O F. Hope was returning from a low level night exercise at 10,000 feet. In the vicinity of his base, and while over a large city, he felt a partial power loss. When a check of the instruments confirmed that the port engine had flamed out, he shut off the high pressure cock and started the relight sequence.

Just as he moved the HP cock to the relight position, there was a loud explosion and the fire warning light came on. He shut off the LP and HP cocks and activated the fire extinguisher.

At this point he noticed that the air speed indicator, altimeter and some cockpit lights were inoperative. He immediately declared his emergency and requested an escort aircraft. Fortunately it was a clear, bright, moonlit night, so both the rendezvous and subsequent landing were a success. F/O Hope exhibited considerable skill and courage in completing the flight under extremely adverse conditions.

A later investigation revealed that a fire and explosion had occurred in the rear of the port engine cowling. The fire had centered in the vicinity of the rear engine mount bracket, but heat and flames were drawn forward along the wing root and into the space behind the leading edge of the wing. Extensive damage was done to the wiring associated with the E4 junction box, and to piping, tubing and wires (including the alloy pitot and static lines) routed to the wing leading edge.

It was concluded that, during the relight attempts, fuel had leaked through the expansion joint between the exhaust cone and the tailpipe, and flowed forward in the tunnel under the fire cone assembly to settle in the aft cowling in the region of the junction box. When the pilot took relight action, flame was propagated forward via the same route and ignited a substantial fire in the cowling area. This excess fuel had pooled during the undetermined interval between the time the engine flamed out and the time the



Extensive damage was done to the junction box wiring.

pilot noticed it and shut off the fuel.

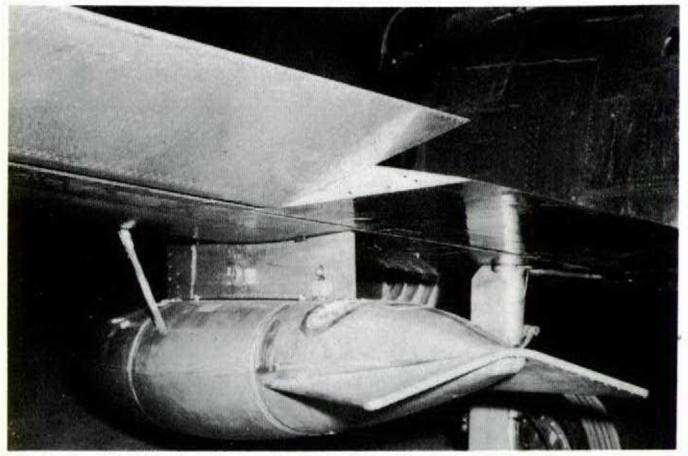
One other such case happened in the past, and in both instances the common denominators were the conditions favourable for the accumulation of fuel (time lag in closing the HP cock), coupled with the comparatively low level at which the relights were attempted.

Unless the HP cock is closed immediately after flameout, the resulting accumulation of excess fuel constitutes a grave fire hazard. If the flameout is not detected at once, steps must be taken to allow the engine to drain and dry out before relights are attempted.

JAMMED AILERON

F/O D.A. Vann was leading a section of two Sabres engaged in a GCI interception. While in a tight turn to port, he executed a snap reverse to starboard. Upon rolling out to starboard, he felt a sharp jolt in the control column, and the aircraft started a violent roll to port. After dropping the dive brakes and reducing power, the pilot managed to check the roll by harsh movement of the control column forward and to the right. As the airspeed dropped off, he regained control with full trim, stick forward, and full right aileron.

F/O Vann next inspected the aircraft and discovered that the port aileron had jammed in the full-up position and could not be moved. When a stall check indicated that the aircraft could be controlled at a speed low enough for landing, the pilot flew back to base, did a wide circuit, and put his aircraft safely down on the runway. Investigation revealed that the port aileron actuator piston rod had fractured, tne rod end assembly dropping in such a way that it jammed the aileron in the up position.



The port aileron actuator piston rod had fractured....
....jamming the aileron in the "up" position.

F/O Vann displayed professional flying ability by preventing an accident and making a successful landing under exceedingly difficult conditions.

SHARP OPERATORS

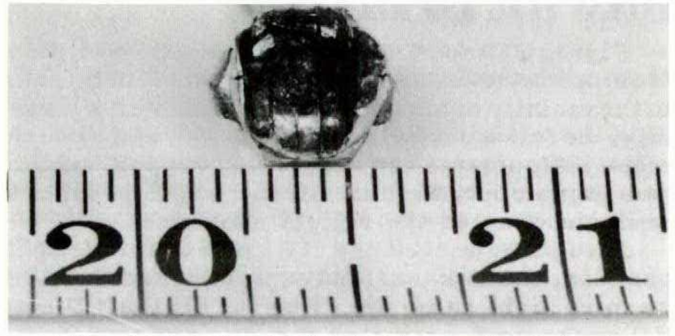
An Expeditor piloted by F/O G.E. Jacobson and F/O H.A.J. Pickard was on a routine air test following a minor inspection. An undercarriage-down selection was made in preparation for a stall test with wheels and flaps down, but the undercarriage would not lower.

An attempt to lower the wheels by the emergency method resulted in the undercarriage lowering to the "trail" position and jamming there. When all efforts to lower the gear failed, technical advice was requested from the ground. Various procedures were attempted, but when they failed to lower the undercarriage, the captain was advised to land on the grass with the wheels up.

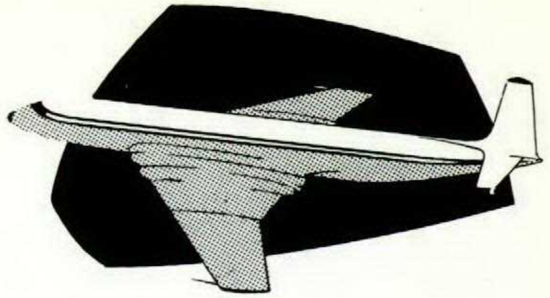
F/O Jacobson decided to try cranking the wheels down once more. He engaged the clutch and positioned the crank so that the co-pilot could exert maximum torque on the crank handle. By almost standing on the crank, disengaging the clutch, turning the crank as far forward as possible, and then engaging the clutch, bringing the crank back to the top, releasing the clutch, and again standing on the crank, the system let loose, the wheels dropped down and locked, and a successful landing was accomplished.

Investigation showed that a 10/32" fibre insert lock nut (AN365) was lodged between the starboard chain and the sprocket on the end of the torque tube. All bolts of this size used in the area were inspected, but none were missing. How the nut got there could not be discovered.

F/O Jacobson and F/O Pickard deserve praise for the methods they employed in meeting this emergency. When normal emergency procedures failed, the captain made full use of the station procedure for getting technical advice during an in-flight incident, and by perseverance and a sound knowledge of his aircraft, prevented a costly accident.



A fibre insert lock nut had lodged between the starboard chain and the sprocket on the end of the torque tube.



World's First Military Jet Transport

S/L J. Marshall

412 Transport Squadron RCAF Station Uplands

"We seem to have lost that jet stream now. Groundspeed has dropped to 420 knots. I'll pass you a revised estimate for the top of descent shortly."

RCAF Comet 5301 was at three-nine-thousand over the North Atlantic, out of Gander for Marville, France. In the passenger cabin LAW Faulkener, three years out of Hansport, Nova Scotia, lowered her seat so that the back inclined almost to the horizontal and the front slid forward so that she could feel her whole body supported by the soft cushions. Outside the oval windows the winking stars gave her a feeling of comradeship in the darkness.

Above the slight rasp of the air-conditioning system and the hum of the four Ghost jet engines, she could hear some of the passengers talking as they sat relaxed in the subdued atmosphere. Others were reading by the individual seat lights. The steward leaned over and in a quiet voice offered coffee and biscuits. Placing her cup in the holder mounted on the armrest, she helped herself to cream and sugar, smiled her thanks, and raised the cup to her lips thinking "So this is Air Transport Command."

LAW Faulkener was one of the increasing number of passengers who have travelled with the RCAF's Air Transport Command Comet Service to and from France. For this service the RCAF is using the DeHavilland Comet IA. This aircraft first flew late in July 1949, and the RCAF accepted delivery of two of them in 1953, making our Air Force the first in the world to use military jet transports.

Tests and Mods

After the Elba and Naples disasters the RCAF Comets were withdrawn from service and returned to England for modification. Many will recall the disasters which beset the early Comets, the subsequent inquiry, the pressure tests in water tanks, and the gust tests where the equivalent of 1500 hours' flying was applied to the airframe in less than 48 hours.

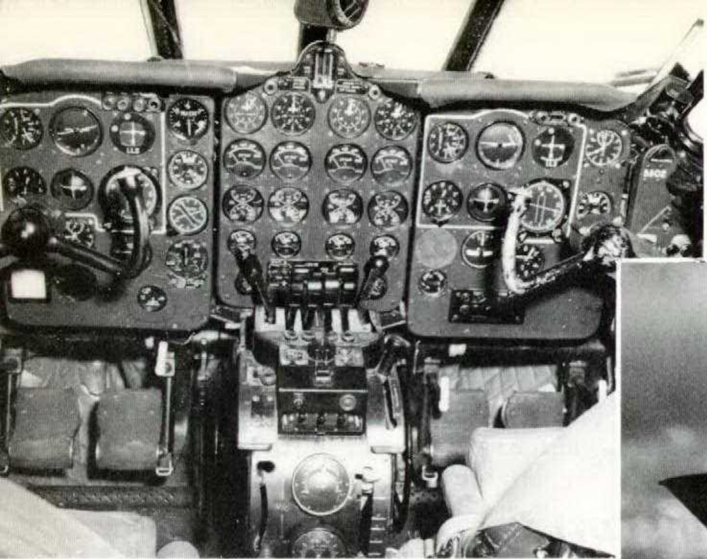
The tests revealed that the original Comets complied with—and even exceeded—the static strength which was mandatory by regulations. But it was the repeated changes of cabin pressure as the aircraft climbed and descended that caused the ultimate metal fatigue.

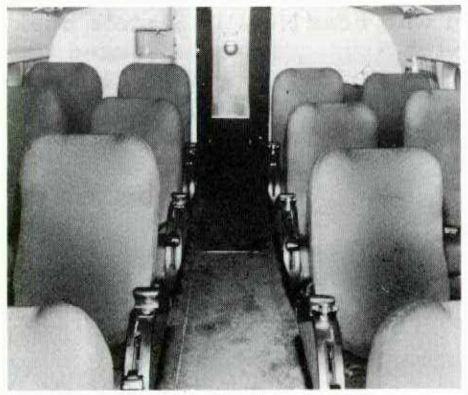
Those of you who read Neville Shute's book, "No Highway in the Sky", can rest assured that exhaustive fatigue tests were applied to every part of the Comet's fuselage and wings. The resulting modifications included replacement (with thicker gauge metal) of all fuselage panels containing doors, windows and other cut-outs, and reinforcement of the structures in the vicinity of windows, doors and hatches.

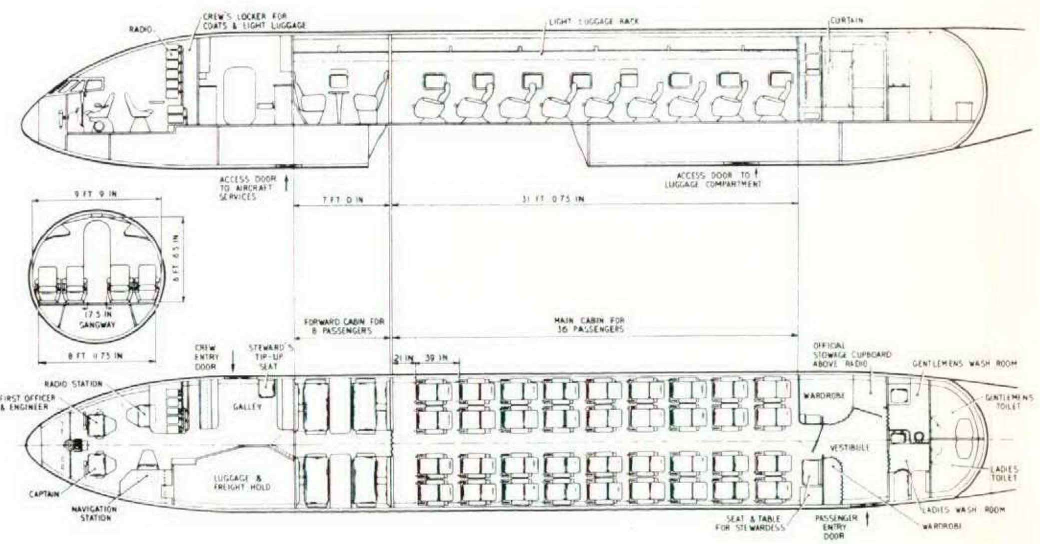
Training and Tasks

New aircrews and ground technicians were selected and sent to England in the Spring of 1957 to be trained in the operation and servicing of the Comets. The pilots, navigators, radio officers and flight engineers were chosen from Air Transport Command's currently most experienced line aircrews. The flying background of the eight pilots totalled close to 50,000 hours. The technicians were chosen from 412 Transport Squadron. Both the air- and ground-crews were given thorough technical training on the aircraft, after which conversion flying training was supervised by pilots of the DeHavilland Aircraft Company. Additional phases of the program were later completed in Canada.

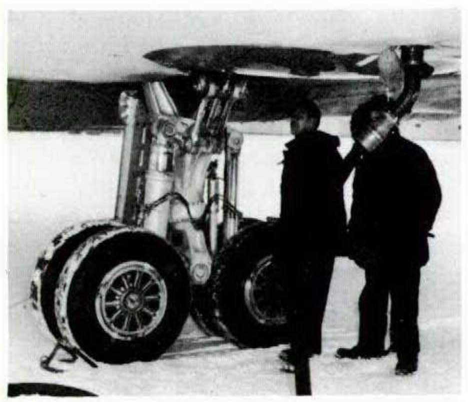
Since the Comets returned to operational

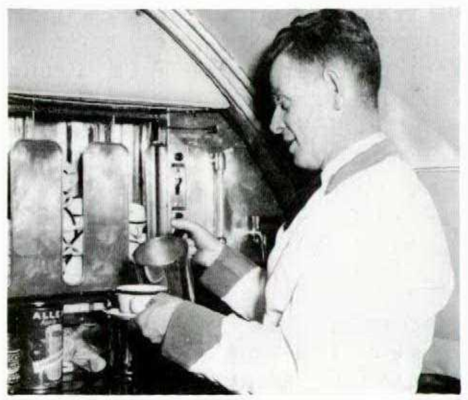


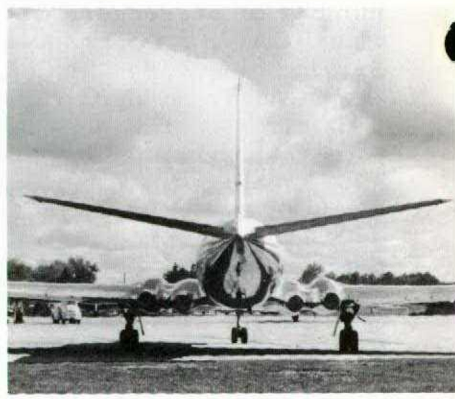




Interior layout of the 44-seater Comet.







service in mid-November, 1957, the tasks allotted to them have been multifarious. One of the scheduled flights—from Ottawa via Montreal and Gander to Marville, France, and returning via Lajes, in the Azores, and Gander—is flown every second and fourth week of each month. The passengers who are airlifted are mainly personnel being transferred to and from units within Number 1 Canadian Air Division in Europe. The flight departs from Montreal at 6 pm EST and arrives at Marville at 9 a.m. GMT. Allowing for the six-hour time zone change, this means that personnel could cease work at Montreal one afternoon and report for duty in Marville, France the following morning. It is the absence of fatigue factors among the Comet's passengers which makes such a feat entirely possible.

A primary mission of 412 Transport Squadron is the carrying of VIPs, and the speed and comfort of the medium-long range Comet have made it so popular that there is a great demand for its service in this category. A third task of 412 is co-operation with Air Defence Command in exercises associated with the defence of Canada.

Inside the Comet

For a close look at the Comet, let us enter the forward slide door and pass through the galley and to our right. Before us is the crew cabin with the two pilots forward, the navigator on the left, the flight-engineer on the right, and the radio officer facing the rear.

The two pilots' positions are completely dual, with the exception of the nose wheel steering which is controlled from the left-hand seat by means of a small steering wheel fitted midway down the control column. Each control column carries an auto-pilot cut-out button and a three-way thumb switch giving intercom, radio transmission and off. The throttles, speed brakes, flaps, undercarriage, and high and low pressure cocks can be operated from either position, as can the toe brakes. The auto-pilot controls are conveniently placed behind the throttle quadrant.

The instrument panel contains many dials new to the transport pilot, including tail pipe and rear bearing temperature indicators, machmeter and accelerator. The zero reader can be operated with the source selector or during an instrument approach it can be switched into the ILS to give both localizer and glide path indication. Set into the roof are the controls for the two VHF sets, the ILS, IFF and radio compasses, the hydraulic changeover selectors, and the fire warning and extinguisher switch panel.

There are four hydraulic systems on the aircraft, all classified by colour code. The flying controls are power operated and on the Blue system. All other services are on the Green system, including the Maxaret (non-skid) wheel brakes. Should the Blue system fail, the Green may be brought in as the secondary system to operate the flying controls; if it fails, the emergency Yellow system is operated. The Red system will supply direct braking and emergency undercarriage and flap operations; and for added safety there is the hand pump reservoir for emergency lowering of the undercarriage.

The air-conditioning system can be operated manually or automatically to control temperature, humidity and cabin pressure. The maximum cabin pressure differential is 8-1/4 pounds which provides, for example, a cabin altitude of 8,000 feet when the Comet is flying at 40,000 feet.

The Comet in Flight

Many will not have the opportunity to fly in a Comet, so perhaps a description of a flight will give you an impression of the aircraft's flying characteristics. The pre-flight preparations are more extensive than on the conventional transport aircraft. While the ground handling party are pressure refuelling with JP1 and JP4 fuel (the Comet operates on either), filling the water tanks for humidifier, galley and washrooms, the flight engineers are doing their external and internal checks. The pilots, navigators and radio officers—after attending a meteorological briefing where the tropopause, jet streams and temperatures are topical points—plan the flight from takeoff to landing.

Operating graphs and tables are checked and cross-checked for takeoff, while the height of the runway, airport temperatures, runway gradient and wind components permit computation of the takeoff distance. Together with the weight of the aircraft, these calculations provide the safe three-engine and "unstick" speeds. Next, the stabilizing altitude, initial cruise speed for minimum drag, the cruise climb, and the cruise descent are planned.

With the crew aboard the aircraft, the cockpit checks commence, and they continue after the engines are started and during the approach to the runway. Each of the powered flying control systems is tested, the hydraulic failure warning horn, the mach warning horn, the fire bells, the stall-warning lights and the stick shaker. Challenge and answer ring out as each crew member replies to the check list.

The Comet's four engines are opened up slowly for taxiing, and once the aircraft is moving, the inner engines are throttled back and momentum is maintained using the outer engines. Manoeuvring is done with the steering wheel and brakes. In the proximity of hangars and parked aircraft, the ab initio pilot has a feeling of uneasiness because the wing tips are only visible if he unfastens the lap straps, places his head at 45° above the instrument panel and inclines his eyes 90° to the left. With experience, however, the aircraft can be turned safely and easily in a circle of one and one-half times its wing-span.

Once the aircraft is lined up on the runway with its parking brakes on, the four throttles are fully opened, the parking brakes eased off, and the roll commenced. Direction is maintained by nose wheel steering until the rudder becomes effective. The nose wheel is raised off the runway at approximately 85 knots. As the unstick speed is reached—126 knots at 117,000 pounds, maximum all-up weight—the aircraft is deliberately eased into the air.

The initial climbing attitude is steep in order to keep the Comet's airspeed below 150 knots while the undercarriage retracts. Takeoff rpm of 10,250 is reduced to climbing rpm of 9750, and the climb commenced at 260 knots indicated. As the indicator passes through 200 knots the elevator gear is changed to fine; coarse gear is used for circuit flying and speeds below 200 knots at low level. During the climb the indicated airspeed is reduced by two knots per thousand feet. Upon reaching initial cruising or stabilized altitude, the pilot allows the aircraft's speed to build up and then trims for cruise with the rpm set at 9500.

The Comet's flying controls do not convey the feel of the aircraft to the pilot; he is actually working against springs placed in each control circuit to apply loads which vary with the amount of displacement. Thus the same "feel" is apparent on the ground as in the air, and care must be exercised to avoid overstressing the aircraft during high speed manoeuvres. The ailerons have a safety feature comprising servo units which will stall at decreasing aileron angles as the speed increases. At speeds 12% above the stalling speed a red light flashes in front of both pilots and the control column vibrates to warn of the aircraft's condition.

Another interesting feature is the mach auto-trimmer which takes over when the speed exceeds .77 mach (300 knots IAS) by cutting out the auto-pilot and applying "up" elevator, thus ensuring a decrease in speed. The normal operating speed is 0.73M (260 knots), at which the best range performance is obtained.

Descent in the Comet is made with the two inner engines throttled back to maintain 200° JPT, while the rpm of the outer engines is progressively reduced with height. Approaches can be made either by jet penetration, Instrument Landing System, or Standard Range Approach. Threshold and cutoff speeds are calculated for the aircraft weight, and touchdown is made on the main wheels just above the stalling speed, which varies with the weight of the aircraft.

For the navigator the flight plan varies according to distance. Flights may be considered in three classifications: short, medium or long range. For example, short range flights of four hundred miles or less would call for a climb to roughly 39,000 feet, followed by the descent to destination. Medium range of one thousand miles would mean a climb to 35,000 feet, followed by a cruise climb to 37,000 feet and a cruise descent to destination. Long range flights would call for a climb to 28,000 feet, a cruise climb to 37,500, and descent to destination. The still-air range of the aircraft is 2800 miles.

Pilots will perhaps wonder how Air Traffic Control is handled with this type of operating technique. In continental North America, flights are normally filed direct, 1000 on top, whereas under Oceanic control an altitude must be requested and assigned. During the cruise climb, as one altitude is reached, clearance to the next is requested. At present no difficulty is experienced, but one can foresee the mounting problems of Air Traffic Control as the number of aircraft using this type of operating technique increases over the next few years.

The Comet is an outstanding example of the air transport aircraft of the future—ultra-fast, ultra-smooth, unbelievably quiet, and a superb machine to fly. By being the first Air Force in the world to adapt for its own use the very latest of jet transport, the RCAF has demonstrated the type of thinking that is necessary if we are to derive the maximum benefit from the strides being made in modern aviation.

Our cover subject this issue is one of the RCAF's Comets as seen through the eyes of artist Jean Dubord.

GEAR

SAFETY SURVIVAL PROTECTIVE

F/L F. D. Broadbent AFHQ

While strolling out to that fast-looking number on the runway, have you ever thought about where your aircrew equipment comes from? I've heard it suggested that it doesn't come from anywhere but is left behind by visiting aircrew who wouldn't touch it with a ten-foot pole, and then issued to you by a scrounging SSO who had somehow latched onto it.

To go further, there are some who believe—and insist—that aircrew equipment is produced in a heavily-barred office by a small staff of idiots, dolts, and torture artists whose chief delight is the creation of items that are both senseless and unwanted. Finally, there are others who are firmly convinced that sizing is controlled by the freak section of Barnum and Bailey's Circus.

For the Flyboy

Leaving rumor for the moment, let us consider what constitutes aircrew equipment, how to get hold of it, and how it is introduced into the RCAF.

Primarily, the term "aircrew equipment" refers to (1) the protective gear we wear: flying suits, G-suits, boots and glasses, for example; (2) safety equipment: parachutes, life jackets; and (3) survival equipment such as the sleeping bags, dinghies and rations carried by all aircrew in their flying operations.

Because of the diversity of flying done in the RCAF, a large variety of items are required in each of the three categories of aircrew equipment. Obviously, a North Star can and must carry more survival gear than a Sabre. In actual fact, there is a great range of equipment to choose from when the survival packs are made up, and the same is generally true for personal flying clothing.

Parachutes airing in the drying room of the safety equipment section at RCAF Station Uplands.

Now, how does an aircrew officer find out what flying clothing he is entitled to? The RCAF has listed all clothing entitlements on what are known as Scales of Issue. Scale B2 is the particular scale of issue for aircrew clothing and equipment issued on a personal loan basis, and it may be read in the Supply Section of your unit. Using it, you can write out your deficiencies and then demand them from clothing stores when you get around there. In case you're interested, here are some of the more appropriate scales of issue for aircrew.

TITLE	SCALE	CAP
Personal Flying Clothing	B2	602
Special Winter Clothing	B25	602
Aircraft Emergency Kits and Equipment	D53	603
Survival Kit Bandolier	K56	650
Survival Kit Basic	K62	650
Survival Kit Dinghy	K63	650
Survival Kit Seat Pack	K68	650
Survival Kit Six Man	K70	650

All aircrew protective flying equipment undergoes extensive examination and testing before it is released for use at RCAF units in Canada and abroad.

CAP 100 (109.30) states that, "Prior to any flight, the captain is to ensure that every member of the crew is equipped with suitable flying clothing......for the climatic conditions likely to be encountered: (a) during flight; and (b) in the event of a forced landing." Since wearing the proper clothing may save your life, or at least keep you comfortable in most situations, why not check Scale B2 and make sure that you are properly equipped?

CAP 100 (109.21) also states that, "Based upon the prescribed scales of issue, the Squadron Commander or OC of a flying unit is to ensure that all aircraft of his unit carry sufficient emergency equipment to meet calculated needs for normal or special flights." A scale of issue is an entitlement only. It does not order you to carry all the equipment listed on the scale; it merely indicates what is available for inclusion in the emergency and survival kits. The Squadron Commander or OC decides what is to be carried in the kits, and when it is to be carried.

If, after checking your scale of issue, you want some changes made, just submit a Scale of Issue Change Request Form (E-336).

New Gear

A question often asked by aircrew is, "How does new equipment come into being in the RCAF?" The system which has been devised looks complicated at first, but in the long run it is efficient and ensures that only the best equipment is put into use.

The first step, of course, is to obtain ideas for new or modified pieces of equipment. Action is usually precipitated by the Unsatisfactory Condition Reports submitted by the units. However, ideas which may ultimately produce new equipment are also passed along from the Suggestion Award Committee (AFAO 99.00/01).

By way of example, let's follow the growth of a new item from the idea stage to the finished article—say a piece of flying clothing. If the original idea is sound, requirements staffs at AFHQ produce a paper called an Operational Characteristic. From the OCH the development agencies of the RCAF produce prototypes of the item. The prototypes are then put through technical evaluations to ensure that they are acceptable by RCAF standards. Those that pass these tests are sent out to operational units for "user" acceptability trials.

When the aircrew in the field have made their preference known, money must be obtained for procurement. Because of the care taken by the RCAF to buy wisely in terms of the National Defence budget, this point is as far as some of the ideas get. Naturally, essential projects receive top priority, and items which are desirable (but not essential) are placed lower on the list. However, if funds are available after the scale of issue is amended by AFHQ, a Contract Demand (CD) is prepared and let to a contractor by the Department of Defence Production. Once the item is received from the production line, distribution is made to units by Supply Depots as demands are received.

Availability

Another frequently asked question is: "Why is new equipment so slow to come into general use?" There are two main reasons for this condition. The first is that, normally, existing stocks of an old item must be used up before a new one can be issued for general use. In some instances the attrition rate is quite slow, which means that it may take a long time to consume existing stocks. however, where an item proves—in use—to be inadequate or unreliable, it is disposed of and replaced with new equipment as quickly as possible.

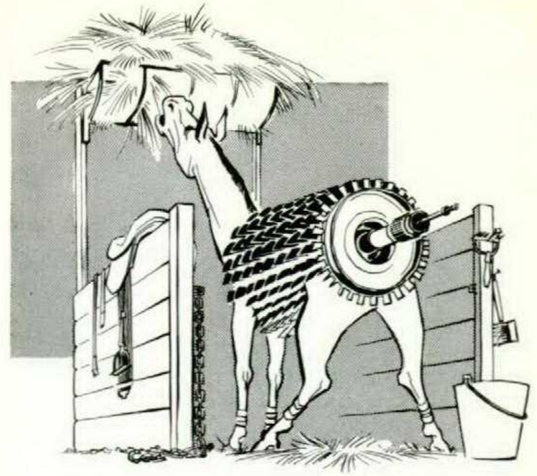
The second reason is that many people do not know that a new item is available; they continue to do without it, all the while complaining bitterly that "they" should do something about the situation. These same people are often the ones who refuse to submit the Unsatisfactory Condition Report which would help rectify that very situation. They also fail to read AFROs, Supply Bulletins, and the AMC Bulletin.

Since the primary function of the RCAF is to fly, many services have been organized to assist aircrew in the performance of their work. Flying Personnel Medical Officers, Unit Flight Safety Officers, and Supply and Safety Equipment sections are all here to help you fly safely and comfortably. Why not use their services?

All protective, safety and survival equipment in use with the RCAF was designed for you. If you are unhappy with any of it, submit a UCR. If you need a piece of equipment that is not on your scale of issue, then turn in an E-336.

If you make with the squeaking wheel, we'll make with the grease!

COMPRESSOR STALL



S/L E. D. Harper
CEPE RCAF Station Uplands

The modern jet engine is a system of engineering compromises stuck inside a big tube. It sucks air in one end of the tube and pushes it out the other, and in so doing develops power. The idea has come a long way from the original concept of a reciprocating engine driving a compressor.

Although the centrifugal-flow type compressor has proved highly effective and efficient in increasing jet power output, designers have gone to the axial-flow types. In these, the problems of air flow through the engine are so complex that engine manufacturers have had to go to two-spool compressors, variable-incidence guide vanes, and automatic fuel regulators in order to get more power with a reasonable degree of control. Variables which must be considered range all the way from the speed expected of the aircraft and the rotational speed of the compressor blades, to such things as the number of stages of compression and the temperatures an engine can withstand.

This article is presented to help point out some of the operating troubles encountered in jet engines, specifically the compressor stall and certain related problems. Automatic flow control units have been designed to overcome many of these faults, and to alleviate design and engineering difficulties. They provide compensation for the temperature and pressure changes which occur with alterations in weather and altitude; and, by means of connections to the compressor, they measure compressor delivery and ensure that fuel flow is correct for air flow. It is well to remember however, that the automatic flow control merely covers up some of the engine's basic faults. Should trouble develop with the fuel regulator, then the basic faults usually become apparent.

Before discussing some of these faults, let us first consider the structure of the engine. Every blade in both compressor and turbine is an accurate aerofoil which behaves like an aircraft wing and is subject to similar forces. In normal operation the compressor delivers far more air to the burners than is necessary for fuel combustion. As shown in figure 1 the excess air is routed around the flame tubes and re-united with the hot gases of combustion in such a manner as to provide cooling of the burners and to keep the exhaust gases from burning up the rest of the engine. If this excess air is not there, things get hot.

Compressor Stalls

Compressor stall is a phenomenon of jet engine operation which is more common and a greater problem than is generally known. The term "compressor stall" is not applicable in all cases of engine misbehaviour just because the symptoms are similar; there are some jet engines which, in a stalled condition, display symptoms ranging all the way from a mild vibration to a shudder of tail-shattering proportions. On the other hand, a centrifugal compressor type jet engine such as the Rolls-Royce "Nene" can exhibit some of the symp-

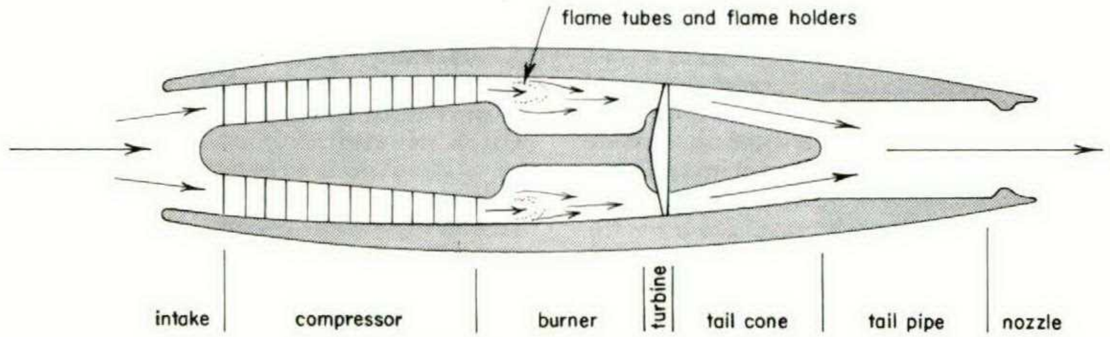


Fig 1. The structure of a jet engine.

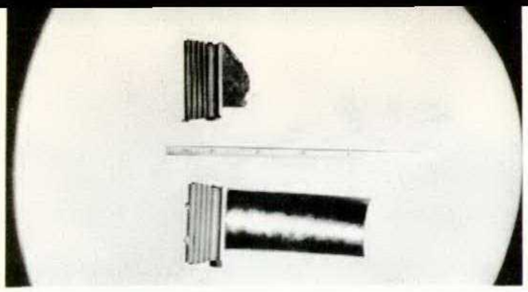


Fig 2. Here is what happens to an overheated turbine blade.

toms of a compressor stall when no stall is imminent. Actually, compressor stall is not usually a serious problem in engines of the Nene type. The reverse is true of the axial flow type, in which compressor stall and surge can be very serious.

Rapid opening of the throttle on a jet engine causes an increased fuel flow to the burners, followed by a rapid increase in RPM, which may lead to a full-fledged compressor stall. Because of the normal excess of air going through the engine, all of the fuel introduced is almost invariably burned, and temperatures rise rapidly. As the temperature in the cans rises, so does the pressure which, as usual, is exerted in all directions including forward.

This increase in pressure slows the airflow from the compressor, and some of the compressor blades start to stall—if they have not done so already. When this occurs the airflow is reduced further, more blades stall, and the RPM levels out—in the Orenda, usually around 75%. These indications are accompanied by a noticeable vibration and sometimes tail pipe rumble.

Meanwhile the fire continues burning merrily and things grow hotter. Pressure and heat increases begin affecting areas downstream in the engine: the shroud ring starts to curl up and the turbine blades commence to burn. If allowed to continue, serious damage will occur in a remarkably short time.

The Engine Laboratory of the National Research Council made qualitative acceleration tests on an Orenda engine—minus its automatic fuel regulator—and demonstrated that rapid throttle openings would invariably result in a violent surge. Whenever the surge occurred, the jet pipe temperature rose to approximately 1100°C in five seconds and would exceed 1200°C very quickly if unchecked. Airborne experience substantiates these findings.

Rapid throttle movement is not always necessary to start the process. In two known RCAF incidents, compressor stalls were initiated by a sharp disturbance of the air entering the intake. In one case a record was being made of engine conditions; it showed the compressor stall start and the JPT rise from 320°C to 790°C in seven seconds—by which time the pilot's recovery action took effect.

A further interesting feature disclosed by NRC was that in all instances of compressor stall, recovery was made by throttling right back. The compressor did not unstall immediately but took as long as 15 seconds in some cases for all stalls to be swallowed. It is conceivable that if a compressor stall developed at too low a power setting, throttling back would not effect recovery quickly enough to prevent damage to the engine. (Figure 2 shows what can happen to overheated turbine blades.)

The term "surge" is often used in connection with jet engines, and the question arises as to what the difference is between "surge" and "compressor stall". From the operators' point of view, the question is academic. Generally speaking, "surge" refers to the surging output of the compressor and engine, and "compressor stall" refers to the aerodynamic state of the compressor blades. Compressor stalls may exist in part of the compressor without any noticeable effect on engine operation, the compressor stall regions merely rotating in the compressor. These are known as partial stalls.

In some cases these partial stalls may result in surge ranges of operation. When operating in a surge range, the compressor output is rough and surging, produces engine roughness and vibration, and reduces engine efficiency. It is conceivable that under some conditions, if the engine were operated continuously in a surge range, the result could be a full-blown compressor stall. Acceleration through, or out of, a surge range interferes with the airflow sufficiently to markedly affect the rate of increase of compressor output, hence upping the chances of a serious compressor stall. Also, if the fuel flow is not carefully controlled in this situation, a very rapid temperature increase can be expected.

Overfuelling

Another major source of difficulty connected directly with the problem of compressor stalls is that of fuel supply. The serious overheating which results from major compressor stalls is a result of excessive fuel in combination with interrupted air flow into the engine. Overheating from overfuelling is characteristic of both axial flow and centrifugal compressor jet engines, and although the condition is not necessarily a cause of compressor stalls, it is worth mentioning because of the close resemblance of its symptoms to those of compressor stalls.

As the throttle is opened in an unregulated engine acceleration, the fuel flow into the burners is increased, and because of the excessive amounts of air being consumed, causes an immediate increase in temperature which the pilot becomes aware of via a rapid rise in JPT. The amount of the rise depends on the quantity of excess fuel being used. What makes overfuelling possible is the fact that the acceleration rate of the engine is definitely limited.

In a centrifugal compressor engine, the RPM will invariably catch up to the throttle setting in time, and as the compressor delivery increases, JPT returns to normal. Temperature rise is generally accompanied by vibration, tail pipe rumbles, and apparent thrust loss. With the T-33, for example, high temperature is a transient condition; as engine speed catches up, the temperature returns to normal. On some axial flow engines the same thing happens, but on others—as soon as the overfuelling starts—a divergent surge develops, the engine stops accelerating, and the temperatures go up, resulting in the compressor stall sequence. Should a violent surge develop, the temperature again becomes transient—this time on its way up.

Blow-Out

The problem of fuel supply to the burners brings up another related occurrence, the blow-out. It can be argued that this is not a problem to be discussed under the heading of compressor stalls but there is a strong relationship. In the circumstances previously described leading up to a compressor stall and violent surge, if the air delivery from the compressor is even more sharply diminished or the overfuelling is even more excessive, the fire goes out—a rich blow-out. The symptoms are vibration, rumble, and loss of thrust; but instead of rising, the JPT falls. Another form of blow-out is the deceleration blow-out which occurs under some circumstances when the throttle is sharply closed—a lean blow-out.

In the event of failure of the fuel flow control unit or some part of it, any of the foregoing problems could be encountered. Engine icing could lead to somewhat similar trouble; and even with the fuel regulator working within normal limits, difficulties may arise as a direct result of basic engine faults, or engine icing, which the regulator cannot cope with entirely. The most common of these problems usually occur at high altitude when the throttle is advanced rapidly: the engine displays all the symptoms of a compressor stall—rough running, vibration, loss of thrust, and RPM levelling out—except that the JPT also levels out. This is a stalled compressor, but the flow control unit limits the fuel and holds the JPT down.

Sudden throttle movements, especially in formation, can stall the compressor.

The symptoms of blow-out—with the exception of the deceleration type—are similar. They include engine roughness, vibration, possible (although not consistent) tail pipe rumble and loss of thrust. The important things for the pilot to watch, particularly when making power changes, are JPT and RPM.

The cure for some of these troubles is to close the throttle, relax and enjoy life for a short while (say 30 seconds), and try again more carefully. By this time the JPT should be settled down and the compressor unstalled (or the fire out). The idea is to correct the fault before the engine burns up. If closing the throttle in lots of time fails to stop a rapidly rising JPT, it won't hurt to stop the engine; it can always be relit.

The reader who has stayed with me this far knows that most of the difficulties mentioned have been avoided or eliminated by the use of automatic devices in the fuel control system, and that troubles usually develop only as a result of a malfunction. In the event of some malfunction, however, there is little or no need for serious damage to result if the pilot knows his engine.

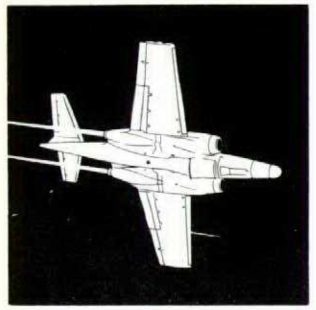
The pilot's responsibilities in regard to the problems outlined can be summed up by citing a few basic rules:

- Know your engine.
- Handle it with reasonable care.
- Watch JPT and RPM, and develop a "feeling" for what is going on.

[There are some tactical considerations to keep in mind. Disturbed airflow from other aircraft in the form of vortices or jet wash can upset a compressor to such an extent that it will thrash the incoming air without effectively speeding its delivery and pressure to the combustion chambers. In addition, the oxygen content of a jet wash is low enough to reduce efficiency in the combustion chambers of a following aircraft.

Muzzle blast from guns can be scooped into an intake to cause airflow disturbances. Rocket exhaust will also distort airflow and decrease the oxygen content for combustion in the burners, hence enriching the fuel-air mixture.

That last-ditch evasive manoeuvre, "the scissors", and others of a similar nature (especially if a little slip or skid is added) can produce a disturbed airflow and a decreased intake of air which, when coupled with throttle movement, can produce a compressor stall that has few equals.— **ED**]

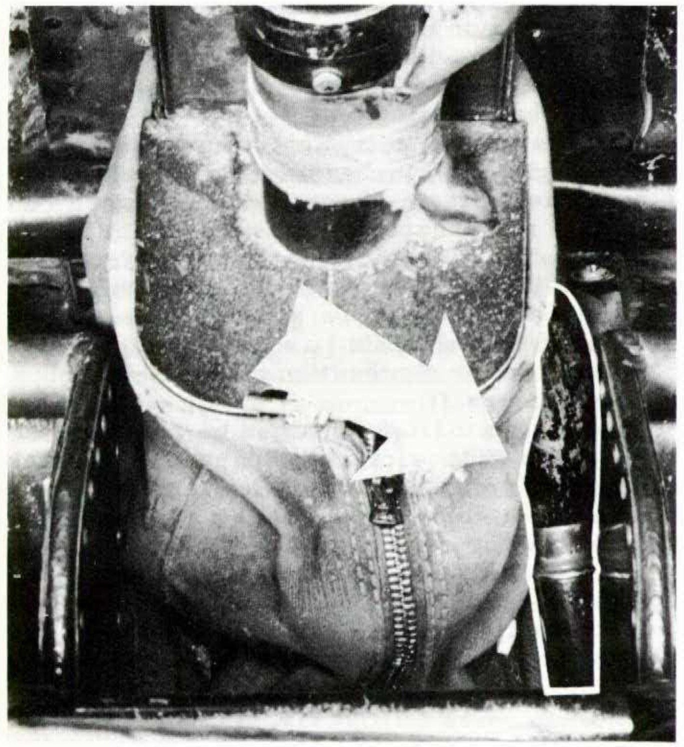


ARRIVALS and DEPARTURES

Pocket Droppings?

Routine checks were made on a Canuck after start-up and while the aircraft was being taxied to takeoff position. Movement of the controls appeared ideal up until then. However, just prior to takeoff they were checked again and a malfunction was found. The control column seemed to be locked in the central position. By applying force the pilot was able to move the stick to the left; but he could not move it to the right.

When the Canuck was returned to the flight line for technical investigation, a six-inch screwdriver was found at the base of the control column. Apparently it had fallen out of the pocket (or through a hole in the pocket) of an airman as he was doing a between-flight inspection. In this case the airman finished his work shortly after completing the BFI. He then hung up his overalls without checking to see that all tools were accounted for.



It was suggested in the Jan-Feb issue of Flight Comment ("Pattern for Disaster", inside back cover) that it would be a good idea to run a check on overall pockets and perhaps make a deal with the local laundry to repair those that are getting thin. SSOs please note!

Untimely Ejection

The pilot climbed into the cockpit of a Canuck and was strapped in. The airman assisting him removed the safety pin, but in doing so he pulled the sear from the ejection gun, and the pilot was ejected from the aircraft.

Two errors caused this accident. The first occurred on the previous night when the aircraft ran off the taxiway and the pilot inserted the safety pin in the wrong end of the sear. The second error occurred when a Before-Flight Inspection was not carried out.

It appears that maintenance used the F17 as a guide when doing a BFI; and since the trip had been cancelled, no BFI was required. A proper BFI would have revealed the improperly positioned pin and prevented a needless accident. The pilot who installed the pin in the first place showed a marked lack of familiarity with the aircraft—and this same lack of knowledge continues to cause accidents.

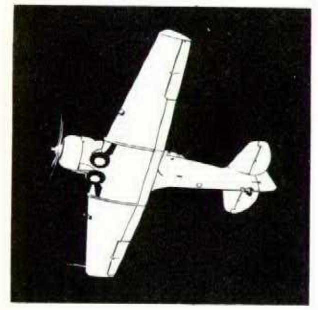
The pilot involved in this case sustained serious injuries.

Floor Disconnect

While carrying out a routine training mission at 22,000 feet, a Canuck pilot discovered during an oxygen check that his blinker had stopped working. When the press-to-test produced no result, the pilot began checking connections and discovered that the one at the bottom of the seat had come undone from the main oxygen supply. During the exercise the pilot had induced negative G, apparently with sufficient force to cause the disconnect. With some difficulty he reconnected the system and it began functioning normally again.

Investigation revealed that the seat had been removed and reinstalled the previous day. In the process, the connection had not been reseated properly, and it came loose during the negative G manoeuvre. The pilot was not bothered by any lack of oxygen because he was cruising at a reasonably low altitude, and in this case did not have to resort to the emergency oxygen bottle.

In recent oxygen incidents which took place at a higher altitude, it is interesting to note that only one pilot used the emergency oxygen. Further investigation revealed that to date only three pilots have used the bottle in an emergency. This emergency bottle is supplied to save your life when the regular oxygen system fails. Don't hesitate to use it.



Who Said Supervision?

A student was carrying out a routine training flight in a Harvard. After ten minutes of aerobatics he noticed that the oil pressure was falling. On the way back to base the oil pressure dropped to zero, and during an attempted forced landing the engine seized. The student made his approach to the field at too high an altitude, and the aircraft overran the runway and turned over.

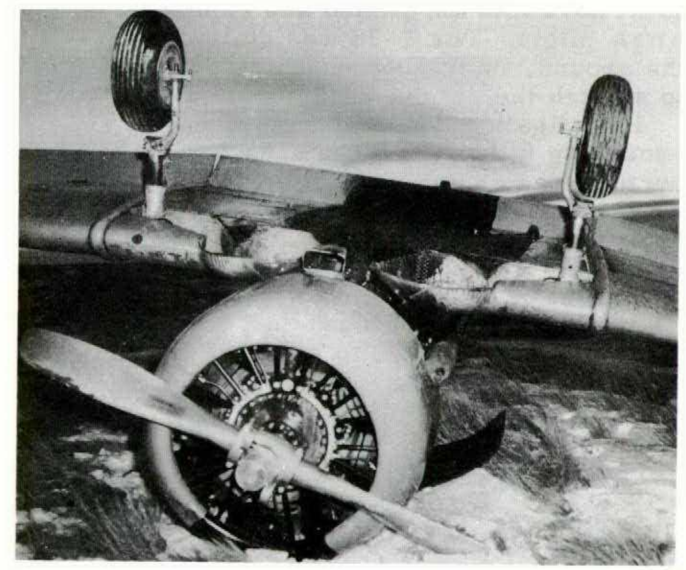
Upon investigation it was found that the rear oil sump drain plug was missing and the front sump plug was loose. When a closer examination was conducted to explain why one plug was missing and one plug was loose, some interesting information was unearthed.

The Harvard had been sent to a repair squadron for a P-100 inspection. During the inspection slight traces of metal were found in the sump plugs and oil filter, so the oil was drained, the tank flushed, and the oil replaced. On completion of the P-100, the engine was ground tested and the oil filters and sump plugs again inspected for traces of metal. None was found. The aircraft was test flown, and on completion of the flight it was declared unserviceable for inspection of the oil filter and sump plugs, and for rectification of a 100-rpm magneto drop.

A Corporal (AETech Gp3) and LAC Jones (AETech 3) carried out rectification of the magneto rpm drop, and the remainder of the crew—LAC Doe (AETech 3) and his helper, AC1 Smith (Gp 1)—dropped the engine oil filter and sump plugs. LAC Doe showed the filter and sump plugs to the Corporal, and the latter inspected them for foreign particles. Finding none, he returned the sump plugs to LAC Doe, who in turn gave the sump plugs to AC1 Smith to install.

The Corporal and LAC Jones completed the rectification of the magneto rpm drop, and without inspecting the sump plugs further for security, replaced the engine cowlings. The engine was ground tested for magneto rpm drop and oil leaks and proved satisfactory. The Corporal and Jones then proceeded to the flight desk to declare the aircraft serviceable and sign the L14-1B; but there he found that the entry for dropping the filters and checking the sump plugs had not been signed out by LAC Doe. Doe was not available; he had gone to band practice. His helper, AC1 Smith, was not available either; he had been called away on line crew duties.

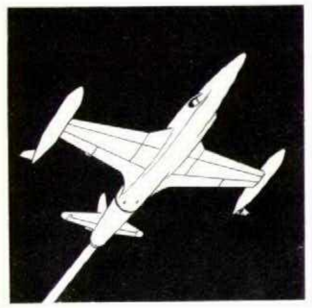
It was at this point that the maintenance error was committed. LAC Jones had not worked on the oil sump plugs; but, having complete confidence in LAC Doe because they had worked on the same crew together for a long time, he decided to sign the L14-1B without checking the oil sump plugs to see if they were safely locked. The Corporal signed the L14-1B as inspected and passed because he had examined the sump plugs and filter for foreign particles



and had given the engine a test (although he had not inspected the oil sump plugs for security). He also had confidence in LAC Doe's workmanship—not knowing that LAC Doe had not put the sump plugs in but had given them to his helper and gone to band practice.

The Harvard was ultimately certified serviceable and turned over to Servicing Squadron. During its first flight, the pilot reported low oil pressure and loss of oil and was forced to make an emergency landing.

We cannot condone the action of the Corporal in assuming that LAC Doe had finished the job—but was he informed that his two men were called away? Or was he by-passed and the AC1 sent to the servicing line and the LAC given permission to go to band practice? Experience has proved that unless the chain of command is maintained, the capability of the junior supervisor to supervise is lost. There is a lesson in this story. Don't lose it.



Stretched Glide

An instructor and a student took off in a T-33 on an instrument exercise. The aircraft was seen to climb straight ahead after takeoff until it was approximately 300 feet above the ground. It then appeared to level out and make a flat turn to starboard. After the turn it lost about 100 feet sharply, recovered momentarily, then began a gradual descent. As it crossed a 50-foot hydro line, the wings wavered and the aircraft dove into the ground and exploded, killing both pilots. The T-33 was stalled when it hit the ground, indicating that the pilot had tried to stretch the glide to clear the hydro wires.

Investigation showed that the engine was not producing full power. (Eye witnesses had reported that it was surging.) The cause of the engine malfunction could not be determined positively, but it is suspected that the fuselage pump was not operating.

Causes of the accident aside, it is extremely regrettable that these two pilots were killed. If they had not attempted to stretch the glide over the hydro wires, the aircraft would not have stalled. Except for these wires (under which was a clear space of 50 feet) the terrain was flat and free of obstacles—virtually ideal for a successful forced landing.

Even going through the wires need not be exceptionally hazardous provided—and this is

the vital factor—that safe flying speed is maintained and the aircraft kept under control to the point of impact. Regardless of the type of terrain involved, it is essential above all else that control be maintained if the pilot hopes to walk away from a crash.

One of the two accompanying photographs depicts the accident we've been relating; the other shows what might have been. Get the picture?

I'll Have Mine RARE

Beware of propeller! Beware of jet blast! These signs are displayed around the hangar areas of most stations and have a definite meaning for all of us. They are effective too, because no accidents attributable to such causes have been recorded for some time.

But wait! There's always somebody who wants to be different; and in this case that somebody has claimed a first.

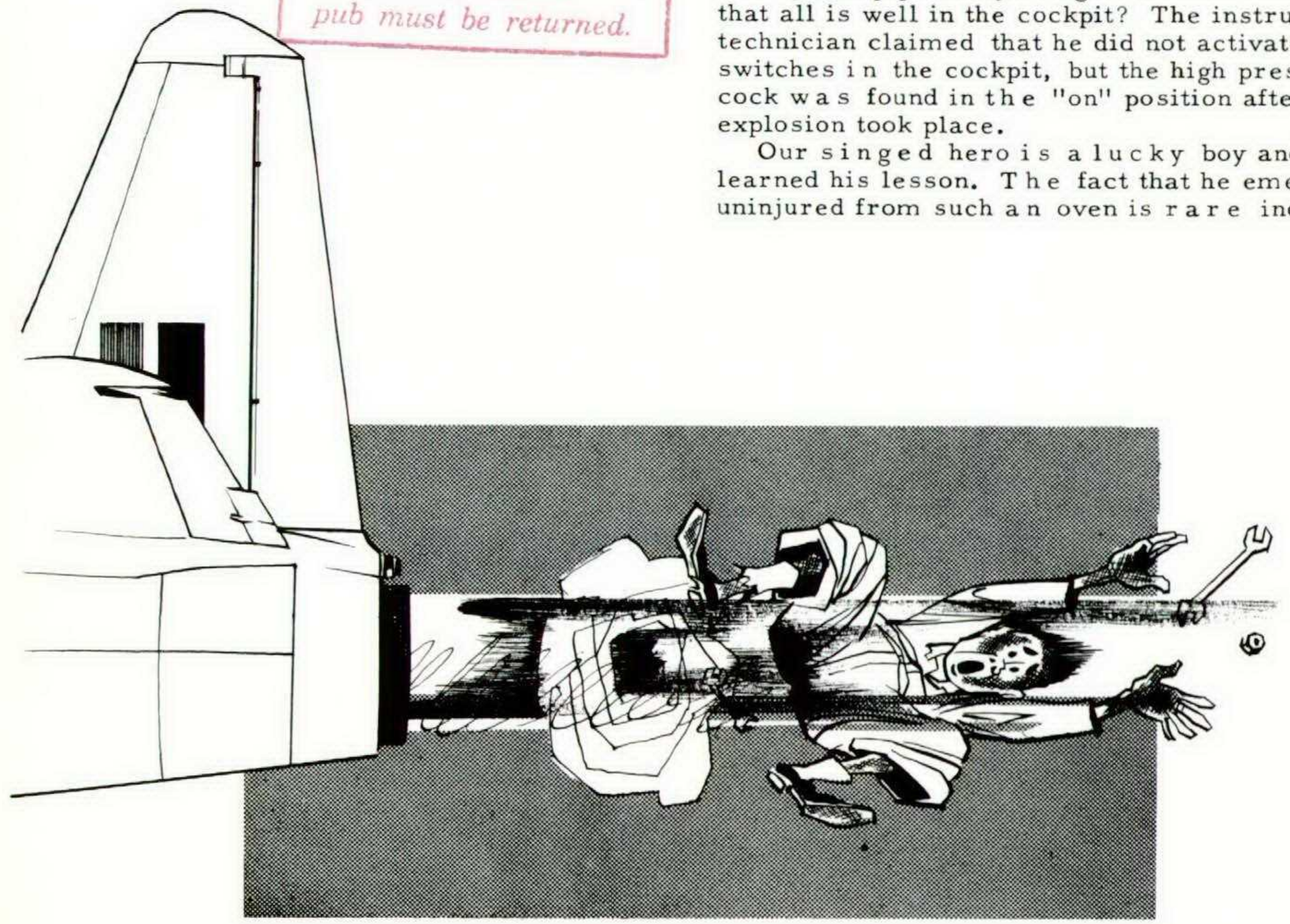
A T-33 was on a primary 800-hour inspection and engine change. The job was just about over, and an instrument technician was finishing up in the cockpit when a slight internal explosion took place in the engine. One blast of flame and one aero-engine technician shot out from the tailpipe!

The explosion was caused by incorrect wiring of the high energy circuit breaker (mod 05-50C-6A/232) by a mobile repair party. Damage to the aircraft was slight, requiring 45 cents and one man-hour to effect repair. As for the personnel involved, Stats 329 does not permit elaboration covering estimates of the damage to manpower; hence a separate report was submitted on the damage to the aero-engine technician, as follows:

"As would be expected, the AETech in question left the immediate vicinity of damage in shall we say, somewhat of a hurry, and was deposited in a rather forceful and undignified manner on his posterior some distance from the spout of 21427. Initial investigation revealed slight singeing of the hair on the top of his skull and severe singeing of the trousers and underclothing in the vicinity of the posterior.

"Further investigation carried out by our efficient medical staff concurred in the degree of damage in the first instance but belied the seriousness of damage in the second instance. The hospital staff, while cleansing the posterior for proper medical treatment, was amazed to discover that the application of soap and lukewarm water restored this area to its original state. Administration of these cleansing agents to the clothing had similar successful results.

"The medical staff having concluded their ministrations of mercy, the airman was dispatched to the local tonsorial clinic for repairs to the area of damage in the first instance. Again, efficiency of the highest order was demonstrated when a simple conversion was effected (without the necessity of an E52) from a state of singe to a more military, and acceptable, brushcut.



"When these two areas of damage were rectified the AETech was again fit for service. Total cost of repairs is itemized for your convenience:

(1) To posterior area .47¢ (1 box of Blue Cheer)
(2) To cranium area .50¢ (for conversion to brushcut)

"This unit is seriously considering the proposal to higher authority of a project of similar nature to be used for future Air Force Day attractions. As this demonstration is still in the initial stage of development, we can't say too much about it other than that it would consist of having six aircraft lined up on the tarmac duly loaded with six defaulters. At an appropriate time the defaulters would be shot out of the spout in the general direction of Aldershot Military Detention Barracks. Not only would this be a singular display of air power, but, upon computation of the correct range, (which we are now working on) we could reduce considerably the travelling expenses chargeable to Primary 05. This in itself should engender the approval of Treasury."

This accident is attributed to irregular maintenance practices combined with incorrect wiring. Would you pull a propeller through without checking that all switches in the cockpit were in the "off" position? Would you crawl into the tailpipe of a jet engine without ensuring that all is well in the cockpit? The instrument technician claimed that he did not activate any switches in the cockpit, but the high pressure cock was found in the "on" position after the explosion took place.

Our singed hero is a lucky boy and has learned his lesson. The fact that he emerged uninjured from such an oven is rare indeed.

Mystery of the Missing Fuel

In the Jan-Feb issue of Flight Comment we printed an item on the mysterious disappearance of some T-33 fuel, and then asked our readers for their explanations. Our poser is reprinted below together with the solution. How many T-Bird pilots had the answer?—ED

Two pilots took off on an IFR crosscountry in a T-33 which had been certified as having a full fuel load. On the 5000-foot check they noticed severe venting from the port main wing group tank filler cap, accompanied by moderate buffet. Since they were on airways, they continued the climb and worked out an estimate of the quantity of fuel they could expect to lose. They calculated that, at the worst, it would amount to loss of the entire internal port wing fuel load. This meant there would still be sufficient fuel to reach either destination or alternate, plus a comfortable reserve for emergencies.

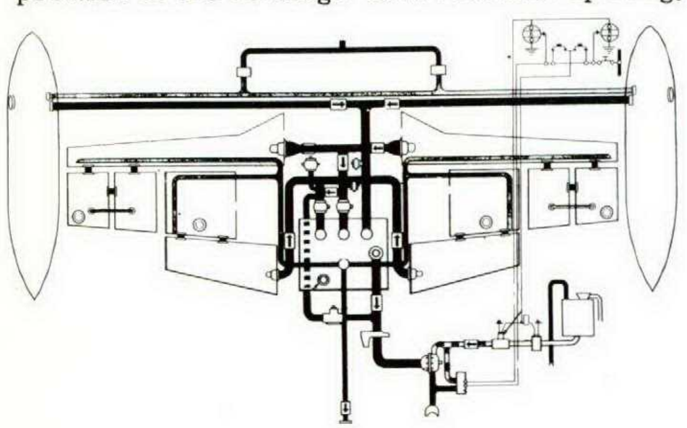
Breaking out above cloud at 33,000, the aircraft was levelled at 35,000 for "1000-on-top" flight. However, when the venting continued unabated, the captain obtained clearance for a throttled-back descent to base, intending to burn off fuel locally prior to landing.

The aircraft had been airborne forty minutes when the tip tank warning light illuminated. A rapid calculation showed that the tip tanks had contained only 100 gallons each! Congratulating one another on the decision to turn back, the pilots landed and marched on the servicing crew with blood in their eye.

It was soon determined that although the troublesome filler cap had been placed in the filler neck, it had not been tightened. (Corrective briefing was soon undertaken on this point!) However, the refueller adamantly insisted that the tips had been topped up to "full"—and a check with the fuel compound confirmed this.

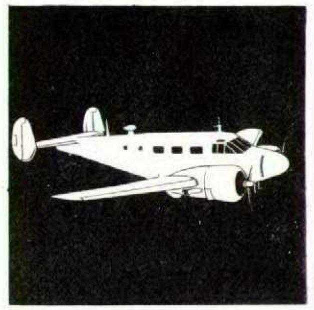
The question is: Where are the 180 gallons of missing tip tank fuel? There is an explanation. Do you know what it is? (Hint: the tip tanks did not vent fuel.)

Here is the solution. First, refer to the illustration on page 746 of EO-50C-4. Note the position of the fuselage tank vent line opening,



and also the position of the vent line from the wing group into the fuselage tank. This vent line is not joined as is suggested by the illustration and the schematic diagram on page 31-32 of the POIs; the wing group vent line actually opens directly into the fuselage tank.

When the aircraft is in a climb, with tip tanks feeding, the fuel level in the fuselage tank will be above the main wing group vent opening. Normally, if the caps on the wing main tanks are sealed properly, having the fuel level in the fuselage tank above the vent opening will cause no problems. However, if a leak develops in one of the wing group filler caps, fuel from the fuselage tank will feed through the vent line to the wing tanks and out the filler cap. The venting of fuel will continue as long as the wing group vent is below the fuselage tank fuel level.



Loose Plugs and Leads

An Expeditor on a long range crosscountry experienced port engine trouble after a fuel stop. There was a 200-rpm mag drop below 1500 rpm, and a "dead cut" over 1500 rpm. Normal clearing methods did not work, so the cowlings were removed. Two leads were found dangling free and one plug was loose. These were fixed, the engine checked serviceable, and the aircraft returned to base.

Subsequent investigation at the unit showed the starboard engine to have six loose plugs, one lead off, one broken shielding, and four lead tips with springs missing. Three loose leads were found on the port engine.

The Expeditor had just undergone a fly-in repair, during which the engines were placed in long-term storage. When the aircraft arrived back at the parent unit, the acceptance check consisted of a P.I. Since this check does not require the removal of the cowlings, the loose plugs and leads were not discovered.

This is a case of maintenance errors involving two separate units. The aircraft should have been serviceable after the fly-in repair but it obviously could not have been. The parent unit would have found the unserviceability if a proper acceptance check had been done. The extent of an acceptance check is left to the discretion of the CTSO. In this instance it is apparent that the check done was not complete enough to ensure aircraft serviceability.

ATTENTION ALL FLIGHT SAFETY OFFICERS!

The new type illuminated display pictured here (Ref 21U/58) is available to all flying units for use in aircrew, operational and maintenance rooms to promote flight safety.

The display can be effectively employed by units as part of a flight safety educational program directed at eliminating those accidents caused by lack of knowledge, forgetfulness and carelessness.

CAP 603, Scale D140, outlines your entitlement, and a supply of the displays is on hand at 1 Supply Depot.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