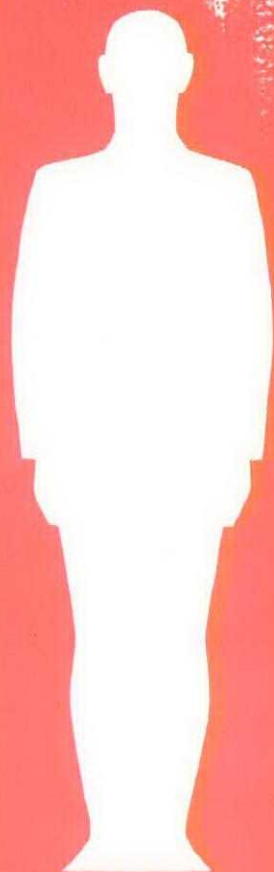




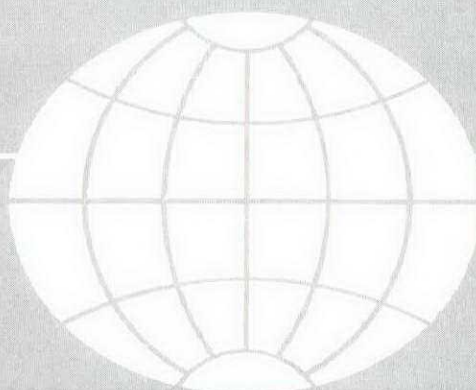
FLIGHT COMMENT

JANUARY • FEBRUARY • 1969

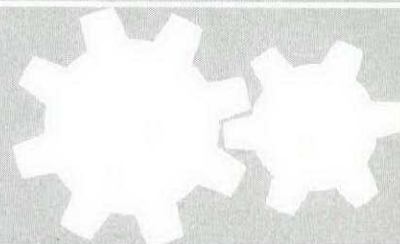
A C C I D E N T S



MAN



ENVIRONMENT



MACHINE

LOOK-see! • two 104s • stress and safety

Comments

We were astonished to read in an official document the admission "...that it would be unrealistic to expect aircrew to ask to be relieved of their flying duties *simply* because they were tired." Precisely; pilots are usually keen enough to deserve protection in the form of realistic managerial directives. In another era, this very real flight safety problem might have been regarded as just another "exigency of the service", but the price can be high for the bargain achieved by skimping or over-extending resources.

The CF Institute of Aviation Medicine has been given the job of testing two new devices to automatically inflate the mae west on contact with water. We will watch with interest the results.

Most of our work at the directorate is proposing and supporting prevention methods which are, after all, of little use unless diligently and properly applied. A recent survey showed, for example, that of 18 successive major accidents among airlines two factors were present in every case:

- lack of cockpit discipline
- misuse or non-use of available equipment resources.

Flight safety is everybody's business and the man on-the-job heads that list.

A milestone of sorts occurred last year when a major aircraft builder in the US was awarded a contract by a military agency. The contract was the first in history in which safety requirements were written into the design and purchase contract. For such a logical sensible step, it's incredible that it was so long in coming.

Sure it's nitpicking, but would all those who think propeller is spelled "propellor", please note.

For the historically-minded, may we modestly observe that this is the 15th Anniversary edition of Flight Comment? Its predecessor "Crash Comment" had its beginnings in the late 40s.

COL R. D. SCHULTZ
DIRECTOR OF FLIGHT SAFETY

MAJ W. W. GARNER
FLIGHT SAFETY

LCOL H. E. BJORNESTAD
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THE NEXT CHALLENGE

First - after a year's absence from this page - I would like to personally thank those who contributed to the 1968 Flight Comment series featuring each of the Commands. There was clear evidence that a great deal of constructive work is being done by many dedicated and enthusiastic people to promote flight safety.

In this issue you will find several items which attempt to shed some light on an aspect of accident prevention that demands increasing emphasis in the future.

Advances in equipment design, reliability and technical know-how have significantly reduced the number of accidents caused by materiel failure, but at the same time the human involvement in accidents has remained relatively constant. This now means that people account for 50-70% of the total accident cause factors - about five times that of materiel failure.

Now that there are reasonably effective instruments for dealing with machine problems, better flight safety measures must logically be directed towards man - or 'Personnel' as statisticians call him. The errors that man makes in coping with the problems of aviation have not really changed over the years, but the information required for a detailed analysis of why these errors are committed is not available, nor are we even sure what this information should be. What we do know, however, is that the problem is a formidable one, and most of us in the flying business are not sufficiently knowledgeable of the subject to recommend solutions. From this, two urgent measures emerge:

- the complexity of human behaviour will compel us to seek the advice of men in the behavioural sciences;
- better techniques for assessing, analyzing and reporting human error must be developed.

These are some of the aspects that will be studied in our continuing effort to get the most from our resources and it is expected that Commands will have a contribution to make in this regard.



COL. R. D. SCHULTZ
DIRECTOR OF FLIGHT SAFETY



MWO A. G. Morran
CFB Cold Lake

LOOK-

See!

PARIS
IN THE
THE SPRING

Look at it. What do you see?

CRUNCH!

**The NCO i/c Shift
runs out of the control room
to find a wingtip resting
at an unusual angle
on the wing of
another aircraft...**

Not an uncommon accident in the handling of aircraft and most likely in this case there really was a man watching the wingtip. But I wonder how often reports carry statements like:

- ▶ "There was always lots of room whenever we came in that way"
- ▶ "We always came in on that line before and the wingtips never hit"
- ▶ "I didn't realize until too late that there wasn't enough clearance"
- ▶ "There was lots of room to spare".

Probably, the investigator would have to assess the first three as Carelessness or Technique. The last is a tough one and would obviously cause a great deal of argument.

Of the examples above, the first two probably came about because an aircraft was not on the allotted spot. The third statement is probably an honest one; maybe the light was bad, the man was day-dreaming, or had just moved where he could see the wingtip in the split second before it hit. In any case, the carelessness assessment - regardless of the reason - is probably as true a choice as can be made.

Now, how about the last statement? An investigator might be privately inclined to call him a liar, using a more polite term to express it! But is this man just a hard-headed individual who doesn't want to admit he is wrong, or does he honestly think there was enough room? Has he been a wing-man on tow crews for months (or years), so that despite another aircraft *not* being in its accustomed spot, he is so accustomed to the wingtip fitting in alongside that aircraft, the impending impact didn't actually register until it was too late? In other words, was the man *looking but not seeing*?

Preposterous? How often have you seen someone playing solitaire and are able to point out a move, or when you are doing a jigsaw puzzle and have the same thing happen to you? Again, cases of looking but not seeing. The same thing can happen on the hangar floor. A man struggles to get two parts mated or a split-pin installed only to have another technician or a supervisor come along and effortlessly finish the job. Another example would be mis-reading the altimeter; after a long trip could it be that the pilot was looking but not seeing?

This writer is not a psychologist by any stretching of the word, so I do not profess to know the answers. However, I think that most supervisors with an unbiased approach can often come up with a solution - providing of course they can "see" while looking over the situation.

First of all, an underlying cause in many accidents and incidents is familiarity. Possibly a better word would be *overfamiliarity*. This cause appears in the first two examples: the tow crew had been doing it that way all along, so the wing-man *knew* it would be clear. Familiarity enters into the other statements; the third man had so often seen the wingtips clear that he wasn't consciously looking. Unless some mental signal alerted him that the old familiar pattern was about to be broken he would be too late to prevent the crunch. The fourth man was so

familiar with the tips clearing at that point he still couldn't believe that they had hit.

Hand-in-hand with familiarity comes the most dangerous factor of all - habit. I refer to bad working habits. Bad habits are the most insidious danger because they usually evolve over a period of time. With less experienced persons - including supervisors not familiar with the aircraft type - bad working habits can be passed on unnoticed. Unless an experienced man or other alert type comes along, the work carries on until something gets really out of line and an accident occurs.

Boredom is another factor that often lurks in the background. Boredom may not show up clearly in an investigation; it is generally named as the more obvious carelessness or inattention. But we could carry on indefinitely about contributing factors to the point of inducing in the reader - boredom!

Let's return to the examples. What are the solutions? Ask six people and you get six different answers. This points to the crux of the whole matter - people. With computers blinking away and with maintenance and flying programs becoming more centralized, people are becoming more and more a hole in a punchcard or a square on an org chart. In this kind of environment, the solution lies with the working supervisor.

First, let's consider bad working habits. Solutions can range from a complete shift of supervisors to a systematic appraisal of working practices by a crew chief. Some units try to prevent accidents from bad working habits by appointing a ground safety officer or NCO whose primary task is inspecting work areas for hazards and unsafe work practices. Others have established Sqn and Safety NCOs who have a primary or secondary duty similar to the ground safety NCO. These are intermediate solutions to the problem of bad working habits. These safety officers or NCOs - base or squadron - are dealing directly with people at the working level and with working supervisors; it's pretty hard for machines to take their place.

The factors of familiarity and boredom return us to that hole in the punchcard or square in the org chart - the individual. Rotation is usually the simplest solution to these problems. There are many pros and cons to rotation - and unfortunately safety is not usually one of the considerations. Rotation of personnel between sections isn't as simple as it might seem; "people" are more involved than would appear on the surface. Of course, the modern way would be to feed a bunch of cards into a machine and have it send Joe Blow from servicing to repair or from a transport squadron to a training squadron because he had a pre-determined length of time in his present task or, has other qualifications on his card. Can that punch or entry take into consideration Joe's personality and needs? Obviously not. This is where the working level supervisor comes in; knowing the individual, he has the opportunity - and the responsibility - to contribute to the decision-making.

Most people are quite versatile but we still have the "individual" who fits in one area with outstanding success but when moved to a different phase of his trade his performance deteriorates. We have men who make

outstanding pilots in the strike or tactical support role but who would be bored with transport or search and rescue flying; similarly, there's the technician who is a real whirlwind in servicing who becomes a near-dud when transferred to the aircraft inspection line.

The supervisor of aircraft technical trades fortunately does have a little more leeway than most trades in rotating jobs within his section but he can still fall into the trap of over-specialization. This was brought to my attention very forcibly when I was a young working supervisor. I was put in charge of an aircraft inspection crew on arrival in repair, and given an inspection to do. As had been my usual practice, I allotted sections of this inspection to each man with plans of future rotation. I allotted the first man the undercarriage and received quite a shock to have him reply, "But, Corp, I've always done the mainplanes". My predecessor had been in charge of the crew for two years and the men had done only one section of the inspection schedule while they were on this crew. After I rotated jobs the mainplane expert found many things the undercarriage expert had been missing. This was, of course, an extreme situation.

To get back to the towing accident, how many supervisors have seen a crew go out to tow an aircraft where men volunteer for the brakes or the wingtips, or automatically take up positions without direction from the NCO i/c? Possibly, as related in the previous paragraph, the wing-man has served nowhere else on the tow crew. In both cases, rotation is a valid solution to familiarity and boredom problems. However, it does involve people assigning people - a combination that doesn't lend itself to hard-and-fast rules.

This article has been written from the groundcrew supervisor's point of view. It offers no cure-all for accidents - towing or otherwise - nor is it a personal crusade. If these words start one supervisor - aircrew or groundcrew - thinking along similar lines which enables him to "see" a remedy for a dangerous situation (be it correcting working habits, moving a man to a different work area, or otherwise); or if one man's life is saved or he is saved from being maimed for life, I'll consider my modest effort truly worthwhile. ■

MWO (Slim) Morran joined the RCAF in 1942 as an AF mech, and after release in 1945 was one of the first five groundcrew to re-enlist in 2 Air Command. His tours were: NWAC Edmonton, 1946-1951; Camp Borden, 1951-1953; Portage, 1954-1957; Uplands, with 412 Sqn, 1957-1961; 2 Wing, 1961-1964.

At Cold Lake since 1964, MWO Morran has been with the Aircraft Technical Research and Investigations section. Here, he prepares and processes UCRs, TFRs, UMIs, and Supplementary Reports to aircraft incidents. This activity means that he spends much of his time investigating aircraft accidents/incidents; consequently, he is in a good position to keep his eye on trend developments in aircraft snags.



CAT clear air turbulence

Clear Air Turbulence can spill coffee or break an aircraft - the likelihood of one or the other occurring depends, of course, on whether we stay out of these invisible disturbances. While we have been flying in CAT regions for decades, only recently have aircraft speeds, configurations, and sizes transformed CAT into CATastrophe...

Late last summer a group of engineers, meteorologists, theoreticians, exchanged opinions and speculations on CAT avoidance. What emerged from the meeting was the recognition that CAT research and knowledge is in its infancy.

Forecast or detect?

As more data piles up and increasingly susceptible aircraft are being designed, clear air turbulence research must place urgent attention to CAT avoidance vs the purely analytical approach.

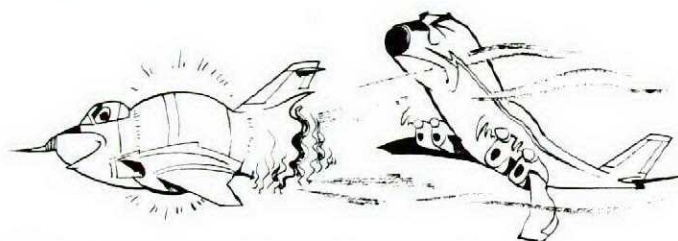
If you're going to avoid CAT you either forecast it or detect it. Both these avenues offer challenges. To forecast CAT the meteorologist must first know what it is and what causes it; this is, of course, the most compelling justification for the analytical approach to determine CAT causes. Curiously enough little is known about how it starts, yet we do know what phenomena accompany the turbulence. With this knowledge a fair measure of success has already been achieved in forecasting CAT-susceptible regions. One meteorologist remarked that even though we may ultimately have a complete physical understanding of CAT, we will probably never be able to forecast it with pinpoint accuracy. This being the case the ultimate solution appears to lie in detection.

What is CAT? Generally, it's the undulant and turbulent motions in the clear atmosphere away from the boundary layer - which says everything and nothing. Some things are known:



Generally, it's the undulant and turbulent motions in the clear atmosphere...

- ▶ CAT is patchy with horizontal dimensions usually less than 20 miles. The limited extent of turbulent regions indicates that it's a local phenomenon caused by small scale disturbances rather than larger air mass disturbances.
- ▶ CAT occurs more frequently near the jet stream and is more likely to be found where the jet stream changes direction.
- ▶ CAT frequently occurs in firmly stable layers having strong vertical wind shears.
- ▶ CAT is more frequent over mountains and continents than over flat terrain and oceans.



CAT occurs more frequently near the jet stream...

A further understanding of CAT may come from ocean studies; one experiment employs a stratified layer of coloured water and brine in a closed container in which formation and breakdown can be observed. Researchers would like to see a turbulence sensor carried on regular radiosonde detectors - a capability they do not have at present.

Detecting CAT

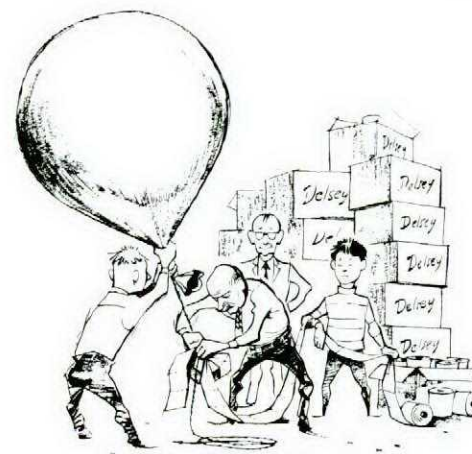
CAT is by definition a clear air phenomenon; the problem therefore is to devise something that can "see" the turbulent areas. Lasers, radars, infra-red and microwave radiometry have been tried with less than satisfactory results. The present state of the art substantially limits detection effectiveness:

- ▶ The limited research using laser radar (lidar) is inconclusive since there is no agreement that echo patterns would necessarily indicate the presence of CAT. However, with the inevitable advance of lidar technology there is at least a theoretical possibility of increasing sensitivity and coherence one-hundredfold.
- ▶ Infra-red detection was generally thought to be none too promising as it is based on the highly questionable assumption that regions of CAT are *always* associated with sharp temperature gradients. One infra-red radiometer had 82% success in detecting turbulence, but (and it's a big BUT) the undetected CAT may be the stuff that's worth avoiding! A number of airlines will be testing IR devices this year although one airline representative saw the tests as not too promising.

- ▶ Ultra-sensitive radars appear to be the only technique of providing definite detection of CAT. Multi-wave radars at Wallops Island have had little difficulty in detecting turbulent regions between 10,000 and 23,000 feet. Above 23,000 they were less successful but here again, technological advances should make radar effective to at least 50,000.

The Search Continues

One research project presently underway involves releasing a standard met balloon trailing a 500-foot paper tail. Observing the behaviour of this paper ribbon



... a standard met balloon trailing a 500-foot paper tail.



... a patch of undetected CAT could give the premium fare customer the ride of his life.

shows promise in describing the phenomenon. One researcher suggested a small packet of chaff to be released automatically whenever the aircraft encounters moderate or severe turbulence; this would be easily detected on other aircraft's radar. The ADR system in aircraft could include a turbulence recorder; if this were correlated to angle of attack, acceleration, movement, etc, much could be learned not only of CAT, but of aircraft response to it.

At the high mach speeds of supersonic transport aircraft soon to fly, a patch of undetected CAT could give the premium fare customer the ride of his life - to say nothing of aircraft damage. With this spur, there's little doubt that scientific curiosity will kill the CAT...

"Warrior" memories

About six months after commissioning on 24 Jan 46, flying from the Warrior began in earnest. Below are a few of the consequences - extracts from the first five month's flying. One particularly active participant in this record had three prangs in one month: nosed-up after heavy landing; he followed this the next day with the port wheel over the side and later nosed-up after a heavy landing! Flying statistics included things like gallons of petrol used - "Enough to take a jeep around the world at the equator, 44 times". From July 46 to May 47 there were 1061 deck landings and 29 "prangs". Here are some of them:

4 Jul 46	Firefly port wheel over the side	29 Jul 46	Firefly engine trouble - no hook - #1 Barrier
5 Jul 46	Firefly port wheel over the side	2 Aug 46	Firefly into the sea on takeoff
14 Jul 46	Seafire caught wire and barrier trying to go-around	9 Oct 46	Firefly u/s prop - #10 wire and #1 Barrier
15 Jul 46	Seafire u/s prop - #10 Wire and #1 Barrier	23 Oct 46	Firefly nosed up after heavy landing and bounce
16 Jul 46	Seafire crashed into the island	24 Oct 46	Firefly port wheel over the side
17 Jul 46	Firefly stalled - stbd undercarriage collapsed	22 Oct 46	Firefly nosed up after heavy landing
18 Jul 46	Firefly hook caught up - into #1 Barrier	23 Nov 46	Firefly nosed up after heavy landing
19 Jul 46	Seafire u/s prop - #10 wire and #1 Barrier	6 Dec 46	Firefly hydraulic failure - wheels and flaps up
22 Jul 46	Seafire hook fractured - hit barrier	27 Nov 46	Firefly excessive speed - nosed-up



Good Show

LT L.D. HAWN

Lt Hawn was number 2 in a three-plane T33 formation descending on a radar glidepath. Approximately 1000 feet above ground Lt Hawn's aircraft with a student at the controls, had a flameout. Lt Hawn in the rear cockpit, took control and attempted a relight while simultaneously raising the undercarriage. The engine would not respond. Realizing that there was insufficient altitude for a safe ejection, he selected the gear down and forced-landed his aircraft in a marshy field. The precision with which Lt Hawn flew the forced landing is demonstrated by the fact that neither pilot suffered injury and the aircraft damage was limited to the landing gear and one flap.

Throughout this harrowing emergency Lt Hawn performed all the required procedures - demonstrating a high degree of professionalism and flying skill.

MAJ G. BERUBE

On preparing for a test flight, the pilot of a CF101 began to lose consciousness in spite of selection of 100% oxygen. After he removed the mask consciousness returned. Maj Berube, the flight surgeon, was called upon to conduct an immediate investigation. Dr Berube, despite having served only three weeks in the air environment, correctly diagnosed and traced the incident to nitrogen contamination of the aircraft LOX converter. His findings resulted in the prompt introduction of measures designed to prevent recurrence.

Under urgent circumstances, Dr Berube's competence in aviation physiology made a noteworthy contribution to flight safety.

CAPT J.P. DESBIENS

At 575 mph on a low-level exercise Capt Desbiens' aircraft sustained a birdstrike on the canopy. Parts of a disintegrated duck struck him in the face whereupon Capt Desbiens reached up to put his helmet visor down only to find it had been torn off by the impact. He noted that in addition to cockpit and ejection seat rail damage, loose jagged pieces of the canopy remained in the frame. Assessing this as potentially hazardous he jettisoned the canopy. An unsafe gear indication compelled Capt Desbiens to use the emergency gear lowering during his visual precautionary approach and landing.

Faced with a sudden dangerous emergency calling for cool judgement and flying skill, Capt Desbiens although



Lt L.D. Hawn

Maj G. Berube



Capt J.P. Desbiens



Capt J. Ilcan

Maj J.E. Greatrix



slightly injured, had the presence of mind to jettison the dangerous canopy and declare an emergency, both of which contributed to the safe landing.

MAJ J.E. GREATRIX

On a night high-level mission in a CF104 Maj Greatrix experienced large fluctuations in oil pressure accompanied by an engine oil low-level light. Closing the nozzles by the emergency system he commenced an immediate descent. The oil low-level indications continued for the rest of the flight; in addition, Maj Greatrix was faced with the disconcerting presence of smoke in the cockpit during the final approach.

Maj Greatrix handled this serious emergency decisively and with cool judgement under very challenging conditions. In this demonstration of flying skill he averted the loss of a valuable aircraft.

CAPT J. ILCAN

On a flight from Greenwood to Ottawa, the Argus was proceeding along an airway in IFR conditions. During a momentary break in the cloud the copilot, Capt Ilcan, saw a Norseman-type float plane 500 to 1000 feet dead ahead and on the same flight path. Capt Ilcan took the controls and with an immediate steep descending turn he passed by the aircraft with a scant 100-foot clearance.

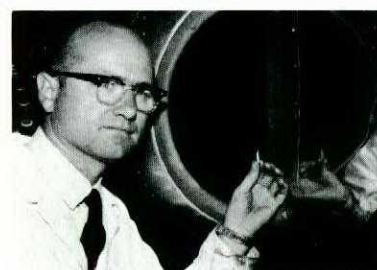
While his response was perhaps no more than should be expected, a less diligent copilot might well have been lured into complacency by the IFR conditions and being under positive radar control. Capt Ilcan's vigilance and prompt, positive action in a dangerous situation averted a tragic accident.



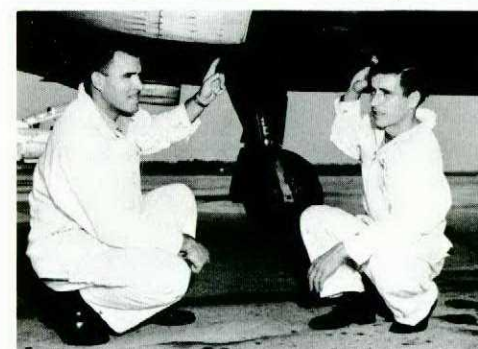
Cpl R.W. White and
Cpl P.A. Potter



Pte F.W.D. Hall



Cpl J.C. McCurdy



Cpl J. Lepage
and
Cpl J.R.C. Bard

CPL R.W. WHITE and CPL P.A. POTTER

During a Tutor start-up, Cpl White noticed smoke coming from the belly and cockpit areas. He quickly signalled the aircrew to cut power, and removed the energizer cable from the aircraft. After extinguishing burning fuel below the aircraft he commenced an immediate investigation through wing inspection panels. Cpl Potter, who had been starting up an adjacent aircraft came to Cpl White's assistance. The ground fire flared up again; Cpl Potter extinguished it with a dry chemical while Cpl White removed the belly panel and applied

CO2 to the trouble area. A fuel line had chafed through the external power wire bundle; the resulting short circuit burned through the line, setting fire to the leaking fuel.

Cpl White and Cpl Potter, by quick, decisive action when confronted with a dangerous situation, averted the loss of an aircraft and possible damage to other aircraft and equipment on the ramp - a noteworthy contribution to flight safety.

PTE F.W.D. HALL

Pte Hall was post-flight inspecting the inlet guide vanes of a CF104; with a flashlight he visually checked the blades for cracks, extending his inspection by feeling and shaking each blade. As a result of this thorough search Pte Hall discovered one blade with excessive play. As there was no visible crack, he applied hand pressure which forced the blade out of position, revealing a complete break at the inner hub.

Pte Hall is commended for his thoroughness while on an inspection during a deployment to another base. This young technician's discovery of a broken inlet guide vane undoubtedly averted a serious hazard or even the loss of an aircraft.

CPL J.C. McCURDY

Cpl McCurdy was performing a FOD inspection on a Tutor when he discovered a small piece of dural metal lodged in the lower section of the starboard intake. This piece of metal was approximately 2" by 1/4" - large enough to cause serious compressor damage on ingestion.

Cpl McCurdy's conscientious and detailed inspection of this aircraft uncovered an almost invisible foreign object which could have caused a serious in-flight emergency or very expensive damage to a jet engine.

CPL J. LEPAGE and CPL J.R.C. BARD

Assisting in a night start-up of a CF101, Cpls Lepage and Bard noted fluid leaking from the starboard engine. Although some fuel drainage does occur in this area, these technicians assessed the amount as excessive and signalled the pilot to shut down immediately. Later, much fuel was found inside the cowling, having leaked from a cracked pressure dump valve. This created a very serious fire hazard because the fuel was near the igniter plug and in a high temperature area.

The alertness and decisive action of Cpls Lepage and Bard averted a serious in-flight emergency and possible loss of a valuable aircraft. In a moment calling for decisive action they demonstrated the good judgement of competent technicians.

CPL G.E. LOWTHER

While on a primary inspection on a transient Hercules, Cpl Lowther noted what appeared to be excessive clearance between the rear spinner and the afterbody of

Good Show

a propeller. His reporting of this discrepancy resulted in the discovery that the shaft thrust bearing lock and the bearing nut were not mated properly.

In extending his check beyond the called-for items, Cpl Lowther demonstrated commendable integrity and alertness. By diligently performing a routine job he uncovered a dangerous condition which could have caused a serious accident.

LEADING SEAMAN A.G. THOMAS

While performing a routine circuit test on a Tracker's submersion actuator, LS Thomas received an unsatisfactory indication from the test. He became suspicious of his findings and studied the circuit diagram in detail, discovering that the test in the inspection schedule would not reliably indicate that the system was service-



Cpl G.E. Lowther



Leading Seaman A.G. Thomas

able. As a result of LS Thomas's finding, three other aircraft actuator circuits were found unreliable although they tested as serviceable. In this condition, the liferaft could have ejected in flight, or failed to eject on ditching.

LS Thomas's initiative and competence uncovered a condition which could have had very serious consequences for Tracker crews.

Paper foul-ups, hazards of

The fault's fixed but the story has a moral...

Once upon a time a hydraulic line "-1" was found to be NG. We had at least one aircraft fire caused by the -1 line cracking in a hot area. We wisely issued a mod dated 4 Dec 64 with a no-later-than date for fleet embodiment 15 Jun 65; a new line - the "-801" - would replace the -1 line.

On 3 Sep 68 a -1 line caused a hydraulic system failure. How did it get there?

When the mod was issued the supply catalogue wasn't amended; it was finally changed in 1968 but not

received on the units until recently. Also the system wasn't purged of -1 lines; to add to the confusion the catalogue said the -1 could be issued in lieu of the -801.

A paper Murphy!

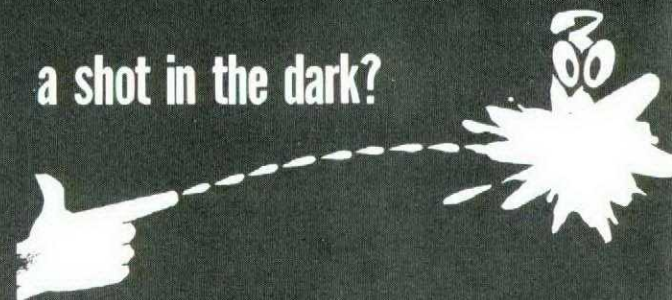
In this latest hydraulic failure, the -801 line had been installed before 15 Jun 65 but after three years had failed. The lad changing the piece went to supply - alas, the cupboard was bare - so he was issued a -1 line "in lieu of". It lasted only a couple of months.

It might be argued that this technician should have known better, but it's asking a little too much of him to remember a 4-year-old mod, especially in these days of flux and staff changes.

Workmanship and safety

An aircraft's hydraulic system was knocked out by a broken line, just where it joined an accumulator. In assessing this occurrence as materiel-caused the unit noted that "poor maintenance practice may have contributed to the failure". Fix each aircraft as if you were going to fly in it.

a shot in the dark?



We all get duff starts in the old T-Bird - often from a tired APU or a poor connection. Do you get another APU, or start playing around with the throttle and HP cock when the temp's hanging around 600-800 - a practice which may be legal but won't help the poor engine.

Help yourself to a safer rescue

Maj D. M. Campbell
CFB Trenton

The straps cut into his shoulders, he looks up and sees a beautiful white canopy shining in the dark night... "Well, I'm glad something works. What a lousy ending to a good trip. At least I'll be away from that desk a bit longer. Better smarten up—don't want to be away forever. Wonder what's down there? Hope they got my Mayday. Where's Jack? He should have got out OK. Can't even see the aircraft. Damn! I never thought it would be like this. Where the hell is the ground? Better get ready—hands on risers, elbows tucked in, legs together, knees bent, feet angled off. Here it comes!!"



The URT 503 in its operating mode.

With any luck our hero should survive the next step - the parachute landing - and after that, the survival. If he uses his 503 properly he will be located within a couple of hours and shortly after that a helicopter will be on its way to pick him up.

You probably think that's the end of the story - but it isn't. From the helicopter pilot's point of view, the story just started when he was advised where the survivor was located.

It is hard to realize in this jet age that even the old T-bird can travel in one hour a distance that a helicopter requires 4 or 5 hours to cover, not counting fuel stops. By the time the helicopter reaches the site, its crew may already have put in a long day; any assistance the survivor can give will be greatly appreciated. As a matter of fact, there are quite a number of things a helicopter pilot can reasonably expect survivors to know or do to aid in their own rescue.

I've been a reader of Flight Comment for many years and I can't recall any article that has dealt specifically with the problems and dangers associated with helicopter rescue so I feel it's about time we had one.

Basically, there are four types of helicopter rescues. Open field, timber, water, and mountain. In the rest of this article I will deal with each type individually.

Open field

The first of these - open field - is the easiest and involves only a simple landing; still, there are a few precautions which are basic to all rescues. If you descended via the nylon elevator, make sure you have it well rolled up before the helicopter lands. The downwash could pick up the chute and blow it through the blades causing severe damage to the aircraft - and incidentally, to yourself. Unless you are very familiar with the helicopter do not approach it until advised to do so by the

pilot or crewman. There are numerous cases every year of people walking into main or tail rotors, usually with fatal results.

Timber rescue

A timber or bush rescue can present a number of problems to rescue pilots; these problems increase proportionately with the density and height of the trees. The helicopter may be low on fuel or lack a homer; do all you can by visual means to assist the pilot in finding you as quickly as possible. You will be almost impossible to see in the trees so try to find a clearing, start a good smoky fire, spread out your parachute, fire flares, use your signal mirror - in short, do anything you can think of to attract attention. If the clearing you have selected is big enough for the chopper to land, remember to fold up your parachute and any other loose articles, put out your fire and get as far back as possible before the helicopter commences its approach.

If the clearing you have selected is too small, the helicopter will hoist you out. You may have heard that a hoisting is a piece-of-cake - and normally it is - but it's always an exacting job and under some conditions it can be downright hairy. Since the hoist lowers or raises the cable at only 50-100 feet per minute, the helicopter pilot may have to hold his machine absolutely steady for a long time. If you get into the rescue belt as quickly as possible you will be forever blessed by the helicopter pilot - especially if he has to use the full length of cable and is fighting a gusty wind!

When the hoist is lowered to you, let it touch the ground to discharge static electricity, remove the belt, tuck it well into your armpits with the attachment ends in front, then reconnect it to the hook. On the way up, keep your upper arms tucked in at your sides pressing against the belt, and cross your arms over your chest.

cont'd on next page



Going down the hoist is para rescue man Cpl Chickoski. He's wearing the 2-man sling to which is attached the normal horse collar. (The cross-strap in the mid point of the collar is used to pull the survivor into the helicopter). The 2-man sling would *not* be sent down to a survivor but would be worn by a para rescue man going to the aid of an injured or unconscious survivor in the water or in dense bush. The survivor will be turned to face outwards and then pulled into the helicopter backwards. *The survivor will not attempt to assist the crewman when coming aboard.*

When you are at door level do not attempt to reach for it, remain in position and let the hoist operator bring you in.

Water rescue

Over-water rescue can be broken down into several categories.

We'll consider first, a pick-up directly from the water. This type of rescue is difficult because the pilot cannot see the person being hoisted. Also, the pilot loses his sense of position when hovering because the rotor downwash blows surface water away from the helicopter giving the pilot the impression he is flying backward, regardless of which direction the aircraft is moving. In order to counteract this illusion the pilot will probably fly over you into wind and drop one or two floats or smoke generators into the water. He can then make the pick-up using these markers to maintain an accurate hover. As the helicopter approaches, you will get a fair amount of spray from the downwash; however, directly under the helicopter is a calmer area where this won't bother you. If you descended via parachute ensure that you are out of the harness and are well clear of it.

The next - and most likely - case is that you will be in a dinghy. The downwash tends to blow a dinghy away, so get your sea anchors out and try to maintain your position by paddling toward the helicopter - or better still - if the water is not too cold, or if circumstances are entirely favourable, inflate your mae west, plunge in and let the dinghy blow away. If several occupants of a large dinghy are to be rescued it is recommended that one person assume command of the operation and have somebody ready to go up each time the hoist is lowered. The helicopter may be required to make several trips (depending on its size and the distance to land), so make the hookups as fast as possible. Ensure that excess hoist cable does not get tangled around the dinghy or any of the occupants.

If the helicopter is amphibious and the sea state

permits, the pilot may be able to land on the water for the pick-up. Two alternatives are available here. The helicopter will either launch an inflatable boat to retrieve you, or he will do a *front door pick-up*. In both cases, relax and let the helicopter crew do most of the work; do not attempt to be too helpful. The front door pick-up requires one word of caution: if you should not be recovered on an attempt, be prepared to kick free and swim away from the helicopter to avoid being hit. Needless to say, the helicopter pilot will be taking evasive action to avoid hitting you!

The normal method of recovering a survivor using the 2-man sling with the floatable horse collar. The para rescue man firmly supports the survivor with arms and legs. An injured survivor might be further injured if rescued in this manner, so would be placed on a stretcher.



An alternate method of securing a survivor in the normal horse collar. (*This is not the proper method of using the horse collar for a one-man pick-up.*)

The last type of water pick-up is from a ship. This would normally be merely a transfer of personnel who have already been rescued; still, there are a few points to remember. First of all, have the ship turned into wind and underway at a slow speed. The hoisting will be carried out from the stern, so remove any loose equipment that could foul the cable and raise any booms that project over the hoist area. If a stretcher has to be used, disconnect it when it is lowered and wave the helicopter away until the patient is secured and ready to be lifted.

Mountain rescue

A mountain rescue can present several problems to the helicopter pilot but probably the most serious one is lack of power. The higher the helicopter goes the less efficient are its lifting surfaces and the power available is less. Winds - which tend to increase with altitude - can create severe downdrafts and subsidence that require applications of power to overcome. In the summer the higher temperatures will increase the density altitude of any given spot about 120 feet for every 1°C increase in temperature, for which more power is required.

In winter the colder air lowers the density altitudes and improves the efficiency of the helicopter but this

kindness is compensated for with new hazards. Loose powder snow blown up by the rotor downdraft can completely obscure the pilot's vision during the critical final portion of the approach. Whiteout, a form of spatial disorientation caused by the snow-covered ground blending with a cloud or precipitation ceiling is also very common in the mountains especially in the winter or over glaciers in the summer. Wet snow or freezing rain can form ice on the helicopter, restricting visibility and reducing lift.

Now, what can you do to help the helicopter pilot? Once again, if you land in trees try to find a clearing; hoisting at a high altitude is difficult with the lower power available. However, don't wear yourself out looking for a new location; in the mountains, depths of snow of 20 feet are not uncommon. Once you have determined where you will await rescue, do all you can to attract attention. During the actual pick-up or hoisting, take the precautions already mentioned.

Should you land above the treeline plan your movements very carefully. A fall over a cliff into a crevasse would probably be fatal.

As a general rule, it is probably better to take up housekeeping very close to where you land. Try to locate and mark a suitable landing area, preferably 100 feet by

A one-man pick-up with the correct horse collar position - elbows well tucked in and hands gripped together. The grip shown, or gripping one's wrists should be used to keep fingers clear of the hoist mechanism. **THIS IS THE CORRECT WAY TO USE THE SLING.**



A 2-man hook-up using the normal horse collar. (Note the tab in the centre of the survivor's back.)



A patient strapped into a Para Guard stretcher. This stretcher has been extensively tested by all elements of the Canadian Forces as eventually replacing the Stokes Litter.



A Labrador hoisting a Para Guard litter aboard.

100 feet but smaller if need be - as long as it is fairly flat. In the winter, tamp the landing site to give the pilot some ground reference and prevent blowing snow. In the summer, the area - or at least the corners - could be marked with stones or any other conspicuous material. Because sloping terrain is common in a mountain landing site, the blade clearance will vary considerably, so be very careful approaching the helicopter.

OK, so it may not happen to you. Just the same, you probably have life insurance and you probably wear a parachute - so the possibility is there. It would be a bloody shame (pardon the pun) if you ejected safely and then your widow had to collect on the insurance because you fell out of a hoisting collar, or were hit by a rotor blade.

It might be to your advantage to drop in on your local helicopter rescue people and get familiar with the equipment and techniques they use. They'll be glad to see you and might even give you a practice hoisting for free.

IF YOUR EYES ARE SHARP ENOUGH TO READ THIS PRINT YOU MAY HAVE DETECTED SOME MINOR DISCREPANCIES IN THE PHOTOS. IN MAINTENANCE AT THE TIME, THE HELICOPTER WAS NOT QUITE OPERATIONAL FOR THE PHOTOGRAPHER. THE PHOTOS ARE AUTHENTIC, HOWEVER, IN ILLUSTRATING CORRECT RESCUE TECHNIQUES.

Major D.M. Campbell, a native of Saskatoon, joined the RCAF in 1948 and started flying helicopters in 1950 with 123 C&R Flight. After instructing on Harvards from 1958-1961 he returned to helicopter flying at Sea Island and then moved to Comox with 121 KU. He is presently at the Aircrew Standards Unit, CFB Trenton where he is the helicopter check pilot.

Major Campbell won the AFC in 1966 for a heroic night rescue flight during which he hoisted three injured persons from a crash in the West Coast mountains. This exploit won him the BC Aviation Council's Back and Bevington air safety trophy (Flight Comment, Jan/Feb 67).

More of the same . . .

The chairman expressed deep concern that continued faulty workmanship at the civilian contractor imposes an unacceptable risk and loss of operational effectiveness.

- Flight Safety Committee

two 104s



Two pilots are dead. And with them millions of dollars worth of aircraft destroyed...

They died because - for some inexplicable reason - they both elected to fly into a region of vision interference to a point where their reaction time plus maneuvering distance was exceeded by their 1/8 of a mile per second ground-speed. At this speed, one mile forward visibility would allow them 8 seconds in which to see an obstruction, make a decision, move the stick, and have the aircraft respond. Both pilots were in level flight on impact - mute testimony to the amount of forward visibility they must have had in the moments before they struck the ground. One flew into hill fog, the other into a heavy snowstorm. How much forward visibility do these phenomena afford?

Each pilot's last words were ironically similar. One stated "Hey, it sure is getting smoky... in here"; the other reported that he had found a hole and was under cloud.

Suppose these 104 pilots - and the eight others who died under similar circumstances - had been merely confronted with a frightening close call, we would be pleased to have them write their accounts on this page. That way, they could have spoken with the voice of conviction to their fellow pilots. Anyway, do these tragic deaths in themselves not convey a message of compelling force? Apparently not. Since 1963 no fewer than ten pilots have impacted the ground in the CF104 (not to mention pilots in other aircraft) during conditions of vision interference. If the 1968 rate continues into 1969 at least two more pilots will die needlessly from this cause.

Are warnings of this sort enough? Certainly not. Flight Comment has carried many accounts in the last few years on this one problem. Doubtless most of the victims had read these accounts; each in turn would have readily professed that they wouldn't trap themselves in this manner - but they did. No, these men flew into dangerous regions with the full realization of the hazard.

There's an apparent contradiction here which is better understood if we regard the human brain as a computer. In this context, the pilot has been trained, motivated, flight-planned, briefed; or in other words, the computer has been effectively programmed. During the flight, as all the inputs click into place the computer functions without a hitch until suddenly an unprogrammed event occurs requiring immediate rejection of all further inputs. At this instant, the computer must be re-programmed by something a theologian might call "free will" because two or more alternatives are presented to the pilot. Unless the pilot is predisposed to willingly accept rejection of a commendable determination to complete the mission, there's a certainty that time-consuming hesitation or bending the rules will precede decision-making. Unfortunately, the system cannot help but create an air of silent tolerance for those who "make it" against formidable odds because the real thing may involve just that. But is the pilot who has just squeaked

through substantially more combat-ready?

Another point worth considering is the proven dubious reliability of the human being to see things as they really are. Since visual stimuli are processed through the computer, what is seen is every bit a function of the viewer as it is of the object viewed. Thus, to the press-on oriented pilot, the mind's eye may "see" much further into the haze ahead than can the actual eye. And that's assuming his windscreen is clear in the first place!

What all this boils down to is "Know Thyself" so that you can honestly assess the extent to which you are capable of retaining total objectivity under varying conditions of motivation, stress, fatigue and the whole bit. Then - and only then - will you be able to recognize and respond to deteriorating weather - or to any other emergency that comes your way.

Every year, ten percent of Canada's amateur pilots tangle with reduced vis and lose - be a pro.

stress and safety



An aircraft was being towed from the hangar to the flightline; an exercise underway at the time necessitated the immediate employment of this aircraft. In the rush a tow crew was quickly made up of men who were not accustomed to this work. As the aircraft was turned after leaving the hangar the mule jack-knifed on ice and severely damaged the nosewheel oleo.

On the pilot's third flight that day the aircraft was landed wheels up. The approach followed a closed pattern after a pilot had taxied to takeoff position without clearance. The tower operator called this one "a real hair-raiser".

Recalled back to the ramp when the weather suddenly deteriorated, the captain parked to await the expected passage of the storm. Later, on the takeoff roll the captain realized his controls were locked; the aircraft was badly damaged in the overrun after an abort. The captain incorrectly assumed the copilot to have done the pre-takeoff drill because he had done a post-landing check on the earlier return to the ramp.

The student in a T33 was last seen attempting to complete a low-level navigation trip by maintaining visual reference with the ground below an active cumulonimbus. The aircraft struck the ground while attempting to maneuver around a sudden rise in the terrain. This weather was not forecast or included in the pre-flight briefing.

Moments after liftoff the lead of a two-plane formation experienced engine trouble and crashed 1/2 mile from the runway. Number two circled the crash scene to direct the crash rescue vehicles. He was seen to perform several steep turns at low airspeed with a full fuel load and full external tanks. From one of these turns the aircraft suddenly flipped and descended rapidly out of control to the ground.

Whether we like it or not the time will come when we'll be obliged to apply to people the same scientific objectivity and know-how we presently are so proud of applying to our equipment resources. However, the staggering complexity of human behaviour makes anyone who ventures into this area feel overwhelmed and frustrated. Why else, for example, would we in flight safety, require a far greater detailed report on a bird which strikes one of our aircraft than we do on a person involved in an accident or incident?

Why do people have accidents? We honestly don't know, which is hardly surprising considering the dearth of information and interpretation we receive in reports. We can hardly complain about this state; there are no human factors analyst groups in the Canadian Forces to match the staffs which analyze sick and broken aircraft.

But time will force a change. Already two notable trends are evident:

- decades of experience in perfecting aircraft systems and achieving higher component reliability will soon bring us to the threshold of feasible economical and technical limits, where combatting materiel-caused occurrences will be in an era of diminishing returns.
- increasingly expensive and complex equipment is being placed in the hands of fewer and fewer persons.

Both of these conditions will compel us to pay greater attention to the rising relative importance of man. First, we must turn to the scientist and his studies for help and guidance...

In a recent paper entitled "Some Practical Applications of Research on Impairment", the late Dr C.B. Gibbs of the National Research Council's Control Systems Laboratories measured changes in skill and response capabilities of humans subjected to various forms of stress. What he found is of considerable interest to everyone in aviation, although his project was aimed at studying the effects of various forms of impairment on driving skill. The reader - be he operator or supervisor - can gain much from Dr Gibbs's findings.

Before proceeding further, read the accounts above and see if you can identify a factor common to each one.

Flight safety records reveal - as do these accounts - that there's a likelihood of the improbable or unexpected in accidents and incidents. We're speaking now, of course, of personnel-involved occurrences. If this is so,

unless we can eliminate the unforeseen in military operations (an unlikely proposition!), we are left with the task of not only ensuring that persons are properly trained, but are well-motivated to remain competent and alert.

Assuming we can train and motivate our people (a problem we'll not expand on here), the real challenge is in understanding the nature of human failure or error. Dr Gibbs's findings relate to this problem and are presented to spark some thinking on this better-late-than-never human factors input into the Canadian Forces.

The "Stressalyzer"

This device which was developed for the tests, measures skill in tracking movements. For our purposes, the mechanical aspects of tracking skill are not as relevant as the findings on general performance level under different stress conditions. The machine was able to measure the number of errors, time for decision, and prolonged and potentially dangerous lapses of attention.



"Driver" operates stressalyzer.

Dr Gibbs commented that psychological stress studies have produced little insight into its effect upon skill. Sleep deprivation studies for example, yielded little understanding of the precise effects of fatigue on behaviour. One reason for this disappointing lack of progress has been the inconclusive results produced by tired or intoxicated men who, when stimulated by the challenge and novelty of a test situation perform surprisingly well for the test. In fact, in many tasks, performances were reduced little - if at all - by psychological stress.

The Findings

The findings produced two noteworthy insights into behaviour:

- resistance to the effects of impairment induced by both alcohol and fatigue stress could be substantially overcome but only on routine or predictable sequences.
- a man's capacity to respond to improbable and unexpected events was grossly affected by stress.

These findings make understandable the high incidence in Canadian Forces aircraft occurrences of unpredicted and out-of-routine circumstances. For both the operator and supervisor there's obviously a need for increased alertness when there's a likelihood for unplanned events to occur. Special exercises, major organizational and operational changes, employment of new equipment all create stressful environments which call for increased vigilance against error.

In these test results see if the test environment has applicability to your work:

- A group of sober men were deprived of sleep for 48 hours and had three runs on the stressalyzer at 4-hour intervals throughout the experiment. After 20 hours of sleep deprivation, the overall performance of the group deteriorated to about 50% of their initial ability.
- In an experiment lasting 48 hours, a group of men were allowed to sleep at night but were aroused at 4-hour intervals and had three runs on the stressalyzer 15 minutes after waking. About 30% of these aroused men showed gross impairment that far exceeded that of any subject in the studies of alcoholic impairment or of 48 hours of complete sleep deprivation.
- There were great differences in ability and tolerance of stress among individuals of the study groups. For example, about 20% of the subjects made more errors of decision when sober than the other 80% made, even when their breathalyzer readings were approximately 0.1% (the equivalent of four 12-ounce bottles of beer).
- Similar large differences were found among individuals deprived of sleep or with their sleep disturbed. About 25% of subjects showed little impairment, even after 48 hours without sleep. At the 10-hour stage the tracking ability of 10% of the subjects was reduced to about 70% of their initial skill level. Sixteen hours after starting the tests a further 10% of the subjects retained

only 1/10 of their initial efficiency.

Morale and motivation are most important. In one group a greater degree of coercion was applied although test periods and intervals between tests were not changed. These subjects were deprived of sleep for 36 hours and consumed enough alcohol to produce an average breathalyzer reading of about 0.08 in the group just before the last test began. In spite of intoxication and considerable loss of sleep the overall efficiency of the group was higher on their last test than on their first run. Five of the eight subjects tested showed improvement and three exhibited deterioration on their last test as compared with their first one.

These findings are in sharp contrast to performance data of other experiments; scientists admit that these anomalies are not fully understood. There is no doubt however that individual differences in ability and tolerance to stress played the major role.

Dr Gibbs concluded from his studies that "...psychological stress reduces the rate at which correct decisions can be made on improbable events. Stress has comparatively little effect on the ability to deal with highly-probable, familiar contingencies." Of course, this accounts for the increased likelihood of an accident under conditions likely to create unexpected or unplanned-for circumstances.

Bear in mind that this skill test was aimed at duplicating the kind of physical movement required in driving skills. In this context, Dr Gibbs commented on the effect of maturity on judgement. Teenagers for example, demonstrated more precise movement than adults but tended to do them more rapidly and overhastily. Young people, Dr Gibbs continues "...tend to make overhasty decisions on the mistaken assumption that events will occur in a probable, familiar sequence and they are therefore prone to accidents when an improbable contingency arises." For this reason, we can regard the influence of the supervisor as having a maturing effect on the work force.

Summing Up

Dr Gibbs described his work modestly as "a promising start" in a research program aimed at understanding the problem of stress impairment. As so often occurs when scientists are confronted with the extraordinary complexity of the human personality he admits that "the problem is

formidable and no facile solution can be expected..." But in taking liberty with Dr Gibb's studies by applying them to the military aviation environment there is a recognizable pattern which emerges from his studies:

- ▶ Men possess widely-varying degrees of susceptibility to stress. This fact is of particular importance to the supervisor and manager.
- ▶ If a man is under stress he may be able to perform routine work with no apparent loss of efficiency. Only when confronted with an improbable event or in a response to stressful circumstances - personal or military - will he be prone to error.
- ▶ In periods of waking following abnormally interrupted

sleep patterns there is a substantial degrading of efficiency.

- ▶ The effects of morale and motivation are clear. It's a matter of judgement to determine to what extent efficiency of both quality and quantity, can be maintained by this technique. Little doubt exists that a disgruntled angry person is an unsafe person to have around aircraft; low motivation means low efficiency.

If you're this far into the article you have demonstrated a commendable interest in the subject. Interest begets understanding - and flight safety needs your understanding of a vital ingredient called PERSONNEL.

I wish I had...



... a good lawyer!

Six Comox aircrew = 7000 Voodoo hours

416 Sqn, CFB Chatham, has six 1000 + Voodoo aircrew. Congratulations to these men:

Capt R.M. McGimpsey CF100s and CF101s at Comox 1960-65; CF101s at Chatham 1965-68.

Capt C.H. Verge CF100s at Bagotville 1961; CF101s at Chatham 1962-68.

Maj D.E. Carney CF100s and CF101s at Bagotville 1957-63; CF101s Tyndall AFB Florida 1963-65; CF101s at Chatham 1966-68.

LCOL S.A. Millar CO 416 AW Sqn - Sabres at 4 Wing 1953-56; T33s MacDonald 1956-59; CF101s Uplands and Chatham 1963-68.

Capt H.A. Clements F51s and Sabres at Uplands 1951-53; OFU 1953-56; Harvards at Penhold 1957-60; CF101s at Uplands and Chatham 1964-68.

Maj M.P. Green CF100s at Uplands 1953-56; CF100s Cold Lake 1956-59; CF101s at Bagotville 1962-65; CF101s Tyndall AFB Florida 1965-67; CF101s at Chatham 1967-68.



Left to right: Capt McGimpsey, Capt Verge, Maj Carney, LCOL Millar, Maj Green, Capt Clements.



From the AIB

Was it the designer's fault? The pilot's fault? Was this STOL landing in a Buffalo properly executed? Open-minded investigators set about achieving a scientific explanation for a landing accident which at first glance could easily have been ascribed as another heavy landing...

The approach and landing was made using STOL (short takeoff and landing) technique: power on, steeper than normal approach, power off during roundout, and stick shaker coming on just after roundout. The touchdown was heavy but - according to the pilot - not abnormal for a STOL landing. "Immediately after touchdown the aircraft commenced a severe vibration and it swung to the left. I was quite sure that the tires had blown and I decided to use only minimum reverse and no brake to stop the aircraft. Nosewheel steering and rudder were used to stop the swing and keep the aircraft on the runway." The damage assessment:

- ▶ both port wheel assemblies and tires beyond repair, although the starboard undercarriage was undamaged,
- ▶ severe damage to port axle and brake assemblies,
- ▶ oil-canning and wrinkles in the aft fuselage, tail cone and ramp.

The pilot stated he had experienced harder landings in the Buffalo from which the aircraft suffered no damage, but the damage was so extensive that company engineers computed it could only have been caused by an excessively heavy landing exceeding the design limit loads of 12.5 fps descent. This represents a landing load greater than 50,000 lbs per gear caused by rate of descent greater than 17 fps. And there, the matter might have stood.

Fortunately, the photo section had just received a new camera. The photographer detailed to test it had decided it would be interesting to photograph aircraft and had positioned himself close to the runway. He just happened to have taken a series of five pictures of the landing starting from about 50 feet up on final, through touchdown, until the aircraft was abreast of his position. Investigators, by measuring distances from projected vertical lines extending from points on the aircraft to the ground, and then scaling altitude from the initial photo, determined that the rate of descent could not have exceeded 11-1/2 fps. This was less than the design limits and therefore there should have been no permanent structural damage. The oleos and starboard tire pressures were a little low but should have had no significant effect. In fact, the port oleo had not even bottomed.

Because of doubt generated by the company assessment and the damage itself, the series of photos were



From this landing the aircraft was extensively damaged. This shot - one of a series - was later used to exonerate the pilot of an excessively heavy STOL landing.

passed to the Defence Photo Interpretation Centre (DPIC) for a more detailed analysis. They determined that:

- ▶ the descent velocity was 10 fps, even less than the investigators' computations.
- ▶ the main undercarriage touched simultaneously with no crab.
- ▶ the main wheels rolled approximately two revolutions before failing.

The other findings were derived from photos of the tire marks on the runway.

All the wheels and tires had been sent to the Quality Assurance Laboratories (QAL) for examination:

- ▶ no evidence of fatigue or other defect in the badly fragmented port wheels.
- ▶ the magnesium alloy in the wheels conformed to specifications.
- ▶ the port inner tire had not blown; damage had been caused by the wheel rolling over the tire.
- ▶ the port outer tire had blown.
- ▶ one fuse plug in the port inner wheel was found less than finger tight.

The results of the two investigations confirmed for the investigators that the landing, although heavy, was still within the design limits. The facts that both main undercarriages touched simultaneously without crab (being therefore subjected to equal loads), and that only the port failed, suggested something wrong with the port gear. It looks like the loose fuse plug in the port inner wheel meant this tire was flat or virtually so. The resulting overload on the port outer tire caused it to fail and blow. The stresses under these conditions would be sufficient to cause the damage sustained.

The pilot's original contention was correct.

Good move

The flight surgeon said he expected to be moved to an office on the flightline... where he will be readily available to aircrew.

- Flight Safety Committee

Inexperience - and high-density traffic

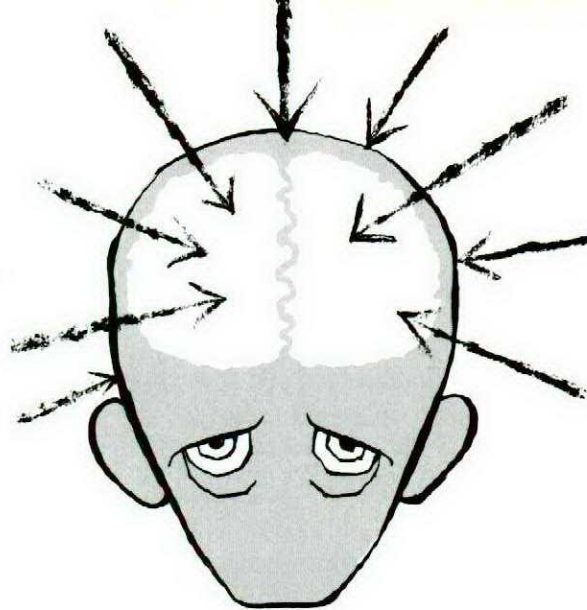
We're not saying that high-density traffic areas are necessarily dangerous but there's plenty of evidence that higher-than-normal accident potential exists for the pilot who isn't prepared . . .

The series of accidents, incidents and near misses involving transient military aircraft landing at CFB Downsview in recent years points to the fact that the unprepared visitor is stacking the cards against himself. Landing accidents and incidents, near mid-air collisions and mixups with controlling agencies means a relatively inhospitable environment for the pilot unfamiliar with the many demands on his attention. Not that CFB Downsview is exclusively the one problem area in Canada - we're mentioning Downsview because its environment appears as a significant cause factor in several occurrences.

How about the pilot who doesn't know that there are three airports immediately north of Downsview? In Near Miss reports pilots express surprise and alarm at the amount of light aircraft traffic observed during the approach; had they known of these airports beforehand they would not only have been less surprised but probably more alert. One of these airports recently reported a Canadian Forces aircraft which flew directly through the traffic pattern while considerable flying activity was in progress at the field.

Compounding the problem of the light-plane airports, Downsview is very close to the heavy-traffic Toronto International, and while this does not pose the same problem regarding near misses it creates the environment for the very rigid air traffic control measures a pilot will experience in the Toronto area. This is demonstrated by evidence of rash decisions being made by experienced pilots. A pilot attempted to salvage a bad approach and ran off the runway's end; in another case a pilot diverted only at the last minute with a critical fuel reserve after experiencing a "routine" delay in high-density traffic.

What's the solution to these and similar problems? To suggest that it is a problem implies that our pilots are less-than-capable of coping with high-density environments. But how close to the saturation point is the pilot who with his hands already full is then confronted with an emergency or unexpected circumstance? Looking over the past few years' experience in the Downsview area one gets the distinct impression that the climate is right for a compromise of judgement. For example, there's the urge to get the aircraft on the ground resulting from



either undue delays or a wish to extricate oneself from the intense concentration needed. A dwindling fuel reserve can further boost this urge to get the bird down and signed in.

If there's more than one pilot on board or if the pilot is currently familiar with the procedures there's less likelihood of a mental problem but the lone inexperienced pilot may have little reserve capacity for either emergencies or unexpected developments. The onus rests with the individual pilot, of course; however, it's the supervisor who must ultimately ensure that only pilots with a proven acquaintance with a high-density destination are scheduled or authorized. Procedures such as a "checkout" ride as copilot or detailed pre-flight briefing have already been instituted by one Command. Also, Transport Command pilots are exposed to this in their training.

If a supervised indoctrination flight cannot be arranged, then, as a minimum alternative the individual should be carefully briefed either by an ICP or a pilot who is very familiar with the area. Factors such as time of day, weather conditions, and fuel reserves at time of arrival should be considered before the flight is authorized. The pilot himself must make careful preparation by a thorough study of the terminal area charts and air traffic procedures.

On this matter generally - lest anyone see this as an "invasion of privacy" - we're merely handing on some gen from our files. These are the facts - the rest is up to you.

FOD - from snowplows

... several broken bolts, identified as retaining bolts from snowplow blades have recently been found on the runway.

- Flight Safety Committee



On the Dials

In our travels we're often faced with "Hey you're an ICP, what about such-and-such?" "Usually, these questions cannot be answered out of hand; if it were that easy the question wouldn't have been asked in the first place. Questions, suggestions, or rebuttals will be happily entertained and if not answered in print we shall attempt to give a personal answer. Please direct any communication to: Commandant, CFNS, CFB Winnipeg, Westwin, Man. Attn: ICPS.

The Altimeter—true or false

Comfortably settled into the left seat, the Ace of the Base is sipping a cup of coffee and watching the autopilot keep the needles in the centre for another flawless ILS approach. As the outer marker passes below, he cross-checks the altimeter indication against the figure depicted in the profile diagram of the instrument approach plate. The sudden realization that the altitude doesn't agree with the published figure - even though the aircraft is shown to be on the glidepath - so unnerves our hero that he spills coffee all over the sleeping first officer in the other seat.

Let's withdraw politely from the ensuing friendly discussion in that front office and consider what caused it to happen.

Initially, a word about that check altitude shown on the instrument approach. It's computed mathematically and is based upon the glideslope angle and the distance from the GP transmitter to the outer marker.

The villain in the whole piece, of course, turns out to be our old friend - the aircraft altimeter. The first of its vagaries, in this case, is none other than the plus-or-minus 50 feet permissible for a serviceable instrument.

Next to rear its ugly head is temperature error, which can be computed by using either an E6B, or a reasonably accurate rule of thumb. The Digit Law points out that there will be 4 feet of error per 1000 feet for every degree of temperature difference between ambient and ICAO Standard. To run it through a "for example", let's say the check altitude is 1000 feet above an aerodrome at sea level, and the temperature is 30 degrees below ISA (-17°C at 1000 MSL). Using the rule above results in 4 x 30 x 1, producing an error of 120 feet. Now, check it on the computer.

Last to appear is position error which is negligible on most aircraft at approach speed. However, the T33 has a 30-foot error, and the 101 (hold on to



...our hero spills coffee all over the sleeping first officer...

your hat) has a 200-foot error, in this region.

Adding up all of the possible errors cited above, we come up with some maximum figures which read like: 170 feet for a Bugsmasher or Gooney, 200 feet for a Tangobird, and 370 feet for a Voodoo. Minor errors such as scale and hysteresis have been ignored.

Consequently, the altimeter check at the OM is just another cross-check, and one which degrades rapidly as the temperature varies from ISA.

Finally most of these errors (except for that 200-foot position error in the 101) decrease to negligible amounts approaching minima. And, if you always come right down the glidepath, your TRUE altitude at the OM will always be as published.

(Don't bother writing to the Editor to point out that a T-Bird shouldn't have been included in the discussion. We happen to have one which is fitted with ILS.)

Flare share

After a recent aircraft ditching in which the two crew members escaped in their dinghies, one man expended his entire set of flares before any were fired by the second crew member. If the men had become separated one of them would have been flare-less...

JP5 Problems

(JP5 is used on the Bonaventure and DDHs for the Sea Kings. It is used ashore (Shearwater) to a limited extent; time permitting the Sea Kings are refuelled with JP5 at Shearwater before going aboard.)

JP5 is a kerosene fuel with an especially high flashpoint for safety in shipboard handling. JP5 is the only fuel that can be used for turbine aircraft aboard ships; it is also widely used at air stations. Deterior-

ation problems in the transportation and storage of JP5 are:

- ▶ reduction in flashpoint - the result of contamination with other fuels having lower flashpoints.
- ▶ association with navy special fuel oil - a shipboard-handling problem. Even a trace of special fuel oil may inactivate filter/separators so that water is carried through to the aircraft.

Contamination of JP5 by dirt, rust, and water can occur during handling. In contrast with removal of the AvGas contaminant, however, removal of the JP5 contaminant is much more difficult; the latter has a great affinity for these contaminants and if adequate precautions are not exercised, contamination is almost certain.

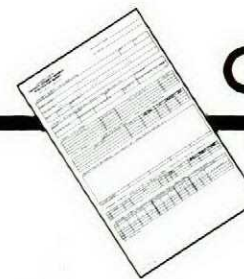
- GE Jet Service News



So you think you have a FOD problem...

Gen from Two-Ten

LEARN FROM OTHERS' MISTAKES—you'll not live long enough to make them all yourself!



(For those who have wondered for some time now, what "Gen from Two-Ten" refers to: the form CF210 is the accident/incident reporting form, a miniature of which appears above. The accounts in this section are derived from these reports.)

CF100s, ENGINES SEIZE Thunderstorms and heavy rain showers were forecast; in fact, departure of the two aircraft had already been delayed by a heavy rain shower. When they learned that another thunderstorm was approaching, the pilots decided to get airborne before it reached the base - and were promptly vectored into a heavy precip area. (Limitations of the DOT radar.)

Cleared to FL180, number two reported heavy rain and lightning in the climb. Both aircraft had trouble with canopy fogging. Shortly after reapplying climb power on clearance to a higher altitude, the aircraft crews noticed an unusual odor and smoke in the cockpits and heard a loud thump. Number two reported his port engine had failed. Then the leader lost his starboard engine. Shortly after, number two reported his starboard engine acting up.

The lead flew to a successful single-engine landing at a civil airport. Number two, after jettisoning fuel, found he could obtain only limited power from his remaining engine and decided to attempt a return to home base with radar vectors for a straight-in approach. After

lowering the gear on becoming visual, the remaining engine failed and the aircraft began to descend rapidly, forcing the crew to eject at low altitude. The aircrew received minor injuries; two empty houses were destroyed.

All three engines seized from stator blade rubbing on the casing rings - a problem discovered in 1957. Two other CF100s which took off a few minutes after the first flight experienced blade tip rub.

This Orenda problem occurs when strong vertical currents concentrate supercooled water droplets. On ingestion, the sudden cooling causes contraction of the stator casing, reducing the stator blade tip clearance. The rubbing generates heat - aggravating the problem. Twenty Orenda engines have failed for the same reason, but as a correction would necessitate major engine modification, it was earlier decided to accept the risks.

Warnings were written into the AOIs after an occurrence in 1964 and an educational program was begun. With no recent occurrences the impact had perhaps gone out of the program; apparently some pilots did not fully appreciate the hazard nor were able to recognize the presence of supercooled water droplets - such as misting of the canopy at high altitudes.

The latest measure - while it still does not remove the hazard - places a "warning" block in AOIs (Part 2, paras 49 and 50 - Flying in Heavy Precipitation) outlining the hazards. Further, the symptoms which normally precede tip rub due to this phenomenon such as canopy misting, sudden rise of cockpit temperature, odor of molten metal (!), will also be described in a separate section of AOIs, as well as a detailed description of in-flight actions. An increased emphasis has been placed on briefing for this hazard.

All good measures - good enough, in fact, to have been taken somewhat earlier in our long acquaintance with this bird.



CF101, NOSEWHEEL COLLAPSED On takeoff for a test flight, pilot and navigator both commented on the severe nosewheel shimmy. The aircraft had a history of this; in fact, a trunnion had been shimmed after the same crew reported severe nosewheel shimmy on both takeoff and landing

the day before. On landing, the pilot carefully and gently lowered the nosewheel to the runway; this time, the shimmy was barely noticeable. After completing a 180 on the runway the pilot found he was unable to straighten out either with nosewheel steering or brake. The pilot requested

a mule to tow him in, whereupon the nosewheel slowly collapsed, substantially damaging the nosewheel assembly, nosewheel, and armament bay doors.

The head of the left trunnion pin securing a nose strut was found sheared; the right trunnion pin was

later located in the nosewheel well. A bolt which retained the trunnion pin had not been properly installed, and went unnoticed in a dark inaccessible area. The trunnion pin had vibrated out of place and the stresses on the gear sheared the head of the remaining pin allowing the nosegear to collapse.

An experienced technician had shimmed and replaced the trunnion pins - an operation he had done many times before. Perhaps he was too familiar with this job. Was he looking but not seeing? (See page 2).



C130, JACK FAILURE The wheels had not cleared the floor when a jack leg broke at a welded joint; a work stand punctured the wing leading edge in two places. The failed members, according to the USAF

Technical Order, required longer bolts in a reinforcing strut - probably as a result of past failures. No corresponding Canadian modification has been issued.

Pipelines to ensure distribution of mods issued outside Canada on common support equipment are as important as those issued on the actual aircraft.

CH112, POWER LOSS After a practice autorotation descent the pilot was simulating run-on while maintaining an altitude of 20 feet. "At this point the engine quit" and the inexperienced student pilot was faced with a power loss over very difficult snow-covered terrain. The pilot applied power which hesitated momentarily then came on with a surge. The aircraft swung violently to the right with the tail rising. The pilot states he had the impression that the skid caught the snow and the aircraft rolled to the left.

Examination of the crash site showed that the aircraft travelled for 106 feet following initial touch-down coming to rest on its side.

No explanation could be found for the sudden power loss although engine hesitation is a known problem with this aircraft. It may have been carburetor icing considering the power-off autorotation maneuver; levelling out with blowing snow may have aggravated this problem. The

tendency to apply power following engine hesitation quite probably compounded the problem. Only an experienced helicopter pilot would have the presence of mind to close the throttle before re-application of collective.

This brings up the point of maneuvering aircraft close to the ground with no objects for visual reference. In this case, the conditions made recovery from the power loss most difficult for the trainee pilot.



YUKON, JACK DAMAGES WING To lift the aircraft, the technician first applied pressure through the hydraulic console to a wing jack. Afterwards, damage to the wing

caused by the other jack was discovered. This jack had rolled out of position on a sloping floor. (It had not been manually engaged with the jacking pad.) What had caused

this jack to inadvertently extend was a leak in the selector console but the real cause of the damage was the improper positioning of the jack in the first place.

The aircraft EO refers to the safety series (00-80) describing precautions when jacking aircraft. In this EO however, there's no mention that jacks are to be fully

engaged with jacking pads - an omission which is being currently corrected. In any case, it's always good policy to position jacks even

though pressure may not be immediately applied because raising one jack could tip an aircraft or move it, causing damage.

ARGUS, GIRAFFE PUNCTURES BOOM On a Sunday evening the

arm of a giraffe maintenance platform was discovered sticking into a MAD



boom.

A test revealed that the suspected creepage (from Friday pm) was unlikely. The giraffe power cable was found lying across the hangar floor to a wall receptacle although not plugged in; a security check on Friday ensured that all cables were put away at the end of the work day.

Someone - probably not familiar with the giraffe - had attempted to operate it. To combat a similar occurrence, two things are obviously required:

- ▶ hangar security increased
- ▶ sufficient clearance between equipment and aircraft when not being used.

The latter item is good hangar practice - under any circumstances.



Connection failed here, from twisting.

ARGUS, ENGINE SHUT-DOWN Ignition problems with an engine while on patrol resulted in the captain wisely shutting it down and returning to base.

The guilty ignition coil was sent to the Quality Assurance Labs for testing. (This was one of several recent failures.) The soldered high-tension lead connection had broken when overstressed by twisting, probably due to improper field cleaning

of the brass contact button in the high-tension outlet.

Looks like someone attempted to clean the button with a rotary cleaning tool on an electric drill, which twisted the button, damaging the conductor. The proper cleaning method is outlined in EOs.

This is the sort of thing that could happen when the supervisor isn't around.

T33 Canopy Jettisons in Flight

Jettison lanyard door left unlatched...

A pilot who had unwisely stowed a spare parachute in the rear seat of a T33 had a close call recently. The canopy jettisoned in flight when an open access door to the external canopy jettison lanyard permitted the handle and lanyard to enter the slipstream propelling it rearward with sufficient force to jettison the canopy. The parachute was retained in the aircraft by the legstraps being tied to the seat shoulder harness straps but the slip-

stream lifted the parachute so that it jammed between the rear seat headrest and the canopy frame. The slipstream had opened the canvas covering, exposing the nylon canopy. In this position it might well have deployed with disastrous results.

The canopy jettison external door is a well-known and respected enemy but we wonder if parachutes are still being unwisely carried in the rear seat. They should be stowed in the nose or luggage carrier - for obvious reasons.

don't forget... CIRCUIT BREAKERS

Things started to go wrong with one of the engines shortly after maximum fuel-load takeoff...

The pilot quickly hit the propeller feathering button and began to dump fuel. However, when the prop didn't feather *no one in the crew of four* thought to check the circuit breakers (right! one had popped) and the engine was allowed to thrash itself to death as a prelude to a heart-thumping overweight landing.

Admittedly, the crew had their hands full - and the

"system" didn't help them, either:

- ▶ a circuit breaker check is not required by EOs
- ▶ circuit breakers on this aircraft aren't eye-catching or particularly accessible.

But no matter - circuit breakers should always come to mind during a post-malfunction runaround.

The EO is being amended, of course, but the best preventive measure would be to convince everyone that circuit breakers demand attention. This latter point will no doubt be heartily endorsed by the participants in this close call.

Comments

to the editor

In the Sep/Oct issue your "Gen from Two-ten" item T33, WRONG HANDLE continues to sound a familiar note. After having tried the current post-landing procedure for a number of years, we ought to look at this recurring type of accident from a slightly different viewpoint.

To raise the flaps after landing suggests a follow-through from the early days when it was necessary to avoid damage to fabric flaps after landing on rough and unprepared surfaces. We no longer operate under these conditions; so why not leave the flaps down after landing? We leave the speedbrakes down. The configuration may not look as good but it may even prevent the occasional wheels-up repetition. In turn it would reduce the post-landing and shutdown checks by one item each.

It's just a suggestion; it may even be a solution to the problem.

Maj W.A.C. Wilson
25 NORAD Div
McChord AFB, Wash

Over to the regulatory organization -
Training Command.

Your Good Show Award to Capt R.A. Hall for his skill in handling a tricky situation with a Voyager helicopter, was great. But, *who was the crewman?* He should have a Good Show, too. Anyone who has scrambled up on top of one of those big choppers - even in the hangar - knows it's a long way to the ground. But to do it with engines running and the rotors turning a few inches over your head calls for a fair amount of courage.

Maj G.M. Henderson
DFS Inspector



Sgt R.A. Brydges

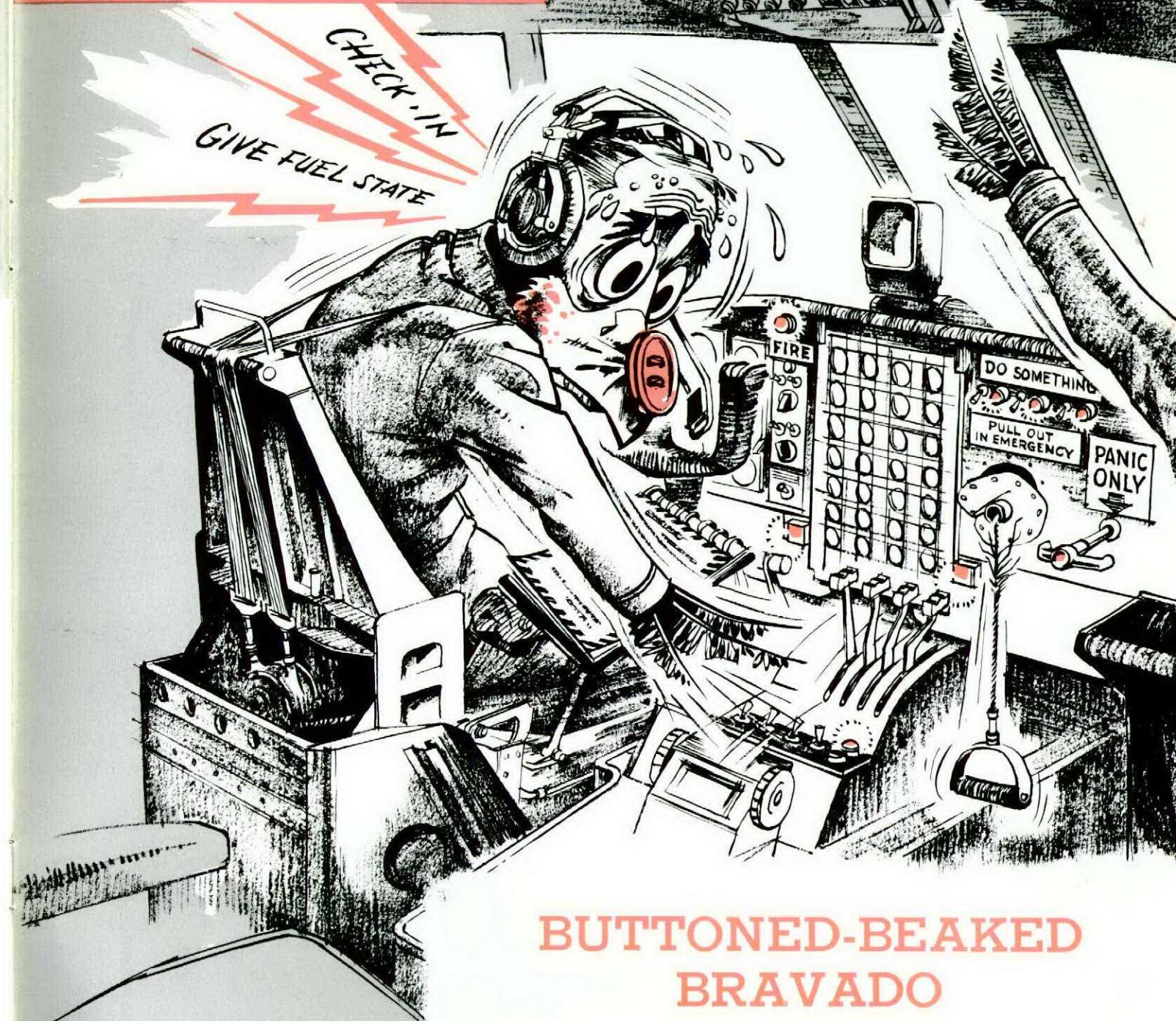
*We prints 'em - only if we gets 'em.
However, a scroll is on its way to
Sgt R.A. Brydges.*

a shot in the dark?



Truthfully now, did you check the lower plenum chamber doors on your last T33 external? (We won't even mention the armament doors.)

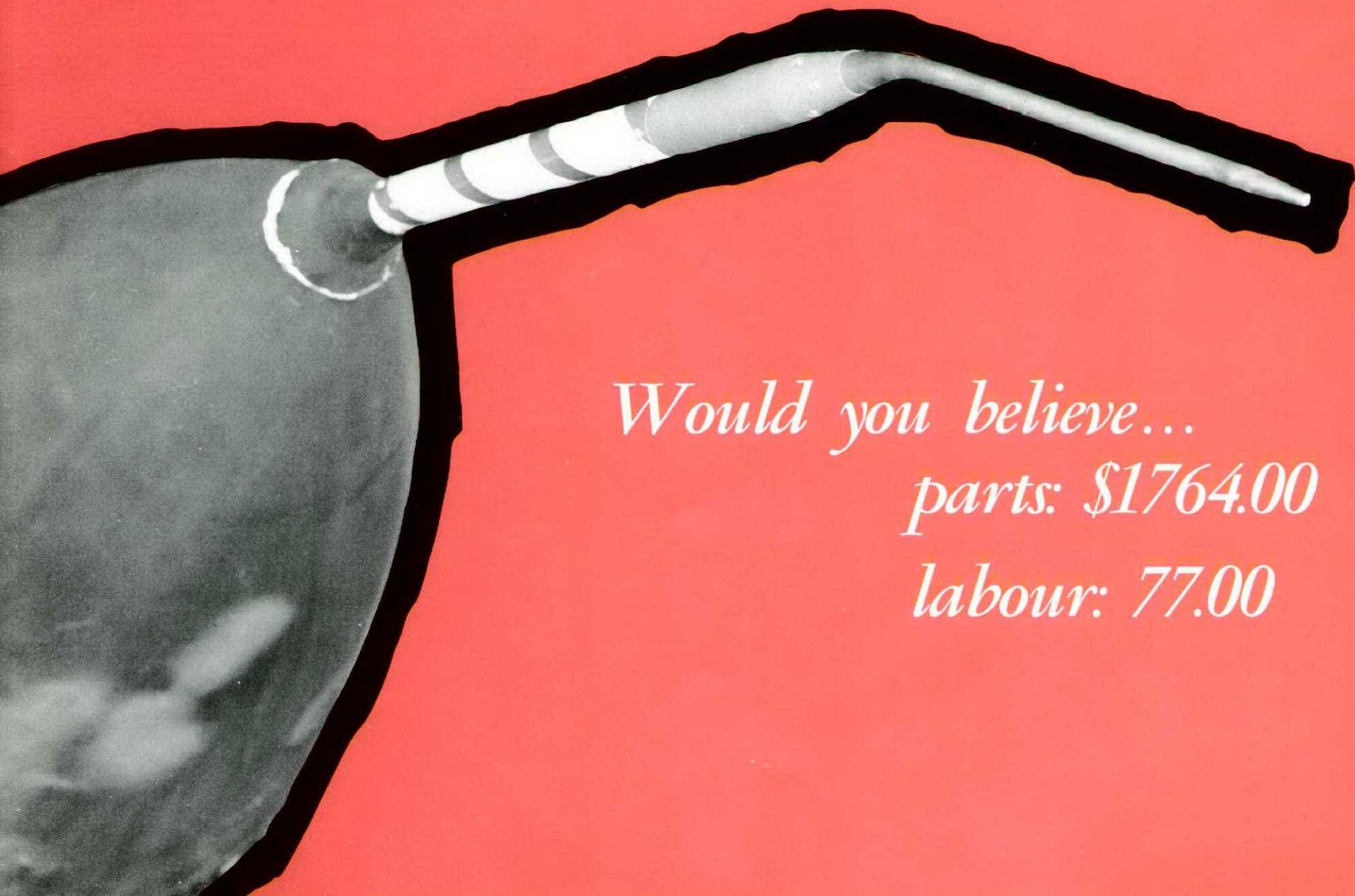
BIRD WATCHERS' CORNER



BUTTONED-BEAKED BRAVADO

"An inconsistent bird", said a bird watcher, "it's distressingly disinclined to call for assistance until help from the ground is either too little or too late, but later at the bar he'll cackle on for hours!" "It's almost as if his feet retracted into his throat" quipped another watcher. A do-it-yourselfer by inclination, Buttoned-beak permits pride to prejudice prudence; whilst airborne, that famed declaration of dependence "Mayday" will ne'er escape his beak. As the emergency checklists and fuel tanks run dry, bravado hums this defiant ditty:

WE'RE NOT AFRAID, EH? SOWHYSQUAWK MAYDAY?



Would you believe...

parts: \$1764.00

labour: 77.00