FLIGHT COMMENT

SEPTEMBER • OCTOBER
1973

Comments

There have been several incidents recently where aircraft have been refuelled with the wrong type of fuel or with contaminated fuel. These incidents repeat the pattern of previous years and occur most often at non-service facilities. When an aircraft is operating away from its parent base, the pilot is responsible for ensuring that the aircraft is maintained in accordance with existing maintenance instructions. It is his duty to see that crew members carefully monitor refuelling operations. When fuel contamination is discovered other users of the facility must be advised.

The pilot and co-pilot of a Dakota were performing a normal change of seats at a route turning point. The pilot vacated the left seat and stood in the passageway. The co-pilot vacated the right seat and as he was sliding over to the left, inadvertently hit the left feathering button. Shut-down procedure was completed on the left engine followed by normal unfeathering. The engine functioned properly on return to base. This surprise "happening" highlights the extreme caution required when moving about in cockpit or flight deck areas.

Flying is a team effort and when teamwork breaks down someone usually gets outfoxed—in this instance it was a pilot. During the pre-flight of his T33 he gave the pins and pitot cover to a ground crewman who stowed them in the pin stowage compartment and closed the door (Stowage of pins and locking the compartment is a pilot responsibility). The crewman was from the start crew of a nearby aircraft and was assisting this pilot prior to the arrival of the other start crew. When they arrived he returned to his own aircraft. The arriving crewman, seeing the pin stowage compartment door was closed, assumed it was locked—an ill-founded assumption. The door opened and the contents disappeared shortly after takeoff.

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What's New?

Regrettably the answer has to be — *nothing* — if you are looking for some simple, startling or magical means of getting the flight safety message to most of the people most of the time. The task is neither simple nor easy but it is important and we would appreciate a much greater input from you at the operating level.

Our program, and those of associated agencies, involve a great deal of effort in preparing briefings, lectures, bulletins, posters and magazines. The aim is communication in every way possible to increase safety awareness both generally and specifically. How effective this communication is depends to a great extent on the attitude of the individual, or the group, and this attitude can vary from one of "flight safety bores me" to a healthy one of "we're getting results and more is possible".

In my opinion, one of the reasons for a negative attitude is the repetitious, stereotyped method of presenting information. In all probability this is compounded by our high pressure cultural and social environment which exposes us to a continuous barrage of advertizing and publicity aimed at influencing our every desire and action. Whether this excuse is justified or not our concern is that in trying to escape from this annoying pressure of the media, many people close their minds to just about everything — the important as well as the trivial.

Whatever the reason, we must counter this understandable human reaction by tailoring our methods of communication to penetrate these mental barriers. Hackneyed expressions and threadbare approaches must be avoided whenever possible. But most of all, I feel that those who are directly involved with particular operations must contribute more to general safety education. Pontificating from headquarters level is essential in some instances but as a continuous diet it is guaranteed to foster a negative reaction.

It is time for you to get into the act and pass on your knowledge and first hand experience to others. We have the means, you have the exposure, so let's combine our resources, and put new life in our program.

COL R. D. SCHULTZ
DIRECTOR OF FLIGHT SAFETY

Dual Visors

...pros and cons

by Capt R.E. Noble
DCIEM

ABOUT THE AUTHOR *Capt Noble is a frequent contributor to Flight Comment, his most recent article being "The Art and Science of Saving Your Head" which appeared in the Mar-Apr '73 issue.*

The requirement for dual visors is two fold – to enhance facial protection in the event of a birdstrike in high performance aircraft, and to provide the option of a tinted or clear visor to fit existing lighting conditions without the use of spectacles or other opthalmic devices.

Just about every flying day somewhere, sometime, an aircraft is flying into one or more birds. It may be surprising to know that if a four pound bird refuses to get out of your way as you coast along at 300 mph, the effect he will have on your canopy is equivalent to a force of 14 tons! Boost the speed of your aircraft to 600 mph and even if the feathered four pounder is desperately trying to avoid you, the force exerted is 57 tons!

Despite the devastating effects of such collisions, some aircrew have managed to maintain control of their aircraft, assisted by a well designed canopy and, where it has failed, the use of dual visors. Here are two examples:

At a height of 15,000 feet, and a speed of 450 kts, a large bird (probably suffering from the effects of hypoxia at that altitude) mistook the aircraft for his mate and expired making his last pass. The canopy was shattered but the pilot had his clear visor down. After a few seconds of terror, he wiped his visor off and regained control of himself and his aircraft for a safe return to base.

Here's another. At a height of 1500 feet, and a speed of 360 kts, the pilot observed a large bird in front of the aircraft. The bird struck the front wind-screen frame, then came through the pilot's canopy. Aircraft control was maintained and intercom re-established. The pilot was not injured as he had his dual visors down. The visors did not fail under impact. It pays to be protected!

The need for dual visors was painstakingly documented but to get them we had to ensure that in solving one problem we did not create others. The guidelines from NDHQ:

a. the dual visors had to be compatible with and attachable to existing aircrew helmets,
b. the dual visors should enhance the protective qualities of the helmet during normal use, against the effects of bird strikes and during ejection speeds up to Mach 0.92,
c. it must be possible to use the clear and the tinted visor together or separately,
d. the tinted visor must provide adequate protection against sun glare consistent with minimum interference to vision.

However, there are certain disadvantages to dual visors which must be recognized:

a. the helmet is no longer clean on top and a greater area is therefore exposed to windblast,
b. we are trying to reduce the weight of the helmet, but dual visors increase the weight by nine ounces,
c. the addition of dual visors automatically moves the centre of mass of the head and helmet forward and upward increasing the loading on the head and neck,
d. the retention qualities of the helmet are affected by this shifting of the centre of mass,
e. the method of operating the visors requires additional hand movements and time.

A survey of other air forces indicated that they were either not interested in dual visors, were developing dual visors, or were trying to solve problems with dual visors in use. Despite the disadvantages (and bearing in mind that you cannot compromise the basic purpose of the helmet i.e., protection of the head) a dual visor development program commenced at the CF Institute of Aviation Medicine in 1967 and continued with the name changes – CF Institute of Environmental Medicine (1968) and Defence and Civil Institute of Environmental Medicine (1970). Various types of dual visors were designed, tested, and rejected, before selecting a prototype model for field trials in 1969. A total of 425 pulse windblasts at DCIEM and 26 sustained windblasts at Bedford, England, were conducted at speeds from Mach 0.35 to Mach 1.0. A four pound chicken was fired at a speed of 180 kts through the canopy of a Tutor aircraft. Mannequins in the cockpit were wearing dual visored helmets and although the cockpit was rather messy, the visors suffered negligible damage. An ejection seat containing an instrumented mannequin was actuated from the back of a speeding truck; the dual visored helmet worked as advertised. (It should be noted that in all tests the helmet was properly fitted to provide complete head protection, which includes the forehead). The tests indicated that with one of the visors down the helmet will stay on the head at Mach 1.0, but the helmet may come off the head at Mach 0.87 if both visors are up.

The prototype dual visor kit consisted of two visors – one clear, the other tinted. The clear visor, made of polycarbonate material, is lightweight, strong, relatively free from distortion and worn closest to the face. Visor surfaces are susceptible to minute scratches and pits and are seldom free from distracting marks. The presence of these flaws is more noticeable on a clear than on a tinted visor. Since the overall light transmission is much greater through the clear visor, the clear visor is therefore placed closest to the eye. This is based on the premise that a scratch mark on a visor close to the eye is blurred and not likely to be mistaken for an aircraft or other stimulus. The general blurring of marks close to the eye also makes them less noticeable and thus reduces potential eye strain and irritation arising from visual distraction.

The tinted visor was acrylic but is now polycarbonate. To have a tinted visor that is satisfactory to all users may be impossible. The tint on the standard visor currently in use is green and is considered too dark for certain conditions. Therefore, an attempt was made to provide a lighter shade of green. And, depending on which squadron's evaluation report you read, the prototype light green visor was or was not acceptable. The consensus was that the tint should be at least equal to the standard green visor. The tinted visor provided with the dual visor kit is therefore the same shade as the old green acrylic visor.

A discussion of visors inevitably leads to the problem of distortion. To be sure we are all talking about the same thing, here are a few words of definition. When an optical system, even as simple as a piece of glass, causes distortion we mean that the apparent shapes of objects, or the apparent distances between objects are altered when viewed through the system. When distant objects are viewed through a uniformly thick sheet of good-quality glass, the amount of distortion is negligible. Similarly, if this sheet is uniformly curved, as in the case of a visor, and the eye views distant objects from the curvature, or along the radius, the amount of distortion is negligible. This is because, to a good approximation, all of the light rays which enter the eye have passed through the visor perpendicular to the surface. If the rays are not perpendicular to the visor surface, the visor acts as a prism and the apparent location of an object will be shifted slightly. (For the mathematically gifted, this is about one half of a percent of the angle the rays make to the perpendicular to a visor which is one sixteenth of an inch thick.) Simple, isn't it?

There is some distortion in the present helmet-visor system because neither eye is at the centre of curvature of the visor. If you make the supreme effort, this distortion can be demonstrated by viewing a tall, straight object such as a telephone pole partly through the visor and partly with the eye alone. At the bottom edge of the visor a break in the object can be seen. This minimal distortion should not affect pilot performance. In some cases uneven thickness may cause annoying distortion. It is also possible that in some cases aircrew who have an acceptable visual problem of some sorts, such as a slight astigmatism, may find that the addition of the slight distortion of the visor causes some annoyance. Such cases should be discussed with your Flight Surgeon.

The location of the control mechanisms for the visors had to be solved. At first glance the top of the helmet seems preferable since it can be reached with equal facility by either hand. There are, however, other factors to be considered. Due to the limited shoulder clearance in some aircraft, the elbow must be kept close to the side when reaching up to the helmet. Grasping a lever, or pushing a button on top of the helmet and moving it forward results in the forearm coming down in front of the face (try it) thus obstructing the pilot's vision. This interference with vision plus the increased probability of snagging the lever or button on overhead objects or projections or scratching the canopy ruled out the top of the helmet for the control position.

This conclusion leads to the next question – which side should control which visor?

While in flight the pilot may not be able to release the control column and use his right hand for manipulation of the visor controls. For this reason any control located on the right hand side of the helmet must perform a non-critical function or one which may be delayed in time of action without compromising safety.

The left hand assembly therefore controls the tinted visor, as the visor would have to be lowered immediately upon encountering conditions of direct sunlight or glare. The clear visor is then controlled by the right hand assembly as the visor should be used only in the presence of a bird strike hazard (all the time?) and the pilot can either put it down before takeoff or before entering an area where bird strikes are possible. A number of pilots leave the clear down at all times and lower the tinted over it when necessary. Whichever arrangement is needed, the choice is yours.

The assembly had to be strong, but light in weight, simple to install and easy to operate. The assembly appears to be fragile but in fact, with a minimum of care, is strong enough for its intended purpose.

A non-breaklink chinstrap is provided to enhance helmet retention. Helmets were being lost because the old breaklink chinstrap worked as advertised; however, only the losses are remembered and not the causes.

The field trials got off to a rocky start. The majority of aircrew who were to test the visors were wearing their helmets too high on their heads with little or no forehead protection. Wearing the helmet too high (in some cases the helmets were also the wrong size) prevented the visors from meeting the oxygen mask assembly.

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Note Photo 1. This helmet is too small and worn too high. There is no way the visors can be compatible. Note also the loose chin-strap. It should be snug under the chin. Look now at Photo 2. The helmet is the correct size, has the dual visors installed, but the helmet still provides no forehead protection. Observe Photo 3; helmet correct size, no forehead protection and the visor too short. Check Photo 4; helmet correct size, and worn properly. Photo 5; all in place. We do acknowledge that the initial problems were aggravated by the prototype visors being manufactured at least one quarter of an inch too short!

The results of the trials indicated that the dual visors were generally acceptable provided the following design changes were incorporated:

- Lengthen the visors by half an inch. The visors were lengthened by one inch. The extra half an inch was to allow extra visor for those aircrew who want to wear their helmet slightly higher than recommended.
- The rotating knobs for controlling the visors were not considered acceptable and a push button assembly was therefore provided.
- The tinted visor was either too dark or too light. The visor was therefore tinted to the old standard.

Some aircrew did not like the dual visors and to demonstrate their consistency indicated that they did not like the helmet either. There were no written complaints about the non-breaklink chinstrap. The additional weight of 9 ounces, while noticeable, was not considered uncomfortable.

There were, and are, grumblings among non-jet aircrew that they should have the dual visor. In fact, the dual visors were initially on trial in helicopters and Tracker aircraft. However, we received new information which indicated that the additional weight of 9 ounces could have a detrimental effect on aircrew during a crash landing.

Research and experimentation demonstrated that with C_x acceleration the centre of mass changes of the head that result from added helmet weight affect the moment of inertia about the seventh cervical vertebra so that forces measured at the seat upon impact are multiplied by a factor of at least four when measured at the subject's chin. With the dual visor system weighing nine ounces more than the single visor system, this would be equivalent to approximately 24 pounds at 40G. Therefore, dual visors are not recommended for non-jet aircrew. But, don't despair, a new type visor assembly is being evaluated. The new assembly consists of a push button control, a visor cover and a new type of visor i.e., a gradient lens which is tinted at the top and flows down into clear at the bottom, or a clear visor, or a green tint similar to that on the dual visor.

Once the design was approved the introduction of dual visors for jet aircrew was still not without its problems. The first production models had an error in the dimensions on the curvature of the visors. The visors would jam, or worse, fall out of the track. Many aircrew had to have their helmets refitted so that the visors would meet the oxygen assembly. Incidently, for those who refuse to wear their helmets forward to obtain the intended forehead protection, you are wasting your time with dual visors. There is really no sense in carrying the extra weight if it is not going to be used properly!

There have been growing pains with the dual visors but after a bit of learning and proper use (which means press the buttons to lower the visors), they are satisfactory. There will also be improvements, for example, scratch resistant visors and probably a different visor tint.

The birds continue to show their disdain for man and machine – as is often evidenced by their accurate bombing. They were in the sky before the airplane, and every once in a while, they attempt to apply squatters' rights. Some of the birds can be identified but others refuse to cling to the man-made machine after impact. The clear visor will enhance facial protection. We offer no one a 100 percent guarantee, but at least your odds for protection are increased. Old Sol manages to get up every day, sometimes you get a good glimpse of his power when you don't want to, but a tinted visor will protect your eyes against the glare. The equipment you have is good – use it properly, and increase your chances of self preservation.

Now, if there were just some way to ensure that the birds would leave the planes alone, those dual visors could be taken off the helmets and . . .

Watch the Wake!

....*vortex avoidance*

In an earlier article (Nov-Dec 70) we reported that the wingtip vortices from the three-engine Boeing 727 were more severe than those from other aircraft of comparable weight and size. Following the fatal crash of a DC9 in which wake turbulence from a DC10 was the suspected cause, the FAA ordered wingtip vortex testing on the two "heavy" aircraft designed with three engines, the L1011 and the DC10. The tests revealed that the wingtip vortex behind these aircraft is of greater magnitude and persists longer than that encountered behind either the Lockheed C5A or the Boeing 747.

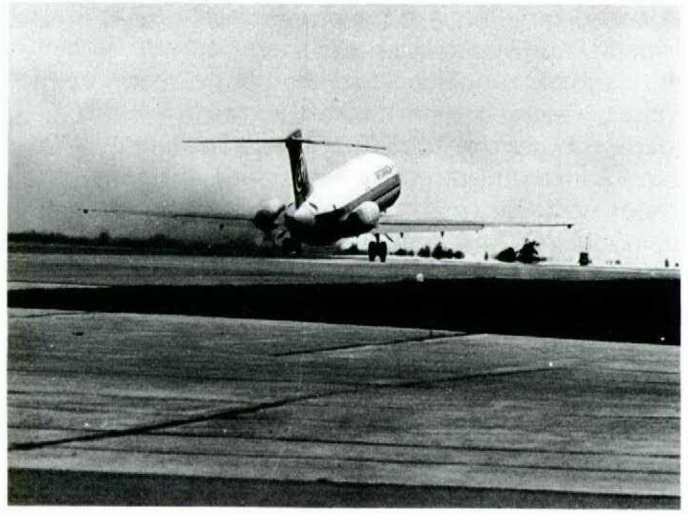
The following example gives an indication of the strength and persistence of wingtip vortices.

A Boeing 727, flying from Vancouver at 29,000 ft and Mach 0.84 was rolled to about 90° of bank by a vortex generated by an L1011 *that was 12 miles ahead of the Boeing 727.* Fortunately, the seat belt sign was on and the incident did not occur at night or in instrument conditions.

It is up to the pilot to recognize potential wake turbulence at an airport, and to know what he can do about it. Vortex avoidance measures are thoroughly covered in the Nov-Dec 70 issue of Flight Comment.

As a reminder pilots should be aware that they have at least five options:

- For takeoffs on the same or parallel runway behind a large, heavy aircraft, takeoff should be before the point where the larger aircraft left the ground. Remember that even in a "no wind" condition, a vortex from a departing aircraft on a nearby parallel runway could descend on your proposed takeoff route. So check out the takeoff point of that 707 on the runway next to you, as well as the one that took off ahead of you.
- For takeoffs on intersecting runways, remember the basic rule is to stay above the flightpath of other departing aircraft. If the departing aircraft on the other runway was still on the ground well past your intersection, and your takeoff will permit you to climb approximately 100 feet or more before you reach the intersection, you should have clear air.
- When taking off after a larger aircraft has landed on an intersecting runway, make sure that it touched down before it crossed your intersection. If this is not the case, you may request a delay or an alternate runway.
- When landing behind a large, heavy aircraft, it is essential to remain above the flightpath of the aircraft you are following and to touch down well beyond the point where he landed if runway length permits. In this way, you will avoid encountering the turbulence which is settling behind and to either side of the larger aircraft.
- Landings after the takeoff of a larger aircraft should be planned to land before the larger aircraft's point of liftoff.



Remember that "cleared to land" means only that the runway is no longer in use by other aircraft. It is not an assurance that no other hazards, visible or invisible, are present.

Good Show

MAJ A.M. VALENTI

Two Otter aircraft were returning from a routine ski mission. Major Valenti, captain of the second aircraft, noticed that the lead's tail ski had tilted forward 50-60 degrees. Realizing that a normal landing would certainly cause damage to the tail of the aircraft, Maj Valenti informed the lead. On return to base Major Valenti conducted landing trials to determine the best flap setting and landing technique to minimize damage to the lead's aircraft. An area of the tarmac covered with smooth compacted snow was chosen and crash equipment instructed to stand by. The lead then performed a wheel landing, holding the tail up as long as possible. The tail ski straightened just prior to contact and an uneventful after-landing roll ensued.

Major Valenti's astute observation and professional aid to the pilot in distress undoubtedly avoided certain damage to a valuable aircraft.

MWO H.E. ANDERSON

During an air to air refuelling exercise, MWO Anderson, the Flight Engineer aboard a CC137 tanker greatly assisted a CF5 Squadron pilot who encountered fuel transfer problems.

The fighter pilot was unable to transfer fuel into his external tank. After three contacts with the tanker, MWO Anderson, realizing that the end of the refuelling time bracket was near, quickly analysed the situation and assessed the problem as a circuit breaker which had tripped internally.

MWO Anderson had the pilot disconnect from the tanker and then locate the "centre line and tip tank fuel control" circuit breaker. The circuit breaker was pulled and reset. On his subsequent contact, the pilot was able to transfer fuel into his external tank.

MWO Anderson's thorough knowledge of both the CC137 tanker equipment with all its complexities and the CF5 fuel system with all its associated refuelling components bears witness to his high level of professionalism and conscientiousness. His remedial action for fuel transfer difficulties will be incorporated in future air refuelling operations.

MCPL D.S. WELCH

MCpl Welch was performing a routine maintenance check on the heater fire extinguisher bottles of an Argus aircraft. He noticed an unusual metallic scraping sound and arranged for the base

Maj A.M. Valenti

MWO H.E. Anderson

MCpl D.S. Welch

NDT organization to x-ray the suspect bottle. The x-rays and subsequent disassembly confirmed MCpl Welch's suspicions: the syphen tube had become disconnected from the discharge head assembly, rendering the extinguisher unserviceable. A Special Investigation later revealed a grand total of forty-three unserviceable extinguishers in the Argus fleet.

MCpl Welch was also instrumental in finding a severe corrosion condition in the Argus engine fire extinguishing system. In this instance, a main extinguishant distribution line was corroded in an area which is not normally visible. The defect was discovered as the result of a very thorough and searching inspection.

MCpl Welch's initiative and superior sense of responsibility were displayed in his thorough investigation of these two situations, either of which, if undetected, could have been disastrous for an Argus aircraft and its crew.

MCPL A.J. LIPSCOMBE

While supervising a snag rectification on a CF104, MCpl Lipscombe heard an unfamiliar noise. The starter solenoid of an aircraft towing vehicle had shorted and was heating the starter assembly to the point where it was smoking and about to burst into flames. The battery was disconnected and the vehicle removed from the hangar.

MCpl Lipscombe's alertness, thorough investigation, and quick action prevented the development of a very serious situation and demonstrated his high degree of professionalism on the job.

CPL J.A. NADEAU

During a routine periodic inspection on an Argus, Cpl Nadeau, an AF Technician, discovered a small discrepancy where the main landing gear actuator bracket was attached to the main structure. Cpl Nadeau's critical visual inspection detected a minute space in this area; subsequent torque testing of the bracket retaining bolts revealed that twenty out of forty were loose. A Special Inspection was initiated and loose bolts were found in seven other unit aircraft.

Cpl Nadeau's vigilance and meticulous attention to detail prevented possible failure of the main landing gear actuator attachment with a resultant loss of control over the positioning of the main landing gear.

MCpl A.J. Lipscombe

Cpl E.J. MacAlpine

Cpl J.A. Nadeau

Cpl R.S. Wood

Cpl G.L. Gervais and Cpl W.T. Betts

CPL E.J. MACALPINE

While carrying out an airframe periodic inspection on a CF5, Cpl MacAlpine detected a broken RH Fwd wing attachment bolt.

As a result of this find, a vital special inspection was initiated and similarly cracked bolts were discovered on other aircraft.

Although the aircraft inspection cards call for a visual examination of the bolts on every periodic inspection, the nature of the failure and its limited accessibility emphasize the professional manner in which Cpl MacAlpine was performing his duties. His extra effort, care and vigilance has brought to light a possible safety hazard in the CF5.

CPL R.S. WOOD

Cpl Wood was on duty as a member of the Line Servicing Crew at CFB Ottawa when he noticed smoke coming from the right main wheels of a taxiing CC137. Cpl Wood responded by immediately contacting the Base Fire Department. As the aircraft was being shut down at the AMU, the crash vehicles arrived and were in position to control any possible outbreak of fire.

Although no fire resulted from the overheated brake unit, Cpl Wood is commended for his alertness, quick thinking and fast action.

CPL W.T. BETTS AND CPL G.L. GERVAIS

Cpl Betts as Crew Chief and Cpl Gervais as Crewman were starting a CF104 Starfighter. A normal start was in progress when Cpl Betts noticed smoke coming from the left side of the front cockpit. He signalled to the pilot and Crewman for an immediate shut down, and with Cpl Gervais, quickly positioned the ladders and assisted the pilots from the aircraft.

Cpl Gervais disconnected the ground power and pulled all the necessary circuit breakers in both the rear cockpit and the electrical bay. Meanwhile Cpl Betts noticed that the smoke was persisting and saw a small flame appear. He entered the front cockpit and put out the fire using the extinguisher from the start unit. Cpl Betts and Cpl Gervais then pulled the radar cone forward to ensure that there was no smoke or flame in that area.

The quick action and professional teamwork of Cpl Betts and Cpl Gervais certainly averted the development of a very serious aircraft fire.

CPL J.E. ROBERTSON

After trouble-shooting a snag in the Auxiliary Power Unit of a CH113A, and prior to re-installing the aft transmission drip tray, Cpl Robertson carried out a general inspection of the aft transmission area. The inspection revealed a crack originating from one of the aft transmission mounting lugs. This crack had

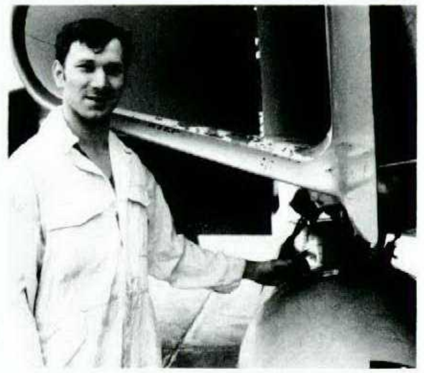
GOOD SHOW

not been visible on the previous Primary Inspection and in view of the rapid progression of the crack may not have been discovered before complete failure of the mount. Further investigation by QETE confirmed that had the situation been allowed to continue, complete breakdown was imminent. This may well have led to the loss of a valuable aircraft and its crew.

Cpl Robertson's initiative in performing an unnecessary inspection, and the thoroughness with which he carried out this inspection truly demonstrate a professional approach to the job.

Cpl J.E. Robertson

Cpl F.J.G. Gauvreau



Cpl J.F.C. Martin

CPL J.F.C. MARTIN

Cpl Martin was on duty as a member of a CF101 Voodoo Start Crew. As he completed the start of his aircraft, another CF101 taxied out of the ramp area about 400 feet down the line. Cpl Martin noticed a wisp of smoke coming from the left engine of the taxiing Voodoo. He immediately ran to notify the line chief who, in turn, contacted the control tower to have the aircraft stopped and the engines shutdown.

Subsequent investigation revealed that a defective 'O' ring on the cap of the external fuel tank had allowed fuel under pressure to be inhaled by the left engine.

Cpl Martin's initiative and immediate action prevented a possibly disastrous situation from developing.

CPL F.J.G. GAUVREAU

While carrying out a routine dye penetrant inspection on a Hercules wing plank attachment fitting, Cpl Gauvreau noticed a suspicious mark on an adjacent area. Concerned about the appearance of this mark, he checked the comparable surface on the other wing. No such mark was evident. Dye penetrant was applied to the suspected area and a defect became apparent. The wing was hoisted to an inflight position and dye penetrant confirmed the existence of a crack.

Through Cpl Gauvreau's alertness, a defect was found in an area which is not normally inspected. This has since led to the discovery of a similar, but worse crack in another Hercules and has contributed significantly to the continuing program of anticipating structural integrity on this aircraft.

25,000 Letdowns

In July of this year, Sgt B.R. Elms of CFB Trenton brought in a CC130 Hercules on precision radar. At the controls was Colonel W.G. Paisley, the Base Commander, who then signed Sgt Elms' log book confirming a most significant event–Sgt Elms' 25,000th GCA run.

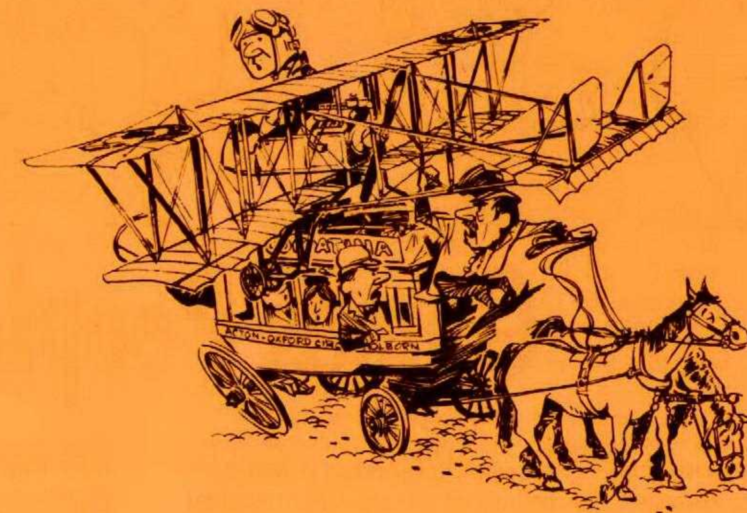
After seventeen years in GCA, Sgt Elms has handled 75 types of aircraft ranging from L19 to Vulcans and from Harvards to CF104s. He completed his 10,000th run with an F86 Sabre in 1960, and his 20,000th run with a CF104 in 1967. Sgt Elms accumulated most of his runs in the challenging high density traffic environment of Air Division, Europe.

OH FOR THE GOOD OLDE DAYS !

The following monthly summary of accidents was dredged from the December, 1917 records of the Royal Flying Corps.

AVOIDABLE ACCIDENTS

The pilot of a Shorthorn with over 7 hours experience, seriously damaged the undercarriage on landing. He had failed to land at as fast a speed as possible, as recommended in the Aviation Pocket Handbook.



A B.E.2 stalled and crashed during an artillery exercise. The pilot had been struck on the head by the semaphore of his observer who was signalling to the gunners.

Another pilot in a B.E.2 failed to get airborne. By error of judgement he was attempting to fly at mid-day instead of during the recommended best lift periods i.e., just after dawn and just before sunset.

A Longhorn pilot lost control and crashed in a bog near Chipping Sodbury. An error of skill on the part of the pilot in not being able to control a machine with a wide speed band of 10 mph between top speed and stalling speed.

A B.E.2 pilot was seen to be attempting a banked turn at a constant height before he crashed. A grave error by an experienced aviator.

Whilst low flying in a Shorthorn, the pilot crashed into the top deck of a horse-drawn bus, near Stonehenge.

UNAVOIDABLE ACCIDENTS

Sixteen B.E.2s and 9 Shorthorns had complete engine failures. A marked improvement over November's figures.

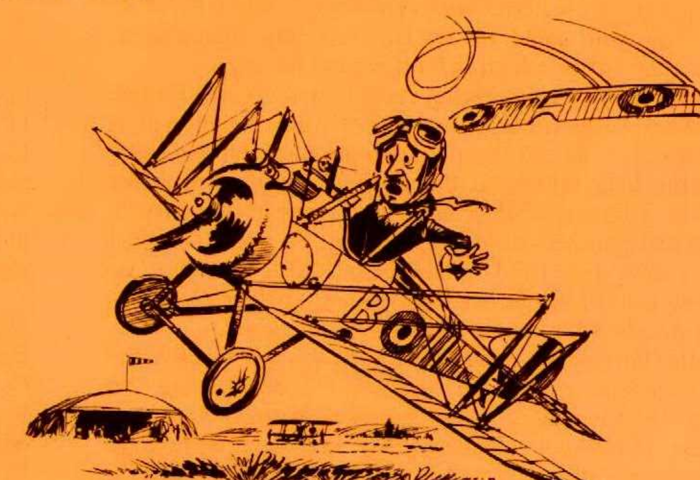
Pigeons destroyed a Camel and two Longhorns after mid-air strikes.

The top wing of a Camel fell off due to fatigue failure of the flying wires. A successful emergency landing was carried out.

COST OF ACCIDENTS

Accidents during the last three months of 1917 cost £317.10.6 – money down the drain and sufficient to buy new gaiters and spurs for each and every pilot and observer in the Service.

(Flight Safety Foundation)



Games People Play

"Clearing one's Yard-arm" (CYA) is a game by no means reserved for sailors or those of a nautical bent. CYA is played everywhere – even on flying bases – and is especially popular with supervisors. Hockey, golf and baseball may be seasonal favorites but CYA is a year round pastime . . . . and anyone can play.

Most CYA players were originally participants in the more orthodox game of MA (Mission Accomplishment) and the similarity between the two games can lead to some confusion. Still, the best way for a learner or beginner to become proficient is to study the great games of the masters. Watch the experts at play and then decide for yourself. Is "Clearing one's Yard-arm" the game of the future or is there more real satisfaction in Mission Accomplishment?

The account which follows is of an imaginary game, but it does indicate the extremes to which CYA players can go.

PITCHOUT'S PUNCHOUT

Lt Percy Pitchout was a keen young pilot, well-liked by his squadron buddies and a real ball of fire and fun on Friday nights and at squadron parties. A gay young bachelor, he was enjoying his first tour after Wings graduation. After all, at 20 years of age, who could ask for anything more than a sleek, fast fighter aircraft in which to burn around the sky.

One bright spring morning Percy roared off on a routine low level navigation training mission. Forty eight minutes after takeoff a telephone call from a rather confused farmer's wife advised the base MP shack that a pilot was nursing minor injuries in a farmhouse 185 miles northwest of the airfield. Pitchout had punched-out moments before his aircraft crashed into a rocky, pine-treed ridge. Base Rescue launched its helicopter and while Pitchout was being safely returned to base, an Accident Investigation Board was convened.

After burning the midnight oil for a couple of weeks, the board members packed up and went home leaving the wreckage (which was in a very inaccessible spot) under the pine trees. The bound volumes of their investigation, findings and recommendations were duly signed, sealed and sent on their way to travel from desk to desk, through the musty chambers of various HQs until "Pitchout's Punchout" was finally laid to rest; another statistic on an accident rate graph, another coloured slide for a Commander's briefing.

Essentially, the Board "found" that the young lieutenant's aircraft had been serviceable and functioning properly on impact. Pitchout was able to fill in the details. En route at 500 ft he had encountered some scattered stratus and had descended below the cloud. The scattered condition rapidly became overcast. Flying down a valley, Pitchout suddenly realized that he wasn't going to clear the ridge ahead. He attempted to pull up but decided to eject when he felt the aircraft contact the trees (the Board congratulated him on his decision). The facts were therefore quite clear and the Board stated as much. Pitchout admitted that he had "pressed on into deteriorating weather conditions which forced him to descend to maintain visual contact with the ground". However, some other observations were made by the investigating team:

- Pitchout had not had breakfast on the eventful day,
- Pitchout had signed out in the wrong column,
- Pitchout had just returned from two weeks leave and this was his first flight, and
- Pitchout – along with others – had not signed Sqn flying orders for the quarter.

Now Pitchout was relatively inexperienced and had been on the Squadron less than a year. But his Sqn commander, LCol Gung Ho, had a multi-year and a multi-type background. He was naturally perturbed at the loss of the aircraft and the close call for young Percy. He became even more concerned when *his* Commander arrived without warning and suggested, in the strongest terms, that Gung Ho shape up his operation or else . . . .

Obviously LCol Gung Ho's operation was somewhat "loose". Operations control seemed non-existent. Pitchout has been gone for two swinging weeks with his hot honey, a new Corvette, and yet he arrived back at base and set off on a low level nav mission without so much as a quick taxi test. Signing out in the "time of takeoff" column and failing to sign the Sqn flying orders are not prerequisites for flying into the trees but they do indicate a somewhat lax attitude on behalf of all concerned. Fortunately, Pitchout was still alive, but a valuable aircraft had been destroyed. What could be done to prevent a similar incident in future? Half a mile of shattered airplane and an injured pilot adds up to lots of zeros below the line. The only plus factor in this type of occurrence is in its preventive value. If some lessons can be *learned* and then *applied* . . . .

This was the point where LCol Gung Ho could have made the opening moves in a serious game of MA – but instead, a classic example of CYA developed.

HOW LCOL GUNG HO PLAYED CYA

- LCol Gung Ho called a Sqn Flt Safety Meeting.
- The FSO briefed on the dangers of continuing a mission in deteriorating weather conditions.
- The FSO exhorted the pilots to have breakfast every morning.
- Base, Sqn and Command Flying Orders, CFP 100 and Ops Memo were to be "signed as having read" *every month* vice every quarter. Furthermore, a new memo was placed on the Sqn noticeboard to be signed when the other pubs had been signed off.
- The visibility limits for low level nav missions were raised from 3 to 5 miles.
- All pilots returning from leave were to have a dual check out.
- Pitchout was given a check ride with the Sqn Standards Officer and returned to the flight line stamped "serviceable".
- A copy of the Flight Safety minutes were immediately sent to command HQ.

LCol Gung Ho was satisfied. He was fairly confident that the Commander would be satisfied – and he was right. Young Percy was just an inexperienced "tiger" now duly chastened. The operation had been tightened up and everyone could sit back and relax. Even those Flight Safety characters could hardly complain. "Pitchout's Punchout" would soon be forgotten and the squadron could carry on doing it's job – just as before.

HOW COULD LCOL GUNG HO HAVE PLAYED MA?

It is doubtful if LCol Gung Ho could start a real game of MA by himself. He probably needs some coaching from a higher supervisory level. Although his CYA moves point in the right direction, their value in most instances is negative.

"I know the wing fell off but ask him if he's had breakfast"

The Flt Safety Meeting was expected – although no-one could remember when the last one had taken place. According to the minutes, *all* pilots were briefed about pressing on in bad weather, (but two were on TD, one was on leave, one was at Staff School and another was at Language School). Since FS meetings were so few and far between, the response from the Sqn might be "Ho hum, here we go – the old flight safety routine". Instant switch-off.

If LCol Gung Ho is to play MA he must evaluate himself and his whole operation in terms of the objectives established by the service. His attitude towards the flying operation creates the atmosphere in which his subordinates work. If Gung Ho merely pays lip service to the goals of the organization then Pitchout's Punchout will be just one of many failures. Regular, programmed squadron meetings with Gung Ho as a *participating, decisive* chairman should be the rule rather than a quickie CYA move when things go wrong. At one of these regular meetings the Base Flight Surgeon could be on hand to give a forceful talk on the advantages or necessity of having some food intake before flying. The FSO, "exhorting" aircrew to gobble up their Shreddies, is hardly speaking with any authority.

What about signing all the pubs monthly instead of quarterly? Well, if Gung Ho's troops aren't signing every 3 months, it's doubtful if they'll be leaping up, pen in hand, to sign on the first of *every* month. (CFP 100 may be getting thinner but it's not getting any more exciting). "Sign as having read" has come to mean "sign as having signed". Obviously some system must be established for aircrew to be advised of any changes in orders or procedures but not to the point where the pilot has writer's cramp before he reaches his aircraft.

Gung Ho increased the limits for VFR to 1000 and 5. In effect he is saying to his pilots "I don't trust you, you Souls on Board, you'll drop me in it given half a chance". The next time someone tickles the trees Gung Ho will say to the Commander, "See that, and I even added on some extra limits for safety! " Of course the original limits were quite acceptable and provided an adequate operational training situation. If Gung Ho continues with this line of play he will eventually fudge himself into a position surrounded by all his aircraft in a locked hangar.

The requirement for pilots returning from leave to have a dual check out is worthy of an MA player (after a few days off a little dual with an experienced pilot never hurt anyone). But the real value of such a ride will depend again on the *attitude* of the supervisory staff which, in turn, influences the behavior of the line pilots. So often this check ride is just a

cont'd on page 17

"OK, I'm cover . . . . I mean . . . . You're safe to go"

ATTENTION!

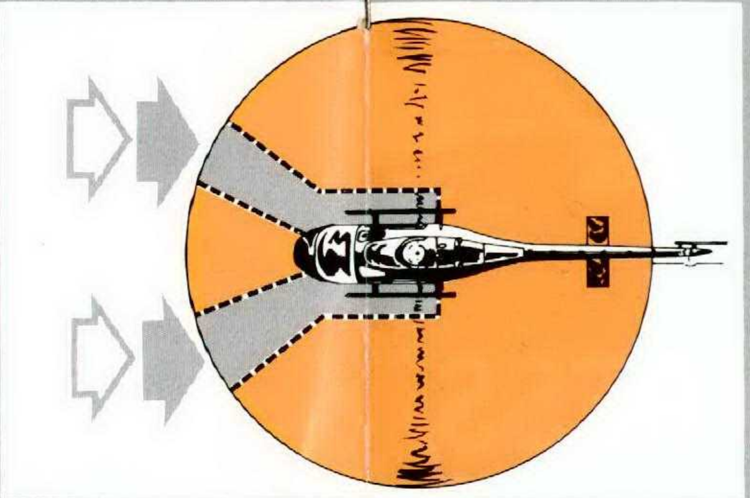
DFS 730

National Defence Headquarters — Directorate of Flight Safety

KEEP helipad clear of loose articles - paper, groundsheets, empty cans, etc.

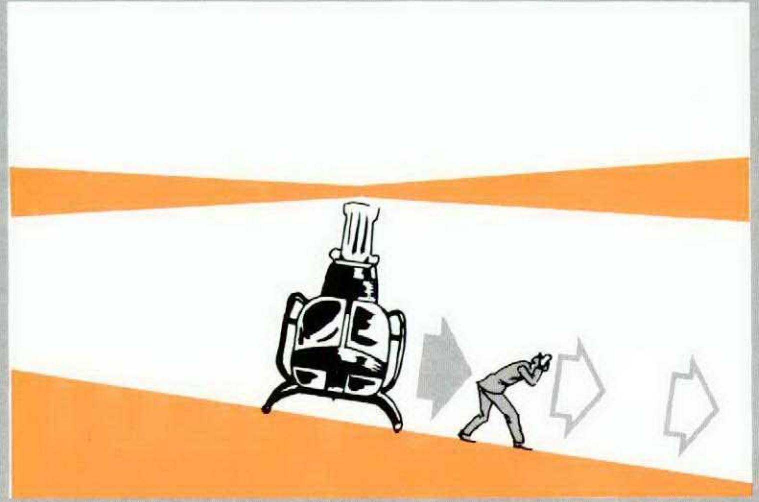
LA plate-forme de manoeuvres d'hélicoptères doit demeurer absolument propre. En particulier, elle ne doit pas être souillée de détritus tels que papiers, tapis de sol, boîtes vides, etc...

APPROACH or leave the helicopter in the pilot's field of vision so that he can see you and to avoid tail rotor.



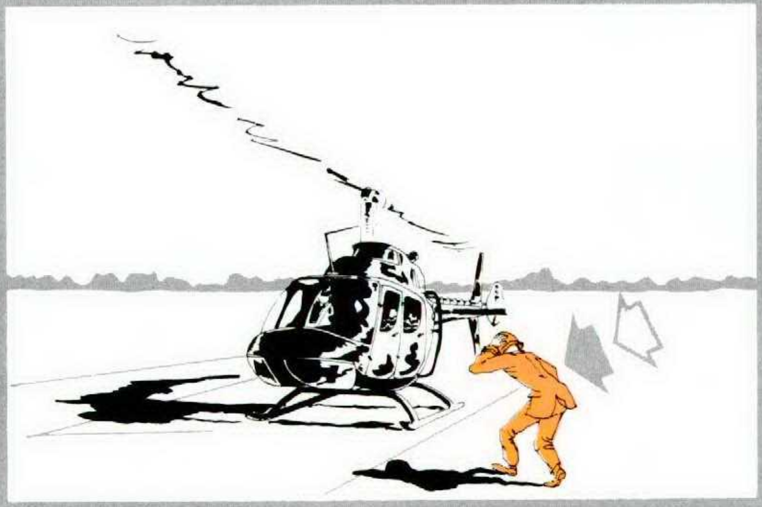
APPROCHEZ-VOUS de l'hélicoptère ou quittez-le en restant dans le champ visuel du pilote afin de lui permettre de vous voir plus facilement. Faites attention au rotor arrière.

APPROACH or leave the helicopter on the down slope side to avoid main rotor.



MONTEZ dans l'hélicoptère ou descendez-en du côté aval du terrain, afin d'éviter d'être frappé par les pales du rotor principal.

APPROACH or leave the helicopter in a crouching manner. Hold on to helmet or hat and never touch helicopter bubble or any moving parts.



APPROCHEZ-VOUS de l'hélicoptère ou quittez-le, en marchant courbé. Tenez votre casque ou votre coiffure et ne touchez ni à la bulle ni à l'une des parties mobiles de l'appareil.

REMOVE radio aerials and carry tools, stretchers, etc, horizontally and below waist level - never upright or over the shoulder.

RENTREZ les antennes-radio et tenez ce que vous portez (outils, bancards, etc...) horizontalement et toujours au-dessous du niveau de la ceinture. Ne tenez jamais un objet quelconque verticalement ou au-dessus de l'épaule.

FASTEN seat belt and shoulder harness on entering helicopter and leave it fastened until pilot signals you to get out. Don't forget to close the door after exiting the helicopter.

ATTACHEZ vos ceintures et vos sangles de sécurité dès que vous êtes entré dans l'hélicoptère et laissez-les ainsi jusqu'à ce que le pilote vous donne le signal de sortie. N'oubliez pas de fermer la porte après avoir quitté l'hélicoptère.

TRANSPORT PILOT STRESS

...on departures

by Maj D.A. Davidson

The C130 lay broken and smoking across a ditch five hundred feet left of the main runway. The crew and passengers had, fortunately, escaped without harm. But several million dollars worth of airplane and thousands of hours of airlift capacity had been destroyed.

How did it happen? Simply enough. A small yellow "Prop Oil Low" warning light for Number One Propeller had illuminated. It had come on during the takeoff roll as the airplane approached refusal speed. The aircraft commander reacted, but the wrong way! For the majority of takeoff emergencies a definite emergency procedure to abort the takeoff is known and practised. For propeller malfunctions the procedure differs. In the majority of the emergencies the throttles are all brought below flight idle to ground idle and the affected engine shut-down. For propeller emergencies the throttles must be brought to flight idle, the affected engine shut-down, then all throttles brought to "Ground Idle".

A seemingly minor procedure change. Unfortunately, ignoring it while the affected propeller is actually pitch-locked in a forward blade angle allows the situation to get swiftly out of hand. Several C130s have died because of this particular malfunction.

Pilots learning the aircraft commonly make this particular mistake during training sessions, either in the airplane, or in the simulator. Even experienced pilots, if they are not alert, sometimes revert to the more natural reaction of bringing all throttles to ground idle when aborting a takeoff. The natural reaction has to be overcome and a less natural procedure followed in order to correct the situation.

The aircraft commander was not having a good day. His ground transport for the crew from quarters to Operations was fifteen minutes late. Eager to make an on-time departure he urged his crew to complete their flight planning. The load was late and he was trying to get the Air Movements Unit to give more priority to his airplane. It had snowed overnight, a wet sticky snow, and the wings and tail were partially ice covered. Servicing was late with the de-icing equipment. Just as the AC was ready to start engines, his loadmaster reported that the passenger meals had not yet arrived. A final flurry of activity got the meals on board and the C130 taxied.

During the propeller check prior to takeoff an unsymmetrical fuel flow condition developed due to an intermittent temperature data system input. The IFR clearance came through garbled, with complicated departure instructions. The first officer finally got it straight but embarrassed the AC with his clumsiness.

On the takeoff roll a number of items dominated the AC's thinking. Distractions, frustrations and irritation over the stupidity and lack of concern of other people while he, the aircraft commander, was simply trying to get a job done, flooded his mind. His normal "cocked" alert mental state during takeoff was overpowered by his reflections on how things could have been done better on the ground if only people would appreciate his problems. Reaction to the usual takeoff drill was automatic and thoughts of malfunction were far from his mind. The prop low oil light flashed on, reactions reverted to basic form, the most natural pilot reaction to the emergency, and it was wrong. Number four propeller was pitchlocked from loss of hydraulic oil. The aircraft responded to its distorted asymmetric power, swung sharply across the infield and struck a ditch – with catastrophic results.

During the initial stages of the accident investigation, the feeling of all involved was that the pilot had erred. He had made the mistake common to inexperienced pilots. But did he err? And if he did, was it his fault? Is it humanly possible to experience one stress after another, some of them ego shattering and temper straining, and then, robot-like, turn them off and become within seconds simply a pilot faced with the problems of getting seventy-five tons of airplane safely aloft?

Psychological stress on aircraft commanders at flight departure times is a common problem. It varies in degree from flying role to flying role and from organization to organization. This article deals specifically with the kind of problems faced by aircraft commanders in the transport role.

When moving people, troops, freight, or tactical loads by air, itineraries are important. Planning and schedules are built around the ability to depart and arrive on time. People become very irate when aircraft do not depart on time.

Management goals are set measuring percentages of on-time departures. A squadron or a base's efficiency is to some extent measured by its late departure rate. Someone is immediately accountable when a late departure occurs. All concerned, the aircraft commander, squadron commander and base commander must explain *why* to their supervisors and to Headquarters. The commander measures his command's performance and the efficiency of his bases, partly by the late departure rate.

All activities pertaining to aircraft readiness at a Transport Base are related to the departure time. A tolerance of up to fifteen minutes is permitted before a late departure must be reported. A message is then sent immediately to the Command Operations Centre and to all affected en route points giving details of the late departure.

In the final analysis, all the pressures, all the frustrations and all the explanations rest on the aircraft commander's shoulders. His name goes on the departure message before any other. Although other organizations are there to do specific jobs, the final impetus to get his particular airplane ready often comes from the aircraft commander. Work schedules for base sections supporting departures cover a number of activities and all of them do not directly relate to the departure of a specific flight. The aircraft commander may have to compete with other departures to get the extra attention he believes his flight requires.

These other "non-pilot" type activities which the aircraft commander may have to expedite prior to flight can only degrade the safety of the flight itself. The first officer and other crew members can and do attend to many of the specific preparation problems but it is the aircraft commander who is handling the aircraft during fifty per cent or more of the takeoffs. The critical early stages of start, taxi, takeoff and climb are affected. One might suggest that the base operations officer, or an officer in a position analogous to the USAF MAC ACP or an airline dispatcher should be doing the expediting. Base Operations do work in this respect but there are many aircraft to handle and this departure is only one of many. The transport aircraft commander also operates much of the time on his own outside his system. Today's departure may be from a busy metropolitan airport but tomorrow's takeoff could be from an isolated Arctic outpost or from some obscure foreign military base. The aircraft commander must be adaptable and omni-skilled. He does not often enjoy the luxury of departing from a base where the operations staff can provide all the qualified assistance necessary. Versatile and capable, he is accustomed to expediting the details of his own aircraft's departure. It is a norm of his kind of role.

By virtue of his training and experience the aircraft commander can suppress or shrug off his reactions to stress and so remain in control of the situation. But some degree of anxiety is always present. He wants to perform a service, do a good job and do it well. Sometimes events seem to conspire against these goals and when things go wrong the aircraft commander must take the blame and carry the responsibility. Weather considerations, tight fuel decisions and borderline go no-go mechanical problems may all add up to a feeling of frustration. This frustration may manifest itself as irritability towards the rest of the crew. An irritable aircraft commander can make a whole crew unhappy, with a resultant decrease in crew and individual performance. Again, the frustration may produce an attitude of "if nobody else can do things right, I can" and over his normal better judgement he takes off when he should have stayed on the ramp. Afterwards, if all works out well and he is safely established en route he can rationalize and justify his earlier risky decisions. "Nothing succeeds like success" can be heady wine after a round of frustrations.

Stress can result from the aircraft commander's image of himself. Perhaps he sees himself as a father figure. In his mind's eye he is calm, decisive, highly regarded by his crew and passengers and icily in control of anything that flying can expose him to. He must perform well and suppress his desires to vent his feelings – another avenue to frustration.

On stopovers the aircraft commander may be under pressure from other crew members to prolong the stay – if the location is attractive. A scheduled short fuel stop at a place where most of the crew would like to stay often has the rest of the crew finding reasons why they should stay. (For example, a stop in Honolulu for only two hours is not popular with many). The aircraft commander, who would probably like to stay too, must convince himself and his crew that the responsible decision is to perform the mission as assigned.

Fatigue, as the constant companion of long range crews, can become an insidious enemy. Twelve to eighteen hour days coupled with a continual change of time zones may critically affect an aircraft commander's judgement. The decision not to add another stop or another day in spite of poor weather or a touchy fuel situation is often made just to get the trip over with. If the flight is nearing home base and the crew is tired, the commander may press on regardless of the need to stop short. This persistence may not just be "get home-itis". It may be due to a simple need to get the trip done – to shed for a while the responsibility and problems of commanding a crew.

The hazards resulting from these emotional stresses are readily apparent. The aircraft commander is forced to change at takeoff from the role of a crew commander to that of a pilot involved in the basic activity of getting the aircraft safely airborne. There is no room for inferior performance or lack of attention in the cockpit. He cannot allow the problems he has encountered on the ground to distract him from the job at hand – but is this possible?

Instead of carefully checking obstacle clearances on departure he may be thinking of the argument he has just had with the Operations Officer. As long as the takeoff is routine, little will likely go wrong; experience allows him to perform almost automatically. However, if an extraordinary or unusual event occurs, he may make a disastrous mistake. His mind is not on the job.

The problems of stress that confront transport crews are well known and well documented – but the stresses still occur. Obviously they cannot all be eliminated but commanders, operational staff officers and commanding officers must have their awareness of these problems refreshed from time to time. Herein lies one of the tasks of the safety organization. Command, base and squadron flight safety officers must analyze their operations to determine what kind of stress is faced by their aircraft commanders. They must search for ways of reducing the pressure.

The organization can help. The aircraft commander can be relieved to some extent of the responsibility for co-ordinating all the activities leading up to his departure. Operations Officers who take on this role must be sympathetic to the aircraft commander's problem. They have the difficult job of being decisive without overriding or usurping the authority of the aircraft commander. The commanding officer can be of immeasurable help. An aircraft commander will act with more confidence if he knows that his professional decisions have the support and backing of his C.O.

With so much of the transport operation outside the main base system, the aircraft commander will always bear the brunt of the departure stresses. Through experience and training he can learn to handle the stresses. Only experienced pilots attain aircraft commander status and then only after significant experience in the transport role.

The older, senior aircraft commander has less mental concern over the problems of departures. Experience has given him a sense of proportion about the stresses he faces. He has learned to delegate duties, and is more knowledgeable about what it is or is not within his power to expedite. Crew leadership training tends to concentrate on decision-making rather than on solving problems of stress. The less experienced aircraft commander should get adequate training to allow him to recognize and rid himself of his reactions to emotional stress. The goal is a well-trained aircraft commander who has, as part of his mental pre-takeoff checklist, "FRUSTRATIONS – SWITCH OFF".

Flash-back

...but they shoot HO4SES, don't they?

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: Base Commander CFB Winnipeg, Westwin, Man. Attn: ICPS.

New Pubs

As most of the readers of On the Dials know (or if not, you soon will), GPH 209, the Manual of Criteria for Instrument Approach Procedures, has been rewritten. The forecast availability date was August 1973, and hopefully it is in all its required slots by the time you receive this issue of Flight Comment.

With the publication in the field there will be a great many changes in format and additions to Approach Procedures and Let Down Publications (GPH 200, 201 etc.) Therefore, close attention to all your letdown plates becomes even more important than in the past (if this is possible).

In future issues we will cover some of the changes and answer any questions that may come up.

Another new publication, CFP 100 Vol. II (draft edition) is making its rounds. It is to cover most, if not all, of the flying regulations that one must dig through CFAO's etc. to find. More on this in the future.

En Route Descents

Some misunderstanding seems to exist about en route descent. In Canada for an en route descent to a straight-in approach and landing with the T33 you would start the descent at a distance equal to double the aircraft altitude in thousands of feet (drop the 0) plus 20 nautical miles. For example, if the aircraft is flying at FL 350, start the descent at 90 (2x35+20) nautical miles. (Reference: T33 Manual of Flying Training). M.O.T. has no criteria for en route descents but does use rough figures for certain aircraft.

DC9 – 3 x Alt.
DC8 – 2 x Alt. + 20
707 – 2 x Alt. + 20
747 – 2 x Alt. + 20

In the U.S.A. an en route descent is based on a descent rate of 4000 – 6000 ft/min. According to the FAA, descent clearance for an en route descent should be issued at a point determined by adding 10 to the first two digits of the Flight Level (at FL 450, clearance would be issued 55 N.M. from the terminal approach fix). One half of the T33 figure.

En route descent procedure in the U.S.A. will not be used if other than normal vectoring delays are anticipated. So – remember, if you are cleared for an en route descent in the States, you will be expected to descend at 4000 – 6000 ft/min. For normal handling request descent at a fixed distance from your planned Final Approach Fix and clarify with the controller the type of final approach to be flown. If you wish other than the above, request "Descent at Pilot's discretion."

Comments on formulas used by other aircraft would be appreciated.

cont'd from page 11

mutual buddy-buddy trip. The flight becomes a casual touch and go practice rather than a professional work-out to get rid of the cobwebs. (These trips *also* contain the seeds of disaster.)

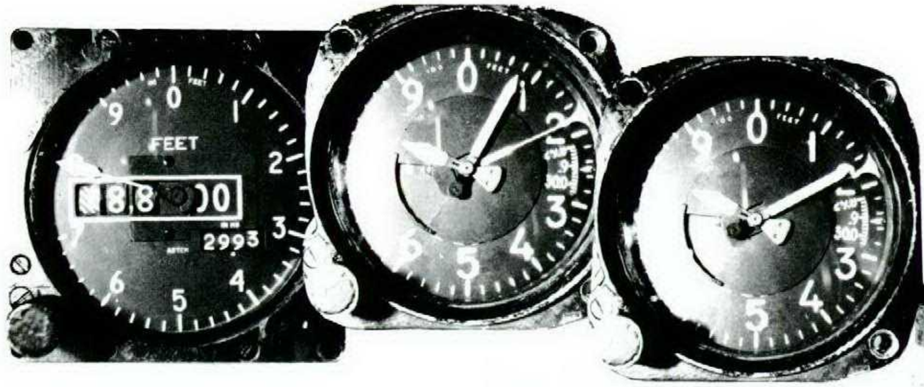
Finally, there's little Percy, the prime mover in all this. He's now back in harness – fit for duty. But is he? The MO has given him a clean sheet and the Sqn Standards Officer has given him a check ride. No problems. What did Gung Ho expect? Did he think Pitchout would go and fly into the trees again – or forget to put his gear down? No, Pitchout may continue his flying career for 20 years and never have another incident – or he may not be so lucky. If he doesn't make it he will become a topic for bar talk. The old heads will gather round; "He was an accident looking for a place to happen", "I knew he'd never hack it", "Remember the time when he punched out". These are the disappointing comments which mean that somewhere, sometime, someone sloughed off his responsibility to a young Pitchout. It isn't good enough to *hope* the young sprog will make it and then hide behind earlier prophesies when he plows in. Why didn't someone speak up earlier? Why didn't the experienced pilots take Pitchout aside and give him the benefit of their years behind the pole? Why didn't Gung Ho recognize that Pitchout needed some personal attention, training and regular evaluation. Why . . . .?

WHY LCOL GUNG HO PLAYS CYA

This is the most difficult question to answer without having access to the clockwork in Gung Ho's head. The incredible paradox is that Gung Ho thinks he is furthering the aims of Flight Safety. In effect, he is doing just the opposite. Perhaps:

- Gung Ho turned to CYA because it was *easier* to play. Authority is lots of fun if you can get rid of the responsibility that goes with it. MA demands *effort*. In the case of Pitchout, it demands a careful appraisal of a pilot and an operation. This is a difficult task but essential if the Sqn is to develop with any prospects of growth and success. Rather than search for the root causes and try to prevent a recurrence, Gung Ho found it easier to have his aircrew sign a few pieces of paper.
- Previous experience had convinced Gung Ho that it was best to look out for himself. A few extra restrictions on the Sqn wouldn't hurt and would prove he was "tightening up".
- The goals of the service had become secondary to personal objectives. Let's see "I've got two more years to my 30 so if I can just keep my nose clean . . . ."

The sad story of Pitchout's Punchout and the ensuing account of LCol Gung Ho's gamesmanship are of course completely fictitious. No one would go to such great lengths to avoid facing up to responsibility. And by the way – how's your paper signing hand?



Altimeter Errors

...improving the system

Maj A.A. Bialosh
NDHQ/DAASE

How accurate is your aircraft barometric pressure altimeter? This is a question which all pilots must face from basic training to advanced operations. With the astonishing increase in air traffic, serious problems of vertical separation, terrain clearance and collision avoidance have been created, necessitating that altitude readings become more accurate. Accordingly, in recent years there has been an increased emphasis to improve altimeter accuracies by reducing the uncertainty of errors. What are these altimeter errors and how can they be reduced? The purpose of this article is to describe them and to discuss various means by which the Canadian Forces are attempting to improve altimeter system performance.

Historically, the Canadian Forces have recognized the need for improved altimeter accuracies and have initiated a replacement program where the standard three pointer altimeter will be replaced by a counterdrum instrument. The two types of instruments are shown below.

The standard three pointer altimeter was long reputed to be a difficult instrument to read. Photographs 1 and 2, which show the same altitude, demonstrate this difficulty. Studies have shown that for skilled pilots the percentage of reading errors could be large with the three pointer altimeter. In one study, the percentage of reading error exceeded 1% as compared to less than 1% with the counter-drum pointer instrument. An RAF Institute of Aviation Medicine Study indicated that gross reading errors were made in approximately one third of the trials with the three pointer instrument. The counter pointer instrument fared the best. Evaluation proved that less than 1% of the reading errors exceeded 1000 feet.

In parallel to the requirements for an improved altimeter presentation, other technological developments took place which centered on the need to provide better altimeter accuracy. It was acknowledged that civilian air regulations aimed at providing 1000 foot vertical separation would required a marked improvement in altimeter accuracies. For this separation a total altitude error was set at 350 feet. This value is based on a Root-Sum-Square (RSS) summation of a 250 foot flight technical error (pilotage) and 250 foot technical altimeter system error. The 250 foot altimeter error includes instrument, calibration, and pressure sensing errors.

INSTRUMENT ERRORS

The old three pointer instrument besides being difficult to read, has significantly large errors attributed to friction, temperature, acceleration, etc. and erratic functioning of pneumatic sensing devices (aneroids or barometric capsules). Consequently, it is not unusual to experience errors in excess of 300 feet under normal flight conditions.

Encouraged by tighter military and MOT/FAA altimeter tolerances, manufacturers were able to design and produce instruments which have errors in the order of 0.5% of pressure altitude. By comparison the old three pointer altimeters generally have errors exceeding 1% of altitude.

The Canadian Forces' altimeter replacement program calls for instruments of better accuracy. Instruments with servo mechanisms will have errors as small as 0.2% and non-servoed units will have errors of 0.5%. These tolerances are being achieved by more stringent specifications which demand rigorous performance characteristics and better production testing.

CALIBRATION

Contributing factors to altimeter errors are maintenance techniques and test equipment used to calibrate the instruments. The old mercury manometers held by most Canadian Forces instrument maintenance facilities have accuracies of ± 0.1 inches of mercury, whereas today it is desirable that an accuracy of ± 0.005 inches of mercury be achieved. Furthermore, the old test equipment needs a controlled environment (air conditioning) and often is not referenced to a National Standard to achieve relative uniformity amongst all equipment.

To resolve this maintenance inadequacy, the Canadian Forces have procured electronic barometric test equipment which has the desired accuracies and contains temperature compensating circuits to allow use in non-air-conditioned environments. Furthermore, it is intended that frequent cross-referencing to National Standards be carried out as part of a regular re-certification program. Each altimeter will be calibrated with the new test equipment before aircraft installation and the determined error recorded for aircrew information.

Photo 1

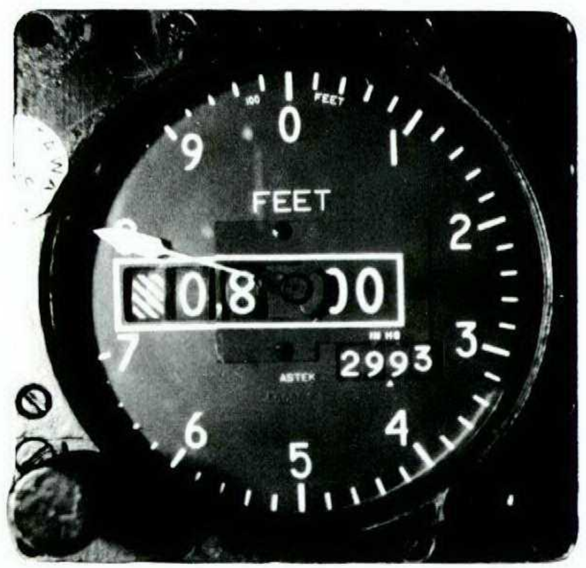


Photo 2

PRESSURE SENSING ERROR

Once the altimeter is installed in an aircraft, and the instrument error determined by calibration, an additional problem of pressure sensing error must be dealt with. Since altimeter presentation is a function of "sensed" ambient pressure, it is necessary to know the difference between sensed and true ambient pressure to determine actual pressure altitude. This difference, generally referred to as position error, is affected by many factors including:

- type of aircraft static pressure probe,
- location of the static pressure probe,
- angle of attack of the aircraft, and
- flight speed of the aircraft as related to the velocity of sound, (Mach number).

The new servoed altimeters used in Canadian Forces aircraft will have a correction cam which will automatically correct for indicated altitude to account for the aircraft's position error according to a predetermined Mach schedule. Unfortunately, the correction cam does not solve other cited problems which emanate from measurement and transmission of true pressure altitude.

Errors in measured static pressure are a result of three variables: design of the pressure pick-up, location of the pressure pick-up on the aircraft and the Mach number. A static pressure sensor can be either a flush fuselage vent or a static pressure tube. In the case of the flush vent, even the slightest surface irregularity or structure in the vicinity of the vent may substantially affect the flow of air past the vent. In the case of a static pressure tube, concern must be given to such variables as the shape of the tube, the orifice configuration and the type of structural support on the rear of the tube. In either case, there will be a local pressure surrounding the pressure sensing vent which will usually differ from the free stream pressure. The magnitude of this local pressure error, which usually varies with Mach number, must be determined through flight test and calibration.

Pressure transmission errors are the result of sensing transmission lag from the source sensor to the instrument and from system leaks. Lag can cause errors of hundreds of feet, depending upon rate of pressure change and the system's size. In level flight or during very low rates of ascent and descent (500–600 fpm) the errors are small and almost negligible. Errors produced by system leaks can be significant if the leak is located in the pressurized area of the aircraft.

The total altimeter system accuracy limitation of ± 250 feet imposes the problem of having to eliminate, correct, or compensate for virtually all errors in the system. To achieve best accuracy, each type of aircraft must be treated separately in relation to its pressure system and flight envelope. Slow, low flying aircraft with small or negligible measured static pressure defects only require an instrument which transforms static pressure input into a readout of pressure altitude.

Medium speed aircraft with higher altitude capability and substantial position errors require an altimeter to compensate or correct for the static pressure error as a function of Mach number. To compensate for the pressure error, the error must be known and repeatable between aircraft of the same type. If repeatability is a problem due to flush static ports or to static tubes being located near external tanks or weapons, the flush ports must be relocated or replaced with a pitot static tube. In either case, the system must be flight checked to determine the new static pressure error of the system.

cont'd on next page

High performance, supersonic aircraft also require an altimeter instrument capable of compensating pressure error as a function of Mach number. The altimeter instrument used in this type of high altitude aircraft has to deal with a greater magnitude of errors encountered over a wider range of altitude and speed. Again, where problems are encountered with flush mounted vents, the use of pitot static booms usually corrects the errors.

While it is true that relocation of the pitot static probes often reduces position error, other problems are usually encountered, particularly with new aerodynamically compensated pitot static probes. These new probes are precision machined and are considerably more vulnerable to damage than the older probes. In order to ensure that the pitot static probe maintains its accuracy the probe surface must be kept free of bends, dents or scratches. The static port and pitot openings must be clean and not burred on the edges. The slightest deformation of the pitot inlet can cause disturbed flow over the static ports and result in large air speed and altitude errors. Damage to these probes is difficult to detect even with a close visual inspection.

Added to these problems, the pitot static probe location is usually susceptible to maintenance damage. Placing ladders against booms, bumping maintenance stands into probes or even grabbing booms for support will often throw them far enough out of alignment to have an effect on the static pressure error. Where the damage is significant, a serious flight hazard is created with the aircraft's altimeter.

The Canadian Forces have determined through various flight tests that anomalies in the pitot static systems in various aircraft can cause errors as large as 350 feet. These errors, discussed above, when added to aircrew reading error could lead to violations of the 1000 foot vertical separation on airways. It is therefore of paramount importance that each aircraft altimeter system should be checked to determine that there are no significant errors arising from damage to or irregularities in the pitot static system or from deviations in the nominal aerodynamic characteristics affecting the pitot static system. While it is realized that anomalies are not usually detectable through normal maintenance inspection techniques, the importance of the determination and reduction of errors caused by pitot static malfunctions must be emphasized by achieving improved altimeter accuracies and calibration standards. In the past, errors arising from all causes were masked by large tolerances in conventional barometric altimeters.

In summary, altimeter errors can be caused by inherent instrument design, improper maintenance techniques, inadequate servicing capabilities, and poor aircraft installations and system components. With improved altimeter testing and a greater emphasis on better instruments and installation techniques, altimeter system errors can be reduced to an acceptable level whereby flight safety will be enhanced, airway violations will be reduced, and greater confidence in altimeter system accuracy will be achieved.

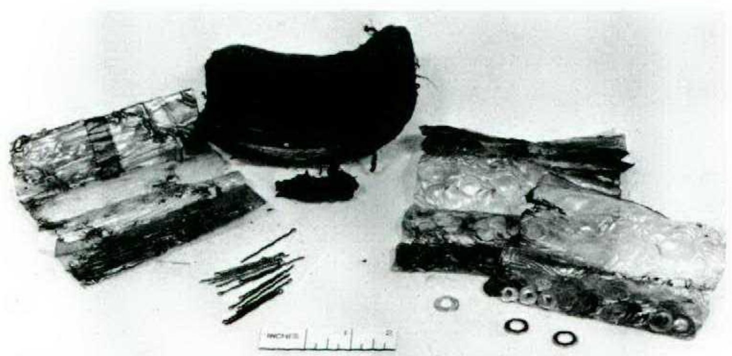
Maj Bialosh graduated from RMC in 1961 as an engineer. His first posting was to Clinton as an instructor at 1 R&CS. This was followed by tours at Moose Jaw as Station Telecommunications Officer and Avionics Services Officer. In 1965 Maj Bialosh moved to Air Materiel Command HQ where he served in Avionic Maintenance and then as Executive Assistant to the Commander. He spent two years as Chief Ground Environment Officer at CFS Ramore before arriving at NDHQ in 1970. Maj Bialosh is currently the Design Authority project officer at DAASE and is responsible for engineering aspects of aircraft flight, cockpit, flight deck and engine instruments.

Tired FOD?

FOD has a nasty habit of turning up in many different places. Its presence in jet engines causes thousands of dollars worth of damage every year. Occasionally, however, FOD finds its way into an out-of-the-way corner. The collection pictured here:

- several packages of small washers,
- one package of cotter pins and
- a roll of four-inch gun-tape,

was discovered between the tube and inner wall of an Otter tire. If FOD can be found in a spot like that it makes one wonder what may be hidden in more accessible areas.



Keep Your(s) Cool

..hot end overtemps

By Maj A.J. Munroe
NDHQ/DAE

Some years ago undetected and/or unreported airframe overstresses resulted in the installation of modified "g" meters which record, until reset, the maximum "g" force encountered. The continuing problem of gas turbine engine overtemps has resulted in the requirement for a similar instrument for "hot-ends".

Since its inception the gas turbine engine has suffered from the problem of hot section distress, and this problem still exists today. For this reason, inspections and inspection methods have been devised to verify hot section serviceability when an overtemperature occurs. These inspections and methods are dependent on the reporting of overtemperature occurrences. A recent survey of engines returned to an overhaul contractor due to hot section distress revealed that over 40 per cent of the engines had been exposed to one or more inadvertent overtemperatures for which no maintenance action was recorded. The result is that evidence of overtemperature manifests itself either on periodic inspection, on overhaul, or in an accident investigation after a catastrophic failure.

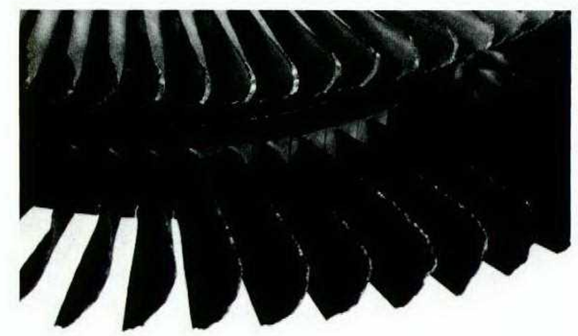
Photos 1 and 2 show two compressor turbines which have suffered hot section distress due to overtemperature. This is typical of the damage resulting from overtemperature. In these cases the compressor turbines had remained in service until it was reported that the ITT (Inter Turbine Temperature) was higher than normal, and that the engine was producing insufficient power. Investigation and laboratory findings indicated that the compressor turbines had been exposed to a higher temperature than that reported. This illustrates the importance of reporting hot starts and the requirement to observe cooling rundown periods. These points cannot be overemphasized, when one takes into consideration the consequences that can be forthcoming.

Two types of overtemperature can occur; one is caused by prolonged exposure to a slightly higher than normal temperature, the other is due to a short exposure to a higher than normal temperature. Both are important as life limiting factors with respect to the gas turbine engine. Hot section temperatures are the determining factors that establish the time engines will last in operation. It is sure folly to neglect overtemperature just because the turbine has not melted away, and if the engine seems to be functioning satisfactorily, it does not mean that the engine cannot be or has not been damaged. Momentary exposure to a higher than normal temperature or prolonged exposure with slightly higher than normal temperatures can cause creep (elongation), deformation and low cycle fatigue failures.

Since cumulative damage may not show up for some time, gas turbine engine operators should be conscious of the overtemperature problem and avoid overtemperature operation if at all possible. If overtemperature operation cannot be avoided *it must be reported*. Operating the engine within the specific limits of temperature, RPM, engine pressure ratio, (thrust or turbine discharge pressure ratio or torque) should become an instinctive technique to the pilot who flies gas turbine powered aircraft.

Photo 1

Photo 2



To help alleviate the hazards incurred by these undetected and/or unreported temperatures it is the intention of the design authority of the Canadian Forces Propulsion System Section to institute a requirement that all new aircraft incorporate a means of recording until reset, the maximum hot section temperature. That is, a "tattle-tale" gauge to report hot section overtemperatures will become a mandatory requirement for all future aircraft purchases.

FLAPPING

what's it all about?

The term flapping is often heard during discussions of helicopter aerodynamics, but is it a commonly understood term?

Flapping simply defined is the coning in and out of the rotor plane by the advancing and retreating blades. The relative wind which acts upon the blade in hovering flight is made up of two velocity components:

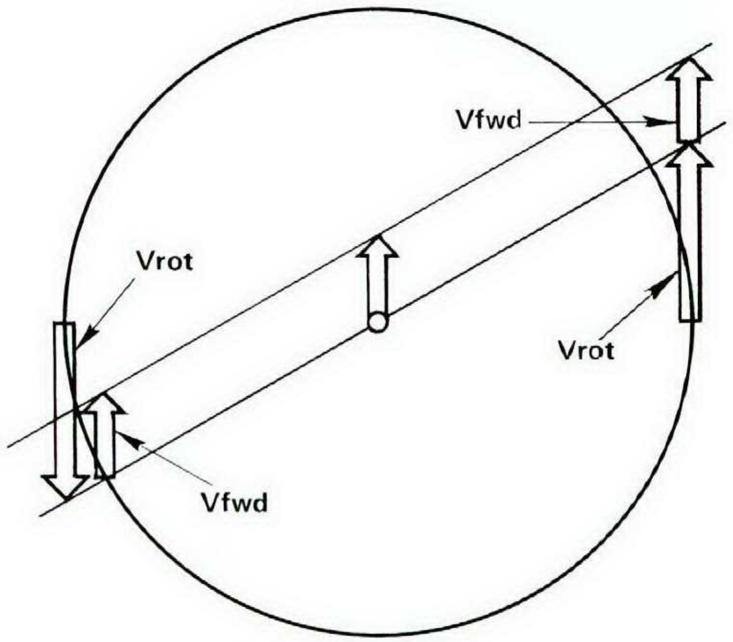
- the velocity due to the rotation of the blades about the hub (Vrot) and
- the induced velocity or downwash velocity caused by the rotor (Vi).

When the helicopter is in forward flight, a third velocity component, V fwd, is added. Thus the relative wind is composed of three velocities.

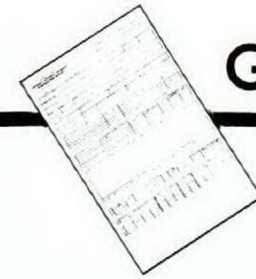
This created many problems in early helicopter flight which were overcome by the addition of a flapping hinge. Juan De La Cierva was credited with this invention.

The flapping hinge allowed the blades to flap individually and thus automatically correct for the dissymetry of lift that results from forward flight. This flapping action reduces the angle of attack on the advancing blade and increases the angle of attack on the retreating blade.

The position of maximum up flapping is at the 3 o'clock position, and the position of maximum down flapping is at the 9 o'clock position relative to the helicopter forward axis. Thus the blade angle of attack is decreased at the 3 o'clock position and increased in the 9 o'clock position.



The simple sketch above illustrates that the relative wind affecting the advancing blade is different from that affecting the retreating blade. The varied angles of attack thereby produce different amounts of lift. The flapping action takes place automatically as the lift on each half of the rotor quadrant attempts to equalize itself in forward flight.



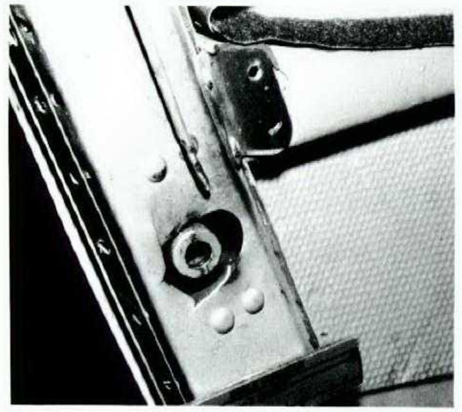
Gen from Two-Ten

KIOWA AUTO

The instructor was demonstrating a normal transition from the hover into forward flight. As the aircraft reached 100 feet and 55 knots it suddenly yawed, lost rotor RPM and yawed again. The pilot entered autorotation, declared an emergency and landed safely in a soft plowed field.

Initial investigation after the engine was removed revealed extensive damage to the fifth and sixth stages of the compressor and the stator blades. The compressor case plastic liner was also badly cracked.

Further investigation by QETE confirmed that the sixth stage of the compressor, which is a one-piece forging, had suffered resonant fatigue failure as a result of high stress and blade vibration.



KIOWA, BLOWN BY HUEY The Kiowa landed and shut down at a CF104 crash site after transporting medical and photographic personnel. The only suitable landing area was small and was also being used by CH135 helicopters. Whilst a CH135 was landing rotor downwash blew the co-pilot's door on the Kiowa open with sufficient force to spring the top and bottom door hinge points in the airframe.

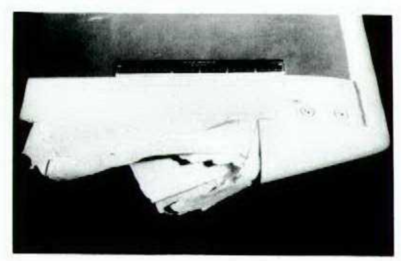
The aircraft captain and crewman had secured the aircraft on shut-down and the doors were closed. The captain stated that from this time until the incident occurred other personnel had access to the aircraft in the performance of their duties. Someone – unknown – had failed to realize the consequences of leaving the helicopter door unlatched.

The sheared hinge rivets and skin crack were repaired locally. The incident again points to the need for detailed briefings to passengers who may be unfamiliar with the aircraft. Even an *apparently* secure machine on the ground can encounter problems.

KIOWA, BLADE STRIKE The mission was an instructional trip on "Tactical Approaches and Departures". The student was flying the aircraft and had completed a high recce of the area and the route to the landing zone. When the student flew the route low level he was confronted by a row of trees across the intended flight path. He slowed to a hover, approached a gap between two trees in the tree-line and then continued through the gap. A slight climb was necessary to avoid low bushes on the other side of the gap. As the student initiated the climb a "popping" noise was heard. The main rotor had contacted a tree on the left side of the gap. The rotor sustained tip damage.

The instructor later stated that he did not expect the student to continue on as he considered the gap too small for safety. When the student did not reach the same conclusion and proceeded forward, the instructor was surprised. It was then too late to react as the rotor blades were already between the trees.

Knowing how far to let a student go before taking control is one of the most difficult decisions in the art of instructing. The need for constant vigilance and attention is particularly important in the low level tactical training environment.



Comments to the editor

WRONG BIRD

In reference to the Jul – Aug 1973 issue of Flight Comment, page 16. The article "NO SAFETY IN NUMBERS" stated that it was a pilot of a Musketeer who had the incident. However, it was the pilot of a CH136 Kiowa as indicated in our message FS436 281430Z Jun 73. I have already apologized to the Musketeer pilots but will still be burned in effigy at TGIF on Fridays.

Maj F.W. Bayne
BFSO
CFB Portage

Thanks for apologizing (on our behalf) to the Musketeer pilots. It was in fact a Kiowa pilot who "done the deed". Sometimes we get our missages mexed up but we can't imagine how a CH136 could be confused with a CT134. How could anyone confuse a helicopter with an aeroplane? Besides, we all know clean-living Musketeer drivers don't smoke or carry matches in their flying suits.

Muskowa?

PUBS CHECK

The Apr – Jun edition of the RAF's Flight Comment (published by the RAF in Germany) devoted a page to aircrew publications listing their latest amendments. Titled "Check Your Publications", it seems a most worthwhile idea. Sure, amendment lists are supposed to be up to date but how long does it take for one to go from command into the pilot's pub bag?

Further, I would venture that if a T33 driver's checklist in Baden was compared with one from Bagotville, there might be a few discrepancies. (Baden's up to date of course.)

Next time you are short of copy Mr. Editor, how about including a pilot's pubs amendment list.

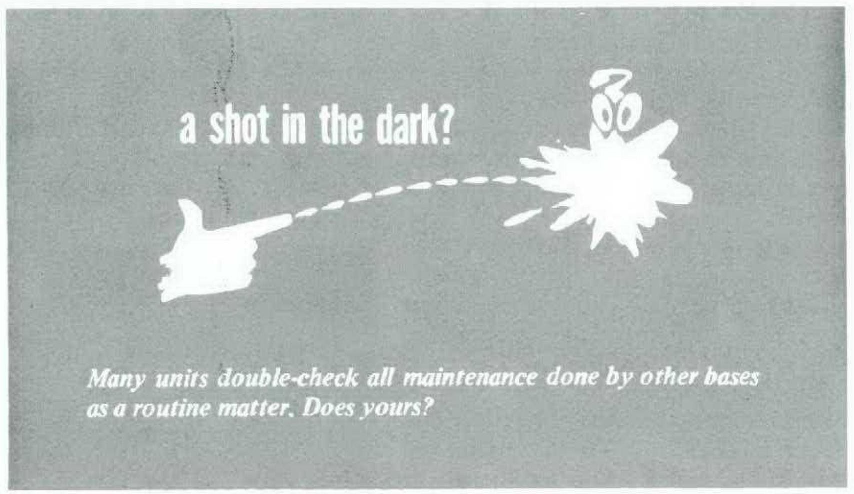
Capt R.D. Sword
1 CAG
Europe

The point you raise is a valid one. However, there is a little-known publication issued monthly by the CFPD entitled "Automatic Issues Listing of Publications." The purpose of this publication is ". . . to enable Base Supply Officers and Units to check their holdings of publications as applicable against issues made by CFPD during the month." AILP (as we shall call it) contains all the amendment lists, revisions, supplements etc., which are distributed on an automatic basis. If you're not getting it – see your friendly Base Supply Officer.

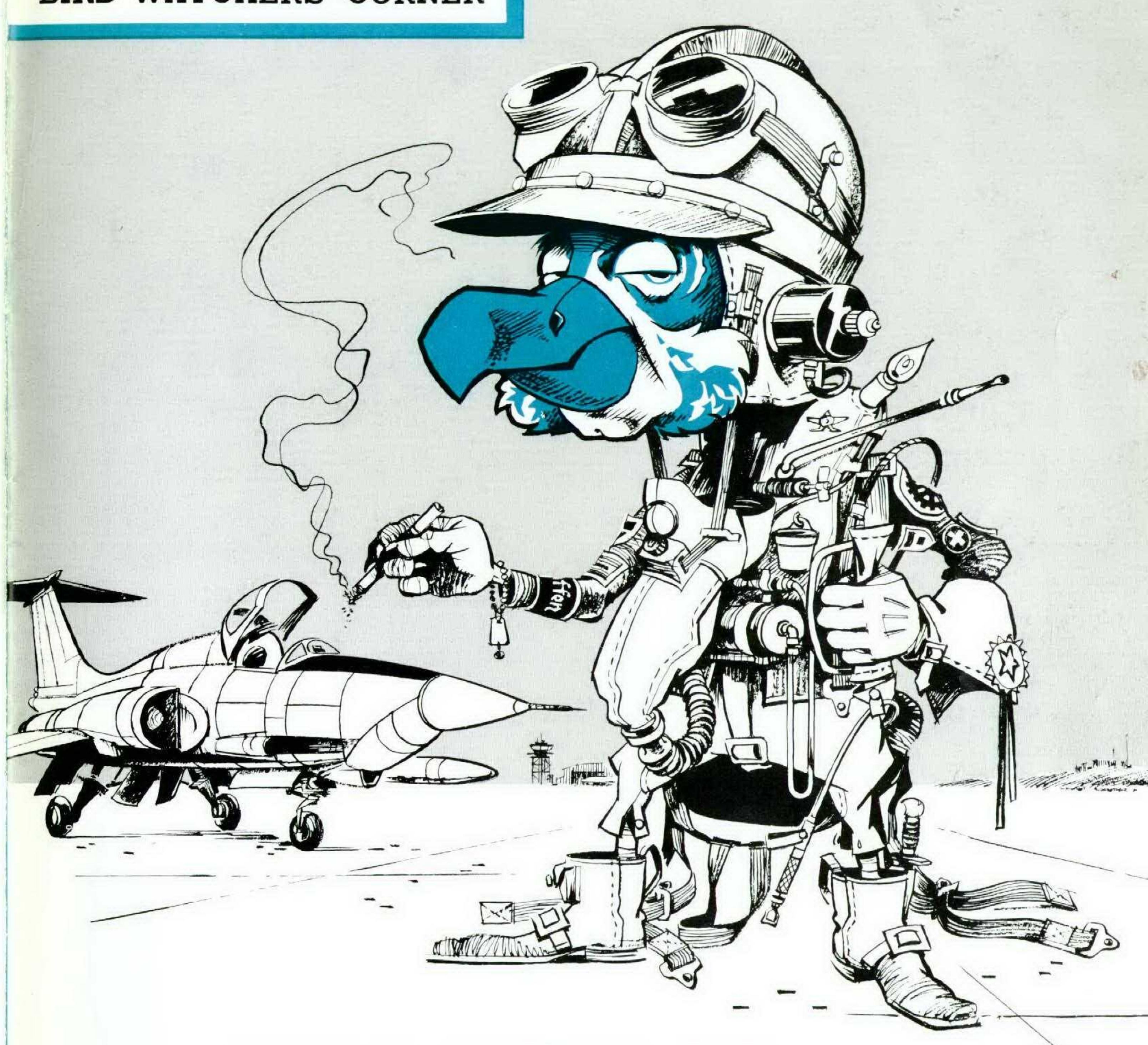
Winter Bush Survival Training

A base program throughout the remainder of the winter to accommodate sqn crews for winter bush training was proposed by the Chairman. Squadrons were enthusiastic for the renewal of the exposure and learning afforded by these short sessions in the "Bush". Additionally some base airwomen had expressed a desire to participate. Their "survival" of an initial course should spur crews on to at least equal the emancipation.

The Flight Safety Committee



BIRD WATCHERS' CORNER



JINGLE JANGLE JAY

This singular specimen of sartorial scruffiness is a close relative of Fodius Collectorus. But whereas Fodius generally gathers his goodies into his nest, old JJJ prefers to hang his collection among his feathers. He is an avid avian acquisitor of baubles and buttons which he wears on his flying suit. Flashy fod is frequently found littering the locker in his nest or hidden in remote corners of the aircraft. J3's acquisitive nature is coupled to a hoarding instinct. He likes to collect odd items of flying gear, often from foreign birdland units. As he struts nonchalantly to his nest, bedecked in out of date, out of style, non-issue gear he cheerfully chirrups:

I'M-A-JACK-I'M-A-JAY   I-WEAR-THINGS-MY-WAY

WATCH IT, JACK!