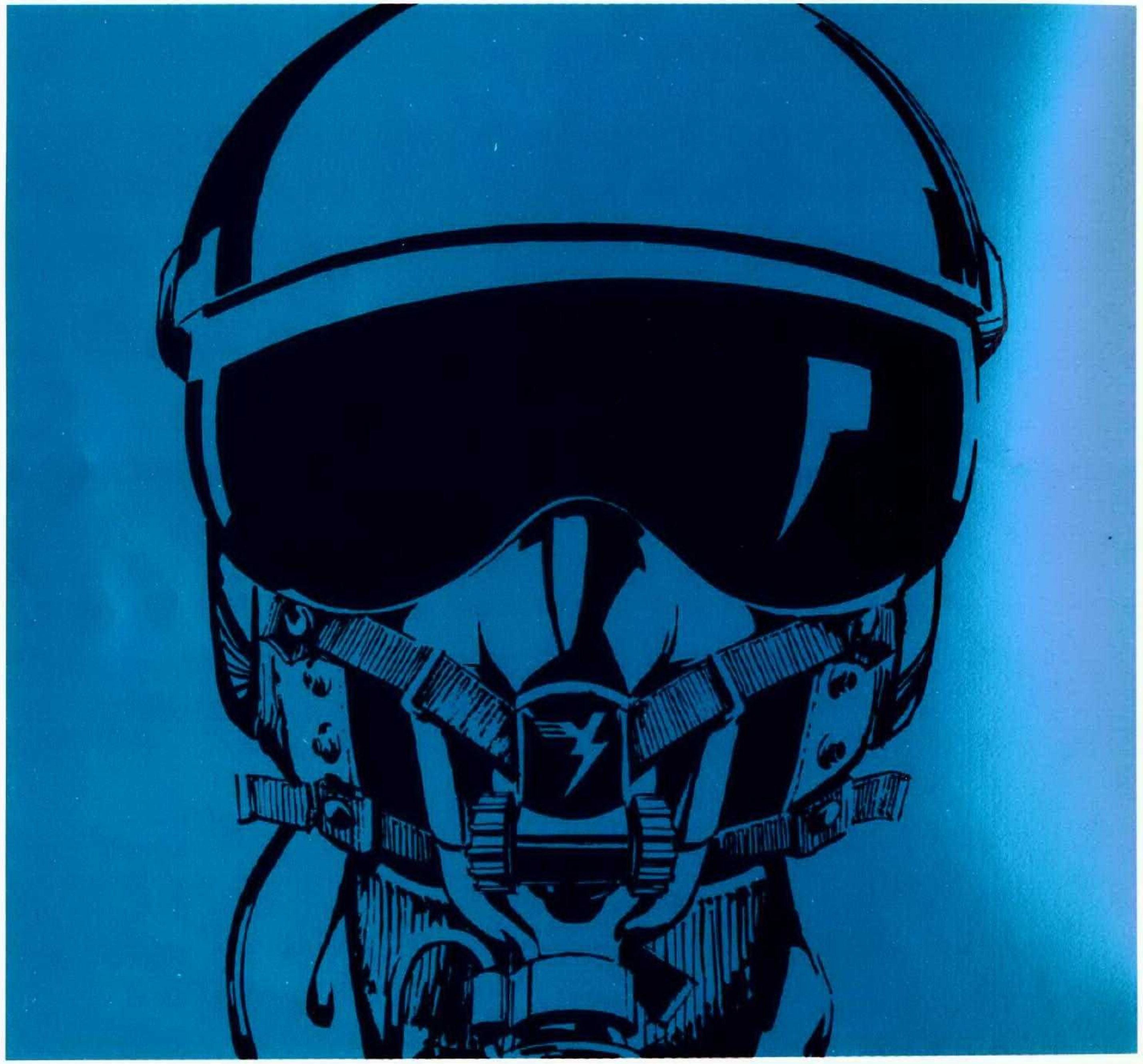
FLIGHT COMMENT

EDITION 4 1977

THE FLIGHT SAFETY DIGEST OF THE CANADIAN ARMED FORCES

HUMAN FACTORS



TICK – TICK – TICK – TICK – TICK – TICK – TICK – RRRRRRINNNNNNGGGGGG!

The alarm clock jolted him out of his semi-consciousness and the fighter pilot knew that he had to leave his dream world and face the reality of the day. Easing himself over the side of the bed he noted that the weekend would be a welcome respite from these five extraordinary days of operation hassles. He also reflected briefly that, having spent most of his flying career in combat, he was still trying to adjust to the changing priorities of peacetime that seemed to overlook getting the job done. These were private thoughts and he still kept them to himself.

TICK

But today he did have a job to do and was looking forward to leading his flight on a familiar bombing and gunnery mission – until he looked out the window. Yesterday's cold, penetrating drizzle was hanging on and he hated the weather hassle more than anything.

TICK

Undeterred, he completed his preparations for the day's work and headed for the ops building. His career had been a rewarding one. He considered himself fortunate to have gained so much experience so quickly. Although a young captain, he had accumulated hundreds of hours of combat time in a variety of stimulating and satisfying missions. Even more important to him was the fact that he had often been entrusted to lead some of the more demanding ones. Much of the satisfaction he gained was from accomplishing those tasks in his own way. He felt good under the pressure of responsibility and had been glad that he was given complete control and flexibility as a mission leader to get the job done.

The weather that had seemed to be lifting on his way to work was confirmed in the day's forecast. The range weather should permit all the required gunnery events, ceiling and visibility were gradually improving, and by the time they were due to return would probably permit VFR recovery.

His flight briefing was smooth, concise, and detailed. His wingman would be another of the more experienced pilots with whom he had often flown. In spite of the VFR weather forecast, he remembered to brief the new IFR recovery procedure. It was the third change in six months, and this time it appeared to be the only one he could use in IFR conditions. What a pain, he thought, to have to put up with all these changes.

TICK

They waited briefly for the wingman to get an aircraft assigned, then headed for the flight line. Engine covers on, downlocks on, canopies closed, starting units not in place. Typical maintenance again, he thought. The crew chiefs are good, but if I had some control over them they might be on time.

TICK

Eventually they were airborne and in the element he enjoyed: confidently leading a flight with a trustworthy, reliable wingman. He knew that he could contend with any problem and that his wingman would be there to support him and to take over if he so decided.

Inbound to the range they switched to primary frequency, then to the secondary, then back to primary without reply. The hiss and loud squeal in the radio, a product of poor design and moisture, was no help. It was becoming just plain infuriating.

TICK

With patience, though, contact was made and he calmly covered the required items with range control including the desired events and a request for the latest observation. He almost could have figured it. The weather was still too poor to complete all they had set out to accomplish. Those weathermen, he thought, I call never trust them to give a reliable forecast.

TICK

Thanks to his briefing they could still proceed with the alternate mission. This they did in spite of the worsening weather, various communications problems, additional pattern restrictions, and a new range officer not totally familiar with procedures. It was a challenge, but he was actually becoming more confident as he successfully overcame each problem. This was his training and experience and he knew he could cope with it all. He was in control and making decisions on his own.

The gunnery completed, they joined up, switched to centre, and got clearance direct to home plate initial approach fix. He would like to have received an enroute vector without going out of the way, but this was the new recovery procedure. As they levelled off, centre passed the latest weather observation. Oh, that is frustrating, he thought. Not only is the latest observation 45 minutes old, but it is far worse than what was forecast.

TICK

Now he set a new bingo, reminded his wingman they would recover in formation but to be prepared to go separately if the weather got worse. Just as he reduced power to a more efficient fuel flow he heard centre pass them to the approach control frequency and direct a descent. He should not accept a descent this far out to so low an altitude because of the narrowing limits of his fuel situation. 'Unable descent at this time, centre'. But he got no response. That's typical, he thought. They leave you hanging as soon as they can pass off their responsibility.

TICK

They began a slow descent and switched to approach control. As they entered thick clouds the radios started their hiss and crackling, and approach's transmission became very distorted.

TICK

He confirmed his altitude and requested an update on the field weather. No response. After several attempts without success they returned to centre frequency. Again there was no response. They returned to approach control for a radio check. 'Loud and clear', came their reply. And this time they confirmed the altitude. Again he asked for a weather update. No response.

TICK

They were coming up on an extended line of the final approach course, still in clouds in formation when approach control passed to them a completely unexpected and inconsistent vector for the situation. To comply would further restrict his options under the weather and fuel state.

'Approach, say again the heading for us', he asked, hoping to prod them into recognizing the error. No response.

'How do you read, approach?'

'Loud and clear', came the reply.

'Approach, say again the heading for us'.

No response.

TICK

Now he had no choice but to take the vector. Fuel was the only concern; terrain was no factor, and other traffic did not use the airspace they were entering. He could cope with it, but he was having doubts about the approach controller.

TICK

It had been 5 minutes since he had last requested a weather update and now, suddenly, approach passed it to them! It was not suitable for a formation recovery, but he was not going to let his wingman loose so far from the base under such uncertain conditions. They were still on the incorrect heading. He asked for a radio check. 'Loud and clear', came their reply. So they did hear him. He quickly informed them of his position and asked for a new heading. No response.

TICK

'Maintain VFR, Sir', said approach.

TICK

'Unable, approach. We are IMC requesting a new heading'.

No response.

TICK

He could hear the controller passing information and direction to other flights in the pattern. 'Is approach losing control?' He thought. 'Can they be so inflexible to the new procedures?'

TICK

'How do you read me, approach?'

'Loud and clear, Sir. Maintain altitude'.

'Roger, give us a new heading'. No response.

TICK

Minutes of silence. No response.

TICK

'Give us a heading, approach!' No response.

TICK

No response, no response, no response.

TICK – TICK – TICK

That was all he could take. Mashing down the mike button and tightening his grip on the control stick and throttles he bellowed into his mask, "Approach, we are in formation, IMC, heading away from the field, at low altitude, and we want a heading to the field, we want separate recoveries, we want full stop GCA approaches, we want you to wake up down there, turn on your scopes, listen to us, and do your job like we are doing it up here! We want some response, now! 'RRRRRRR INNNNNNGGGGGG!'

His outburst jolted him out of his state and the fighter pilot knew that he had to leave his emotion and face the reality of his position. Regaining some of his self control, he recognized that he was in no condition to continue as the flight lead. He passed the lead to his wingman so that he could calm down. Radio contact was soon re-established and recovery accomplished with no further problems.

The next day the fighter pilot reflected on the incident. Why had he reacted so? Such immature behaviour was not like him. The flight surgeon's reference books were in front of him and he searched for answers. He noted a paragraph on immature reaction to stress. 'Aggressiveness in the solution of problems is desirable behaviour. On the other hand, aggression defined as 'destructive attacks' is an undesirable response. It is however, among the most frequent reactions to frustration of other stressful situations'.

So it had happened even to him! He remembered also that Alvin Toffler had theorized in 'Future Shock' that stress is often a result of the pressure of change. So he had not been able to modify his ingrained feelings to the peacetime situation in which he had to relinquish flexibility and control and depend more on the decisions of others. In combat he would have had more ways out of the same situation.

Another paragraph told him that 'the distinguishing characteristic of either panic or rage is that it is uncontrollable'. Certainly he had been out of control for those few seconds. 'The principal way emotion affects thinking is by narrowing, or "channeling" attention'. That is why he seemed to forget everything except that controller. Was there anything else? The book said that 'gloom is a more prolonged emotional state'. That week's operation could have added that emotion to yesterday's pressures. Environmental stress, it said, affects the mental stability of the pilot by exposing him 'to frustrating situations resulting from weather conditions, traffic, the inadequacies of other persons . . . . ' Almost an example of yesterday, he thought.

He read well into the afternoon. The information would be good material to use at the next flying safety meeting. Learning to recognize his own symptoms to stress would be something to work on. He resolved to learn more on this subject of emotion, and to try and understand more about personality.

Ahead of him was a relaxing night at a quiet restaurant. His worries were subsiding and would soon be gone. Tomorrow the alarm would not go off.

courtesy Aerospace Safety

12 o'clock at 200 meters

from USAF Study Kit

Several years ago I had a bull session with some German fighter pilots. It seems that they were all bemoaning the fact that a Belgian pilot had achieved superior scores over all the Germans in the recent NATO competitions. The Belgian had achieved a perfect score on his strafe pass because he had pressed through the foul point. The strafe score was perfect; however, his aircraft score was 12 o'clock at 200 meters. Good results, but no trophy!

I've been in ATC too long, I know; however, I've seen that same "Can Do" attitude displayed a number of times in ATC during those long years.

"Ha," you say, "nobody in ATC attacks a target." That's a truism; however, the "press to the death" attitude exists nonetheless. Here are some examples for the unbelieving:

The weather is marginal, PIREPS, telewriter, and the out the door look all confirm it. The deciding factor, however, comes when the SOF calls the senior class flight commander and is told that they are four days behind.

"Launch the fleet," comes over the squawk box. "Score: 12 o'clock at 200 meters," is registered on the Safety Scoreboard.

Running out of gas has never been a good excuse for wrecking an aircraft.

But over the years I've seen more guys in ATC get more mileage from less JP-4 than the designers ever dreamed possible. The IP planned a very long leg home and by using a few "tried and true" methods, figured he could just make it with a legal reserve. The weather was super and he pressed because he'd been away 3 days longer than anticipated and he had run out of patience, money, and underwear. A severe case of "Get homitis." He would have made it but a solo student with no flaps closed the runway by taking the barrier.

"Score: 12 o'clock at 200 meters."

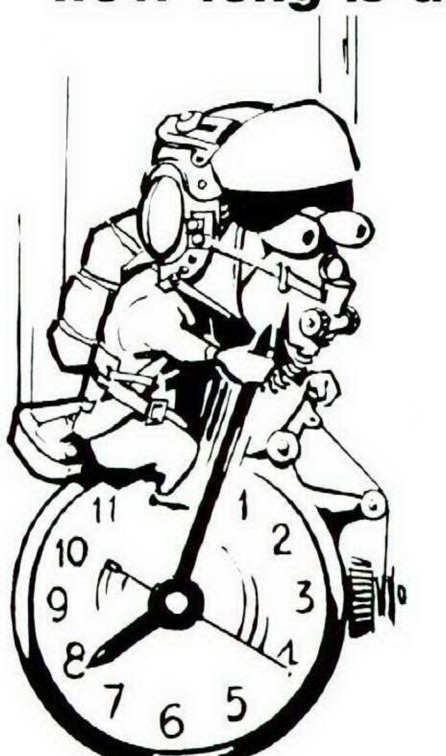
There are 168 hours in the average 7 day week. If you worked as hard as you could, 84 of those hours would be reserved for crew rest. I used to have a friend, a real go getter who used to work well beyond the allotted time. He wasn't coerced, or forced to do it, although many of us have been; he just seemed to have too much to do to rest for 12 hours at any one time. One night after a particularly long day, he confessed to me that he had fallen asleep while flying a night ride. He swore he'd never fly in that condition again. He never did. Driving home that night he went off the road into a ditch.

"Score: 12 o'clock at 200 meters."

Overextending yourself may be considered virile during an athletic contest, a game, or some harmless competition, but when it's done in flight, the score is usually, "12 o'clock at 200 meters."

anonymous

how long is a minute?



Three crewmembers who ejected near FL240 would all tell you it's a *&!¿¡! time. All the individuals free fell for what they thought was an eternity, then pulled the D-ring for a manually deployed parachute. The opening shock wasn't too bad, and none of them had problems with the cold or lack of oxygen. You can't argue with success.

Some of us may never have given thought to the amount of time spent in free fall during ejection above 14,000 feet. To increase awareness of this phase of an ejection, the following example is offered: Assuming an ejection altitude of FL240, the distance to free fall prior to automatic parachute opening is 10,000 feet. The initial velocity will vary, but as a guide, the average human will reach a free fall terminal velocity of approximately 120 mph after approximately four seconds. This converts to 176 ft/sec which means the 10,000 foot free fall will take 56.8 seconds or approximately one minute. As three pilots will all testify,this is a long time to wait. As altitude increases, the speed range of the injury-producing forces will be a function of the mach number. At higher altitudes, the time of free fall increases but so do the hazards from early deployments.

Ejection at high altitude may require some real determination to give the automatic function a chance to work and thereby avert some of the hazards from high altitude parachute deployment. *from USAF Study Kit*

BACKACHE IN HELICOPTER PILOTS

by Maj Ron Goede
Base Surgeon,
CFB Portage La Prairie

One does not have to spend much time in a helicopter squadron flight room before it becomes very obvious that a large number of helicopter pilots suffer from chronic backache. In fact, this author has on occasion experienced low back pain on some especially long trips in the Kiowa helicopter.

A French researcher found that 87.5% of helicopter pilots investigated, all of whom had at least 500 hrs, suffered from backache while flying. While the majority experienced pain in the region of the lower spine, the incidence of neck pain was also high. He found that the pains started after approximately 300 hrs of flying and were more likely to occur if the previous intensity of flying had been high. It was interesting to note that in pilots with co-existing spinal disease, the pain appeared between the 50th and 100th hr. Once the symptoms were established, any flight which was prolonged or difficult brought on the pain. This was especially true of flights which required considerable concentration by the pilot, ie. confined area operations.

The development of symptoms is basically a function of the flying intensity. The flying rate which seems most likely to promote back pain is more than 5 hrs per day, more than 40-50 hrs per month.

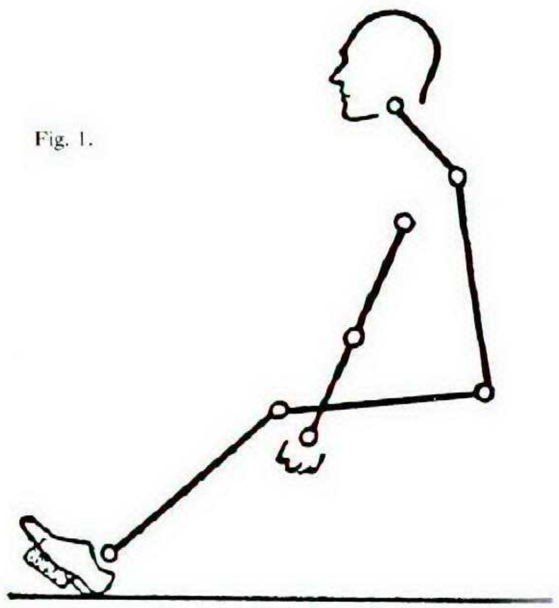
There appears to be two factors which promote the occurrence of back pain, the posture of the pilot and the vibration generated by the machine.

POSTURE

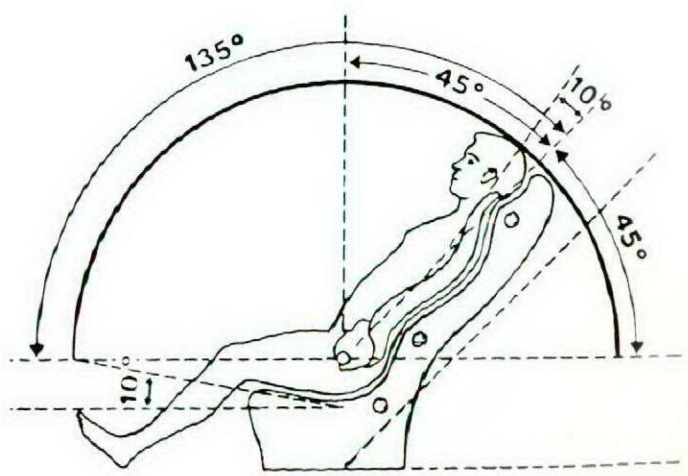
The unique control system in the helicopter requires the adoption of an abnormal sitting posture by the pilot.

In order to control the collective, the pilot is obliged to lean to the left. The left hand, which activates the collective lever, is half flexed. The right arm, which activates the cyclic, is bent at the elbow, almost at right angles. Generally the handle is too high for the forearm to rest on the thigh. Hence the pilot holds his hand as low as possible to compensate.

Fig. 1.



Posture adopted by helicopter pilots.



Relaxed sitting posture according to Krämer.

The pilot then hunches over the cyclic (fig. 1) and as a result, the spine is moved away from the back of the seat rest and can not be supported by it. In order to see over the instrument panel, the pilot must hold his head tilted slightly upwards. This is especially true of shorter pilots.

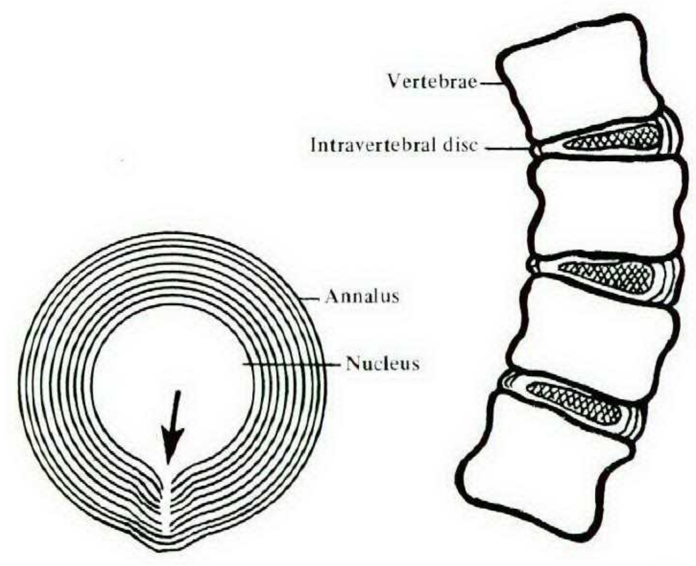
The lower limb rests on the rotor pedals with the legs and thighs slightly flexed. The knee is tensed and maintaining this posture over long periods of time causes fatigue.

This posture is bad because the position is rigid, asymmetrical and the pilot is forced to maintain it for the duration of the flight. It is this constant state of tension in the musculature that results in the eventual production of pain.

The sitting position adopted tends to press the vertebral bodies together at the front and pull them apart towards the back (fig. 2). This difference in hydraulic pressure on the intervertebral discs will tend to force the nucleus of the disc rearwards.

Fig. 2 depicts radial tears in the anulus (washer) as a result of the aging process and repeated trauma. These begin centrally and near the nucleus (ball bearing) and progress outwardly. Due to the uneven hydraulic pressures within the nucleus, the torn ends of the fibre are forced outwards, when these tears reach the outer margin of the discs, they can produce a bulge. Now the conditions are prime for a minor stress, ie. hard landing, to "tip the scales" and precipitate a complete prolapse of the disc.

The spine of the helicopter pilot, weakened by numerous small injuries, is particularly vulnerable to degenerative injuries to the fibro-cartilage of the disc. These injuries set the stage for the ultimate extrusion of the nucleus rearward. This will irritate the ligamentary system, and even the nerve roots, resulting in back pain.



Radial tear of annalus

Figure 2

In the case of heavy or crash landings, this vulnerable posture may cause serious injuries to the vertebrae, ie. compression or chip fractures.

VIBRATION

Vibrations are considerable in helicopters. These become greatly intensified on take-off and landings. They are complex, of varying frequencies, and significant in the vertical, lateral, and horizontal axis. Helicopter vibrations arise from a number of mechanical sources.

Vibrations in the 3-12 HZ range are induced by rotor blades, the frequency being related to the number of blades. Tail rotors induce high frequency vibrations in the 20-25 HZ.

The lowest tolerance of the human body to vibration is in the 4-8 HZ range due to the amplification of vibration by the natural resonance of the human body.

A fundamental problem is vibration isolation between the rotor and fuselage. Excitation of the fuselage by low frequency rotor vibrations adversely affect aircraft controls, sub system operations and crew comfort.

Efforts to reduce oscillatory forces have had limited success. Tailoring the rotor and/or fuselage to avoid resonance is usually attempted. Some form of isolation system is also desirable. This is particularly true of two bladed rotors because of the low frequency and high magnitude of the rotor hub forces produced.

Vibrations are transmitted to the pilot through his feet and the seat. The magnitude and frequency varies from one machine to the other.

From a mechanical point of view the human body is a complex elastic structure in which visco-elastic soft tissue elements are supported and coupled to the skeleton, made of bone, and behaving more like a solid.

The human body is considered as a system of suspended masses separated by springs. When excited with certain input frequencies, resonance of the body parts can occur, ie. the deformation or displacement of body organs is much larger at resonant frequencies than at other frequencies. Changes of phase of resonance will act particularly on lumbar discs. Supporting musculature "springs", must consistently work to absorb the vibration and hence rapidly become the source of the pain.

The chronic effects on the disc itself have already been described. The load on the spinal system will increase the problems already caused by the vulnerable posture.

Poor posture and vibration therefore are the two main causes of low back pain experienced by helicopter pilots. However one must take into consideration the frequent minor injuries of the spines of the pilots, as a result of poor posture, and their resultant long term effects.

PREVENTIVE MEASURES

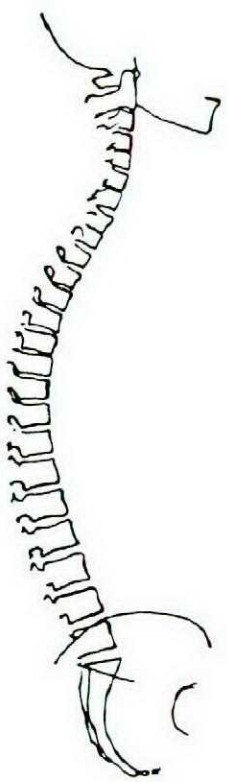
The most ideal method of preventing back pain and spinal injury in helicopter pilots would be to ensure adequate human engineering at the time of design conception. For example, helicopter controls can be redesigned to improve the posture adopted by the pilot.

The cyclic control should be close enough to the body and its handle sufficiently low for the forearm to rest on the right thigh.

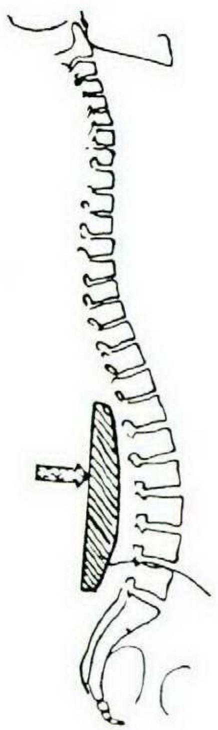
The length and travel of the collective control should be such that it would prevent the body from being tilted to the left. Adequate support should be given to the left elbow.

The rotor pedals should be adjustable, not only fore and aft

Figure 3A Spinal column in upright position



3B Same subject in sitting position adopted by helicopter pilots.



3C Same subject in sitting position with lumbar pad of 8 cm.

but vertically as well, to ensure that the foot forms a right angle with the leg and the heel can rest on the floor. The instrument panel should not restrict the field of view and must be sufficiently close to the pilot so that the reading of the instruments does not cause an accentuation of the foreward leaning position.

The seat should be adjustable, not only fore and aft but vertically as well. The wide range in the size of helicopter pilots will bear this out.

The seat back should match the contour of the human spine. An adjustable lumbar support would ensure the retention of the normal curvature of the lumbar spine and prevent the forward bowing of the spine as a whole.

The seat cushion should be of such shape that it would give a certain degree of support to the thighs. There should also be design considerations to prevent transfer of vibration from the airframe to the pilot and to attenuate decelerative crash forces.

REMEDIAL ACTION

Remedying the pain is an immediate problem: present helicopters will remain in service for a long time without any possibility of retro-fit modifications.

Since helicopter pilots will have to live with the current design for some time, there are numerous remedial programs that can be undertaken to delay the onset of back pain and minimize the degeneration of the structures of the spine.

- there should be adequate medical screening of potential helicopter pilots, including xray examination of the spine, to rule out pre-existing spinal disease and deformity.
- flying hours should be limited to a maximum of five hours per day and fifty hours per month.
- provision of lightweight helmets for helicopter pilots.
- rotary wing tours should alternate with fixed wing tours to prevent the rapid accumulation of helicopter hours.
- pilots should maintain their ideal body weight to prevent added stresses on the spine.
- pilots should undertake regular exercise programs designed to strengthen their abdominal and spinal musculatures and increase flexibility.

Studies conducted by Beach and Killus of the German Air Force Institute of Aviation Medicine demonstrated that seat positions are better tolerated for prolonged periods if the forward protrusion of the lumbar spine is encouraged and supported (fig. 3).

This can be accomplished by a custom designed lumbar cushion of approximately 8 cm thick and high enough to support the full lumbar region. This could be attached to the seat back with velcro fasteners and adjusted to a height suitable for the particular pilot.

CONCLUSION

It has become very evident to most helicopter pilots that very little human engineering has gone into the design of cockpits. Helicopters are making up an ever increasing percentage of Canadian Armed Forces aircraft inventory. Both the pilots of Rotary Wing Aircraft and the medical profession should ensure that the inadequacies of our current inventory are not repeated in future generations of helicopters.

In the interim, the remedial measures outlined should be encouraged. These would delay the onset of back pain experienced by Rotary Wing pilots and minimize the permanent damage produced.

TO REMOVE TWITCH

by CWO C. W. Kearce CFB Trenton

Technicians trouble-shooting fuel tank indicator probes on Hercules aircraft, have been complaining recently of the increasing incidence of water found in fuel tanks. Needless to say, water inevitably results in false fuel quantity readings. Water in fuel has even worse effects downstream in a fuel system, as experienced airmen know. An old problem is reappearing, leading to a conclusion that the current crop of Flight Engineers and technicians are placing too much reliance on the anti-icing additive now standard in military turbine fuel — and are forgetting some old lessons about this fuel. These lessons are overdue for review.

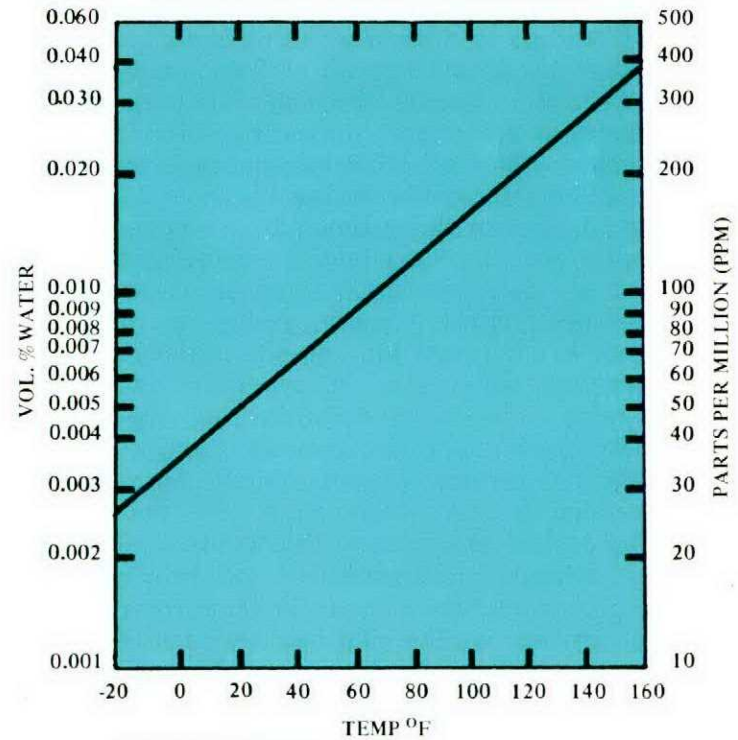
There are both *free* and *dissolved* water in turbine fuel. Free water may be picked up from water contaminated refueller units. However, this source may almost be discounted; one CF Technical Service agency reported no water contamination found in five years of quality assurance sampling. Floating suction intakes in tanks, much improved filter/separator units in delivery systems, and strict attention to quality control programs, have paid off, at least at Canadian sources. But the main source of free water remains; *condensation* in empty fuel tanks or the air space above full tanks. Air contains water vapour and the right temperature/humidity situation produces free water. It can *not* be prevented as long as fuel systems are vented to atmosphere.

Aside from free water, the other villian is dissolved water. Due to its specific gravity, turbine fuel readily retains dissolved water in solution. The solubility is related to temperature, reference the accompanying chart. Dissolved water cannot be removed by filter/separators and gives *no* indication on the CF issue Shell Water Detector Kit. However, a climb to altitude with the accompanying temperature drop will induce precipitation and produce *free* water. The fuel with the worst potential will, of course, be that loaded from a high temperature, high humidity source.

Hence, free water in aircraft tanks is the total of tank condensation plus precipitate from the fuel. A design factor not generally recognized, too, is that water is often trapped on tank bottoms in odd corners by baffles, etc, and does not always neatly flow to draw-off points. The total amount of water "generated" by a particular aircraft type on a regular flight schedule may be fairly accurately predicted by experience and may amount to several gallons. Maximum advantage should be taken of "settling"; drain the tanks as close to take-off time as possible.

Anti-icing additive is an improvement which reduces the natural icing tendency of water in fuel; but it is foolishness to depend on four engines to produce power with only this single safeguard. We are becoming too accustomed to reliance on sophisticated systems and duplication, to save the day. To repeat, water cannot be kept out of turbo fuel; it can only be detected and drained before each and every flight. It is no glamourous task and often messy, but carried out religiously it does help to remove the twitch from your life insurance agent.

SOLUBILITY OF WATER IN JP-4
IN TERMS OF VOL. % AND TEMPERATURE



NOTE: SHELL water detector will indicate FREE water above 20 PPM.

GOOD SHOW

CAPT A.G. BROOKS

The pilot of a Stinson civilian aircraft CF-BBM with two passengers on board was on a VFR flight from Alert Bay on Vancouver Island to the city of Vancouver. Somewhere southeast of Denman Island the pilot, who had no IFR training and limited IFR experience, encountered low cloud and fog. Unable to maintain VFR and unsure of his position, he commenced a climb into cloud to hopefully miss a suspected near land mass. Within a few minutes he became disoriented and experienced vertigo and could not maintain control of his aircraft. He spiralled/spun out of his predicament and somehow recovered approximately 200 feet above ground somewhere near Qualicum Beach on Vancouver Island. The pilot observed power lines and trees between the fog patches, therefore, not knowing his position, he immediately commenced another climb and declared a "Mayday" call on VHF guard at 2000 hours local.

During this sequence of events, Capt Brooks was the senior Air Traffic Control Officer on duty at CFB Comox RATCON. On hearing the Mayday call from CF-BBM, Capt Brooks acknowledged the Mayday and attempted to ascertain what problems existed with CF-BBM. Capt Brooks advised the pilot that he had a faint target 21 miles south of Comox and he suggested the pilot take up a heading of 360 degrees and climb his aircraft. Capt Brooks, by this time, also established the pilot's IFR experience, type of aircraft, number of people on board and fuel remaining (only 30 minutes flying time). It was now obvious to Capt Brooks that the pilot was possibly disoriented and either could not read his compass or was flying with an unserviceable compass, as the aircraft appeared to be in a constant turn. Seventeen minutes after the Mayday was declared, Capt Brooks observed a solid radar target 17 miles Southeast of Base. Again Capt Brooks noticed the pilot was having difficulty maintaining control of his aircraft, particularly maintaining constant headings. At this point Capt Brooks advised the pilot to level his aircraft at his present altitude and proceeded to brief the pilot on what procedures would be followed to recover the aircraft at Comox. The pilot had never before flown a no-compass approach or a radar PAR approach. Capt Brooks, however, continued to coax the pilot towards Base and advised the pilot to descent his aircraft. At 2,700 feet the pilot reported sighting lights which turned out to be Powell River. Within moments Capt Brooks had the pilot pointed towards CFB Comox where the pilot eventually landed.

According to a letter from the grateful pilot, Capt Brooks' confident voice and his assistance throughout the remainder of the flight was an invaluable aid in calming the pilot to enable him to settle down and accept the assistance needed to safely land his aircraft under weather conditions beyond the pilot's ability.

Cpl L.A. Wenninger

Cpl M.K. Hansen

Capt A.G. Brooks

Capt Brooks' immediate reaction to the distress call, his correct assessment of the serious predicament and his display of professionalism undoubtedly prevented this in-flight emergency from becoming a disastrous accident.

CPL L.A. WENNINGER

Cpl Wenninger was tasked to assist in a Voodoo engine trim and run-up following the change of a fuel control unit. After successful completion of the leak run and trim check, the crew prepared to conduct the afterburner test sequence. Due to the high noise, heat and shock levels inherent during this procedure, technicians normally position themselves forward and well away from the aircraft. However, Cpl Wenninger recalled that a CF-101 afterburner fuel line special inspection had been completed 18 months previously and therefore decided to move in closer to the aircraft during the afterburner test in order to check for possible fuel leaks. Upon taking this action, he observed fuel vapours and raw fuel leaking from the underside of the aircraft and quickly ordered immediate engine shutdown to prevent a potential fire. Subsequent investigation revealed a fuel leak in the afterburner fuel sensing ferrule connection.

It is evident that Cpl Wenningers conscientious and professional approach to his job was instrumental in the discovery of this aircraft fuel leak. Furthermore, on initiating immediate shutdown of the aircraft engines, this NCO averted a potential fire condition and possible serious aircraft damage; thereby contributing in a positive manner to our Flight Safety programme.

CPL M.K. HANSEN

While performing an aero engine DI on a CH147 Chinook helicopter Cpl Hansen noticed what appeared to be either a mark or crack on the outboard flex coupling of the Number Two engine drive shaft. On closer inspection with a strong light and a 5 power glass it was confirmed that the flex coupling was indeed cracked.

The crack extended from a bolt hole to the outer edge of the coupling. Rust and corrosion were also found on the coupling around each of the bolts. This is an extremely difficult area to inspect properly and exemplifies Cpl Hansen's diligence and devotion to duty in discovering this hazardous discrepancy with the "naked eye". As an interesting note, the DI has since been amended to include the use of a 5 power glass rather than the "naked eye" to inspect this area.

The flex coupling in question connects the engine output drive to the mixing transmission. Failure of this component during flight would constitute an extreme emergency situation amplified by the very inhospitable terrain (Central Alaska) that the aircraft was operating in. The results could very well have been disastrous.

MCPL Y. PARE

While performing a daily inspection check on a helicopter for a ferry flight to Bagotville, MCpl Paré noticed a ½ inch crack on the lower part of the transmission fifth mount support beam.

The helicopter was declared unserviceable. It had flown seven hours since the last inspection cycle. The crack was found through meticulous inspection since it is not readily accessible and is not a normal part of a daily inspection. Furthermore, this check was carried out in adverse weather conditions with winds gusting to 70 kmh.

Cpl C.J. Allain

MCpl Y. Pare

Sgt. W.H. Marsh

A subsequent detailed investigation revealed another crack on the same beam which necessitated a transmission mount support beam change at Bristol before the aircraft could be ferried to Bagotville.

MCpl Paré's dedication to duty and thoroughness of inspection prevented a possible in flight engine break up and possible serious accident.

CPL C.J. ALLAIN

Cpl Allain was carrying out a Last Chance inspection on Voodoo CF 101050 in preparation for a test flight when he spotted oil on the starboard engine cowling. Even though oil in this area is not unusual, Cpl Allain decided not to take a chance and signalled the pilot to shut down the aircraft. When a preliminary investigation did not reveal the source of the oil, he had an engine run-up carried out. It was discovered that the oil scavenge filter bowl was leaking. The "O" ring had ruptured and, in all probability, complete loss of oil could have occurred had the flight taken place.

Through his alertness and sense of responsibility in keeping with his highly professional attitude, Cpl Allain averted the likelihood of a most serious in-flight situation in recognition of which he is awarded this Good Show.

SGT W.H. MARSH

After take-off from a partially slush covered runway at Killaloe in a Hercules aircraft the gear was raised and lowered twice in accordance with standard operating procedures, to attempt to clear the slush accumulation. On the second selection to the down position the gear indicators showed unsafe. Prior to any further selections, a visual check was made of the nose wheel area and the nose wheel was down but only at an approximate 45 degree angle. The aircraft was levelled off at 4,000 feet and proceeded directly to Trenton at low transit speed so as not to create any further structural damage to the doors.

On arrival overhead Trenton, after much checking and re-checking of applicable emergency procedures, further gear selections were made. Sergeant Marsh was able to see that the aft nose gear door would go down but not shift to the rear and thereby prevented the nose gear from extending forward to the down position. Several attempts were made to force a wooden handle between the gear door and the frame with no success. A further attempt was made utilizing a steel bar to pry the aft door rearwards. As soon as Sgt Marsh was able to put pressure on the correct point, the nose gear extended properly and locked down safe.

The personal efforts of Sgt Marsh to work in an extremely confined area were outstanding. This is a case where the book failed to provide the right answer – only innovation and logical thought saved an expensive aircraft from very probable extensive damage and possibly lives.

LT G. CLIFFORD AND SGT S. HEMENS

During the evening of 9 Feb 76 Lt Garry Clifford and Sgt Stan Hemens were successful in guiding the pilot of a disoriented Cherokee aircraft to a safe landing at CFB Cold Lake.

The pilot enroute to Edmonton from Saskatoon on a VFR flight had encountered deteriorating weather and became disoriented. Vermilion aeradio attempted to render assistance but the pilot found himself flying into worse weather.

Edmonton ACC determined Cold Lake had better weather and the supervisor alerted Lt Clifford, the duty terminal controller requesting his assistance. Lt Clifford and Sgt Hemens, the radar controller, instantly responded to the call employing radar and the VHF Direction Finder (DF), to locate the aircraft. Direct communications with the pilot could not be established immediately but messages were relayed through Edmonton ACC and an IFR flight overhead; these included a heading as indicated on the DF.

After several minutes of communications difficulties direct pilot/controller contact was established. Lt Clifford determined the pilot had fuel for less than one hour of flying, and was not fully familiar with the aircraft; he directed the pilot to select an economical cruise and follow the steers provided. Shortly thereafter radar contact was established and the aircraft was positively identified.

Radar guidance was provided to give the pilot the shortest route to the closest runway. Aerodrome lights were turned to full intensity to aid the pilot in locating the airfield visually.

About 5 miles from touchdown the pilot reported his engine had failed from fuel starvation; after gliding for approximately 30 seconds he switched tanks and was able to do a powered approach and landing with the small amount of fuel remaining.

The prompt response by Lt Clifford and Sgt Hemens together with the precise guidance given to the pilot undoubtedly saved what appeared until the very last moment a forced landing at night.

CAPT J.G. BEAULIEU

On the 13 Apr 75 Capt Beaulieu departed Downsview destined for Trenton to conduct an IRT renewal on Capt Purdy in CSR 123/3691. Consequently Capt Beaulieu was occupying the right hand seat and Capt Purdy was in the left hand seat. The only other occupant on board was LCol Foy.

Just prior to reaching the assigned IFR altitude of 3000' the engine started to malfunction. The aircraft was over a heavily populated built-up area of Metro Toronto at the time and Capt Beaulieu instructed Capt Purdy to turn north away from the built-up area. Capt Beaulieu simultaneously advised civil Air Traffic Control Agencies of the emergency and his intended actions, while nursing the engine on, despite a loud banging, to obtain sufficient power to clear the built-up area and ensure a safe landing in a plowed field. Once a safe landing was assured Capt Beaulieu carried out the in-flight engine shut-down procedure. Toronto Terminal Control authorities were able to track the aircraft on radar and pinpoint the site of the emergency landing. Because the aircraft was only equipped with single brakes Capt Beaulieu elected to permit the left seat occupant, Capt Purdy, to fly and land the aircraft.

The high degree of crew co-operation, knowledge of emergency procedures, excellent degree of airmanship and flying skill of both these pilots resulted in not only the safe recovery of a CF aircraft but also averted the potential disaster had the aircraft forced landed in the built-up area.

CPL G.A. COSTIN

While carrying out an independent check on a CH-118 "Huey" helicopter transmission installation, Cpl Costin, a Flight Engineer with CFB Chatham's Base Rescue Flight, noticed that a fuel line was touching the rear bulkhead in the cargo suspension area. He decided to investigate further. When the line was removed, it was found to be worn and chafed. Had the damaged line not been noticed, a fuel leak would have developed resulting in a possible in-flight emergency.

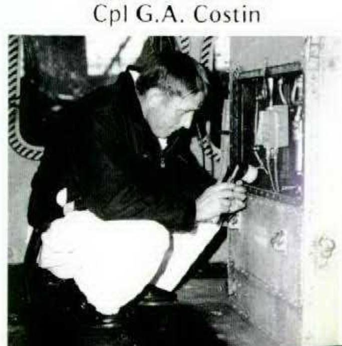
Cpl Costin's alertness and thorough investigation revealed a serious defect applicable to all CH-118 aircraft. This Base reported Cpl Costin's findings to higher Headquarters. As a result, a Special Inspection of all units' CH-118s was ordered to ensure that other aircraft in the fleet do not contain the same potential hazard. Cpl Costin's diligence has ensured a safer flying operation at CFB Chatham as well as at other units in the Canadian Forces.

For his exceptional knowledge of his aircraft's systems, his diligence and initiative in investigating what proved to be a potential dangerous hazard.

Lt G. Clifford
Sgt S. Hemens

Capt J.G. Beaulieu

Cpl G.A. Costin



CPL A.A. McFADDEN

On the 27 Mar 75, Cpl McFadden was assigned to perform a No. 3 Periodic Inspection on Tutor Aircraft 114189. During this inspection he found the main battery cable insulation to be worn and chaffed where the wire goes through a metal bulkhead.

Although the survey calls for a visual inspection of the wiring in this area, the damage could not be detected by a visual check, and only by unscrewing and lowering the battery cable clamp bracket, was he able to detect this dangerous situation.

The battery cables have no safety devices such as fuses or circuit breakers to protect the circuit. Considering the current capacity of the nickel cadmium batteries in the Tutor Aircraft, the results could have been disasterous had the battery cables shorted to the airframe.

Cpl McFadden's further investigation on the Tutor Aircraft in Repair revealed the same unserviceable condition and a Special Investigation was drafted which resulted in finding over 90% of the Tutor fleet at CFB Moose Jaw defective.

Cpl McFadden's vigilance and meticulous attention during the inspection prevented possible in-flight incidents and revealed a serious defect which was repaired before further damage could occur.

PTE D.M. KNOCKLEBY

While performing start crew duties at 1 AFMS on a CH135 helicopter Pte Knockleby observed what he believed to be excessive movement of the tail fin whip antenna during the ground run. On completion of the ground run he carried out a close inspection of the antenna mount fairing and discovered that the mount was loose. Further inspection in conjunction with his supervisor revealed a cracked front antenna attachment bracket. A local SI was performed on similar aircraft which resulted in the detection of one additional cracked bracket. These brackets are not a normal inspection item and are shrouded from view by the antenna mount.

Due to Pte Knockleby's keen perception of an unusual condition and his conscientious follow up action a serious problem was averted. Had the cracked brackets gone undetected the possibility exists that the antenna could have broken free from the aircraft with the resultant loss of FM communications and a possible tail rotor blade strike from the departing antenna.

CAPT B.H. RUTHERFORD

Capt Rutherford was preparing to depart on a student training trip and was in the process of completing a normal walk around of his aircraft when he decided to go back and have a look at the speed brake area because of a nagging doubt that something was amiss. On a second intensive look Capt Rutherford found a double open end wrench lying between the hydraulic lines and the flight control cables. The position of the wrench with only a small portion showing made it particularly difficult to see. On inspection, it was obvious that this wrench had been lodged in the aircraft for some time prior to being discovered.

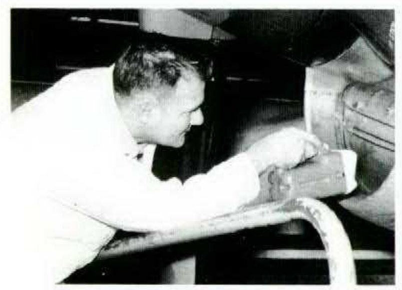
Had the wrench gone undetected it could conceivably have caused a jamming of the control cables or a rupture of the hydraulic lines or both, the consequence of which could have been the loss of a valuable aircraft.

Capt Rutherford's attention to detail and his persistence in returning for a second look eliminated a flight safety hazard, that could have led to loss of life and or valuable resources.

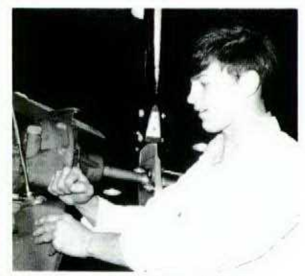
CPL E.J. CARRIERE

While carrying out a "B" check on Hercules 130317 at night in high winds and below freezing temperatures Corporal Carriere noticed something that in his own words "didn't seem quite right" in the intake of number four engine. He persisted in making a more thorough inspection and still not satisfied, he requested that his supervisor assess the situation. The supervisor, on examination, determined that the piano hinges on the torque shaft anti-ice cowl duct had worn through allowing the hinge pin to come adrift, damaging the corner of the cowl duct shroud. The nature and extent of the damage to the shroud indicates that this dangerous condition had gone undetected for a protracted period. If this situation had been allowed to continue, the engine would have undoubtedly ingested parts of the shroud and possibly the piano wire hinge pin causing extensive and costly damage to the engine.

Cpl Carriere's discovery of this hazardous situation is a creditable example of attention to detail in spite of inclement conditions. His action in detecting and eliminating this serious flight safety hazard is a significant contribution to the flight safety programme.



Cpl E.J. Carriere



Pte D.M. Knockleby

Cpl A.A. McFadden

Capt B.H. Rutherford

MCPL A.G. LEBLANC

While participating in Exercise Northern Ranger, 422 Squadrons Supplemental Checks and Special Inspections were being carried out at CFS Gander. In each case, when such a check or inspection was required, a partial crew of one pilot and one flight engineer would transport the appropriate technicians to Gander from the exercise area and wait for the repair to be completed then returned to the exercise.

On 9 Feb 77, MCpl Leblanc, who is an Instrument and Electrical Technician, offered to assist the required leak check on start-up. While doing so, he noticed a difference in the engine oil which is visible through a sight gauge. Although there were no leaks and the engines were running smoothly, he brought this discrepancy to the attention of the Flight Engineer, who upon further inspection confirmed that the engine oil was contaminated.

Due to MCpl Leblanc's alertness in an area not normal to his trade, he averted possible damage to a valuable piece of equipment which in turn could have resulted in an emergency situation.

CPL J.F. ROCHESTER

CPL Rochester, an Airframe Technician, was carrying out an "A" check on a CC109 aircraft which had just returned from a flight. After completing the usual inspection of the wheel well area, he decided to give the surrounding area a very thorough check. He discovered a crack approximately 4 inches long on the support assembly of the inboard flap track.

The cause of this crack is still being investigated and a special inspection was called up to check the other aircraft. Several cracks in the wheel wells of other aircraft have subsequently been discovered and can be attributed to the initial discovery by CPL Rochester.

CPL Rochester's initiative and alertness have revealed a dangerous situation and have allowed repair action to be initiated before an accident occurred.

CPL R.C. MAIN

During startup on an Argus aircraft, Cpl Main thought he saw moisture in the area of the left main bogie. Anyone familiar with the "flying oil stain" will realize that moisture, and oil are an integral part of an Argus flight line. In spite of this and the foul weather, Cpl Main investigated further and discovered a small hydraulic leak where a hydraulic line joins the gear retraction cylinder. Cpl Main immediately advised the crew and on attempting to tighten the connection the leak became much worse. Closer investigation revealed the thread to be stripped. If this aircraft had gone flying the line would have undoubtedly let go, causing complete loss of hydraulic fluid and a serious in-flight emergency. There is no doubt that Cpl Main's alertness and extra effort prevented a critical airborne emergency.

MCPL B.R. GILLIES

While performing ramp and hatch functional checks on a Chinook helicopter on periodic inspection, MCpl Gillies and MCpl Beadle found that the sequence rod assembly was bent, therefore not striking the striker pad. This, in turn, did not give the proper sequence for the hatch operation.

Through their trade and aircraft systems knowledge, they deduced that the striker pad was installed 180 degrees out of position. When it was repositioned and tests carried out their theory was confirmed.

If this situation had been allowed to continue it is possible that damage to the aft end of the aircraft would occur through out of sequence operation of the ramp and door.

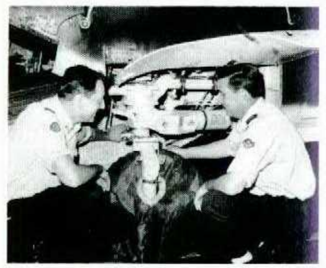
Subsequent investigation revealed that the problem was present on all CH147 aircraft, and the manufacturer has acknowledged that the striker pad had indeed been installed backwards.


Cpl J.F. Rochester


Cpl R.C. Main


MCpl A.G. Leblanc


Cpl A.G. Gabriel


MCpl B.R. Gillies

Master Corporal Gillies is to be commended for his professionalism in discovering this hazardous situation and preventing damage to a valuable aircraft.

CPL A.G. GABRIEL

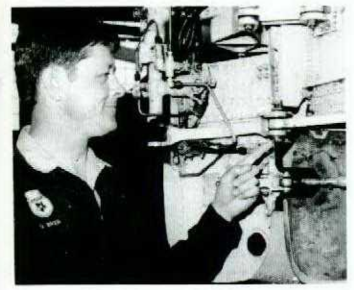
Cpl Gabriel is an IE Tech at CFB Trenton. While carrying out a No. 3 Periodic Check on a Hercules aircraft power plant in the engine shop, Cpl Gabriel noticed what appeared to be an irregularity on a power lever cable. He summoned an AE Tech who dismantled the control assembly and found five out of the seven strands of the cable broken off at a swaged fitting.

This cable assembly does not require inspection on a No. 3 check and would probably have remained undetected due to its obscure position and the fact that the broken area was located in the groove of a pulley. In-flight failure of the cable assembly would have resulted in engine shut-down and would possibly have caused an emergency situation.

Cpl Gabriel displayed a high degree of initiative in observing and reporting an unusual condition on a system outside his own trade responsibility.

CPL E. BUTLER

Cpl Butler was employed on a Snowbird Recovery operation to install "vespel" engine compressor bleed valves on a Tutor. Before installing the new bleed valves on the engine, Cpl Butler checked them for freedom of movement. Both valves functioned serviceable, but when one valve was inverted and checked functionally, it jammed in the closed position.


MCpl B.J. O'Brien


Cpl E. Butler


Cpl J.W. Adams


Cpl J.J. Majore

Further investigation after valve disassembly revealed a roller was situated out of place and was causing the valve to bind while inverted.

Had this alert and dedicated tech not gone beyond what is normally called for, the engine would have performed serviceable on run-up, but when the aircraft was performing inverted during an Airshow, the engine would have certainly stalled.

Cpl Butler's astute observation and his thoroughness in following up his discovery, revealed a technical problem that would have had serious consequences. His attention and high degree of alertness averted a serious in-flight incident.

CPL J.W. ADAMS

While completing a Tutor seat anti-G hose installation, Cpl Adams discovered that the canopy ballistic connection to the female portion of the quick disconnect block had become separated.

Further investigation revealed that the two body halves of the female part had become disconnected.

Since a spring normally conceals these body halves, it is almost impossible to visually detect any threads that might be exposed as a result of the halves backing off.

A Special Inspection was carried out on all Tutor aircraft resulting in the detection of another three unserviceable emergency egress systems.

MCPL B.J. O'BRIEN

Master Corporal O'Brien was the working supervisor carrying out a Number One Supplementary Inspection on Sea King 12426. While performing a routine lubrication of the tail pylon he noticed that the bowser pylon hing bolt was not flush with the upper edge of the tail hinge bushing. MCpl O'Brien's first impression was that an incorrect bolt had been installed and he therefore attempted to replace it with the correct bolt. However, during removal of the bolt it was discovered that the bolt had in fact sheared into two parts, the upper part having worked its way partially out of the upper half of the hinge assembly.

A special inspection of this bolt assembly was initiated throughout the Sea King fleet and although no further broken bolts were found, a number of bolts were discovered suffering from varying degrees of deterioration due to pitting and corrosion which necessitated their replacement. Further action is now being taken to increase the inspection periodicity to prevent a re-occurrence of this situation.

Master Corporal O'Brien's initiative and professionalism resulted in the discovery of a very serious fault and eliminated the potential for an in-flight emergency.

CPL J.J. MAJORE

During the acceptance check of Tutor aircraft 114047 on 28 Mar 77, Cpl Majore discovered that the check valve was installed in the inverted position and above the Tee fitting leading to the catapult on both ejection seats. This condition made both seats inoperative for ejection because the flow of gas would have been prevented from igniting the seat catapult.

Acceptance checks only require the Safety Systems technicians to check hoses and valves for condition and security. Further, the SS Tech must know from experience what the correct installation of the valve is, as there is no up-to-date reference material or drawings in the technical orders.

Cpl Majore is to be commended. Through his professional attitude and job knowledge, a faulty installation, with which the aircraft could have flown for a further 300 hours with inoperative seats or longer if the fault was missed again, was detected and corrected preventing possible loss of life should the use of the ejection seats ever have been required. ■

FLIGHT SAFETY

...and the Low-Time Pilot

by **Don Broadfoot** *Royal Canadian Air Cadets*

To those of you who have recently been awarded your pilot's wings I say "Well Done!" In July of 1976 I graduated from the air cadet flying scholarship program with civilian private pilot privileges. One year earlier I had received my glider pilot's licence in the Cadet gliding program. I would like to share with you some of the things I have learned over the past 80 hours of flying as they relate to flight safety and the low-time pilot.

The pilot is part of a complex system which involves many risks. As long as risks are present the possibilities of having accidents are high. The idea of the exercise is to eliminate as many risks as possible thereby decrease the possibility of having an accident. It is a very difficult matter to eliminate risks if we do not know the risks that can exist. This is the basic problem with low-time pilots. It is impossible for even the most experienced pilot to consider everything that can go wrong but at least he can draw on his experience in recognizing potential hazards. The low-time pilot, on the other hand, has had very little time to be exposed to the many hazards which can be associated with flying.

The best source of information on hazards of flying which I have found are aviation publications such as Flight Comment and the MOT Publication the Aviation Safety Letter. The "Letter" is available to licenced pilots and explores the causes of aircraft accidents, incidents and hazards of flying. It contains many helpful hints to the pilot as well as general aviation information. Flight Comment and the "Letter" are excellent opportunities for low-time pilots to learn from the experience and mistakes of others. Remember, you'll never live long enough to make all the mistakes yourself.

Air cadet pilots for the most part, fly at commercial flying schools. These operators keep their equipment in quite good condition considering that commercial operators are in the business to make money. Funds are allocated for repairs and checks but with perhaps 8-10 different pilots flying the same aircraft each day it is difficult to determine how the aircraft have been treated. Problems can crop up out of the blue and an unalert pilot can find himself in a sticky situation if the last pilot has badly mistreated the aircraft. The best way to be sure you don't get into trouble is to do a thorough walk around on the aircraft. The best way to do a complete walk around is to look at everything! Take your time and check every possibility. If you find the smallest defect in the aircraft, report it! In this way you can find out when the defect was caused. If no one knows when or why, it is possible that the problem occured on the last flight because the last pilot mistreated the aircraft. In this case it is possible that the problem could be aggravated by you flying the aircraft and perhaps it should stay in the hangar. If the defect does not pose operational hazards to the aircraft, it is a good idea to report it anyway before the problem becomes a big one. This lets the mechanics correct the problem right away instead of it coming in for inspection with major repair bills resulting. This is also a good way to keep popular with the owners.

One clear Saturday morning, I wandered out to the Cessna 172 that I was supposed to fly. On my walk around I found five loose cowl screws and a large crack in each of the plastic winterization baffles in the air intakes ahead of the engine. On closer examination I found that the cracks were propagating towards one of three mounting pins on each baffle. My imagination ran wild. I pictured myself on a steep final approach to a snowy field in sub zero weather with a large piece of plastic in my carburetor. I immediately cancelled the flight. I reported the defects to the owner hoping he would ground the aircraft. He wouldn't. (An aircraft on the ground does not make money.) He took the keys from me and handed them to another pilot who wanted to fly on a long distance cross country. I advised him of the difficulties but it did not seem to bother him too much. I wished him luck and he left. Fortunately he did not become a statistic but the added risks were there and the possibility of an accident was high. I knew I had done everything I could by reporting the defect but I still wonder what defect he will overlook in the future that will be the fatal one. If it doesn't look right, report it!

If one day you happen to arrive on the runway in a series of bumps and grinds, instead of one of your usual "greasers" it is wise to report that too. Landing gear struts badly over stressed on hard landings could spoil some other pilot's day! If you botch it up, admit it. It's only fair to the next person who has to fly the aircraft.

Since most low-time pilots do not possess instrument ratings, perhaps a word should be said about weather. The preflight check should begin when you get out of bed in the morning. Call the weather office and get the current weather forecast. Call just before flight time and get the same thing. Compare the present weather with the forecast and see if the Weatherman is accurate – sometimes they are not. When you get in the cockpit compare this with the ATIS broadcast if it is available at your airport.

It's always nice to hear the Met man say CAVOK but look at other things besides ceiling and visibility. How about the surface winds and upper winds? Can you handle the shear that is present? Where can you expect carb ice? Most low-time pilots do not take these things into consideration. I would hazard a guess that many low-time pilots listen to the local disc-jockey to get weather reports for flying. "It's clear today, Man. No sweat!"

When you come down to the decision of whether to go or not it is a good idea to pick you own minima (above those of MOT of course!) You should be able to handle flying in these minima and you should be comfortable with them. This saves time in preparation and you either fly away knowing you can handle whatever Mother nature can throw at you, or you can drive home knowing you made the right decision. For me, anything below 3000 and 8 is not a very nice day to fly anyway. I would just as soon stay in bed.

Now that you have determined that you are going to go you climb into your machine and takeoff towards your destination. You are armed with map in one hand and forecast in the other. It is a good idea to check with the nearest aeradio station for weather updates. Just because your forecast says it should be CAVU all the way along doesn't mean that you can't run into bad weather. Many low-time pilots end their careers flying into deteriorating weather. If this happens you can do one of three things. You can press on and the only thing you have going for you is luck. You can divert but who knows how wide spread an unreported weather system can be? The smartest thing you can do is to go home. You know what the weather is like there. The guy who turns back is going to be alive tomorrow to be chicken again!

On my first solo cross country I ran into some low weather that was not reported and turned back. Another pilot took the aircraft for the same route and ended up diverting several times and arriving several hours late on minimum fuel. He spent the night at his destination waiting for weather to clear. He was lucky. I was safe.

Some pilots are in the habit of memorizing check lists. This is a very unhealthy practice which could lead to dangerous situations.

One day during my flying course I was waiting for my flight to come up. I was passing the time reading an accident investigation report. It dealt with a pilot who had memorized his check list. In doing his takeoff check he forgot to set his propellor to fine pitch. On takeoff he ran off the end of the runway and struck a fence causing damage to the aircraft and embarrassment to the pilot. After reading this report I went out to the flight line, checked my aircraft and awaited the arrival of my instructor. We boarded the aircraft and I drew my starting checklist. The instructor grabbed the list and said I should have memorized it by now and to do all of the checks without the aid of a list. I arrived at the runway thinking I had done everything correctly. I applied full power and began to accelerate. When I reached takeoff speed I hauled back on the stick. It took quite a haul and it should have with trim set full nose heavy! I trimmed back and requested my checklist which my instructor handed over without comment. Pilots forget things and a low-time pilot with his mind on what may seem a multitude of things can easily forget an item.

A dangerous situation can exist if a pilot changes types of aircraft. I have recently changed from a high wing Cessna 172 to a low wing Grumman Tiger. The added items on the latter type such as fuel pumps could, if forgotten, cause serious trouble. The best idea is to develop and use a written checklist. It should be easy to use and you should consider the layout of the cockpit and your personal habits when you make up the list. Have one checklist for each type you fly and use it every time you are in the cockpit.

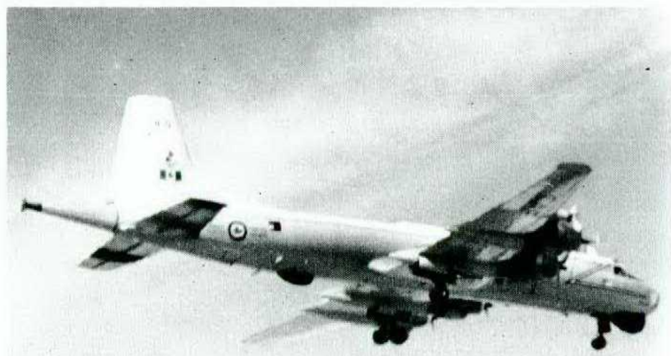
I would like to say a word to instructors. I ran into one instructor who insisted on doing spins at 700 feet AGL, pushing the aircraft, in this case a glider past it's operational limits, and doing aerobatics at low altitude. I would not recommend these practices to anyone but my point is this: students are influenced a great deal by the actions of their instructors. It is likely that a student could attempt such a maneuver and not recover. You can pass your knowledge on to your students but pass your common sense as well. A note to students on this: If it does not look safe – ask!

For those of you glider pilots who are about to become power pilots I would like to give you some advice. Flying a powered aircraft is a little more than flying a glider with a throttle in your spare mitt! It is a whole new environment. The best way to learn to fly a powered aircraft is to forget you have ever flown a glider. In this way you only need learn what you would have been taught anyway and you can look at everything from a power pilot's standpoint. After you become competent as a power pilot you will probably see that the two types of flying are quite different.

The air cadet pilot has an advantage over the civilian private pilot in that he has had the benefit of military training which supplies him with the self-discipline which is required in flying today. This leads to the development of safety habits which stay with a pilot throughout his flying career.

To those of you who are taking advantage of this excellent training I say welcome aboard and have a long, SAFE flying career.

ARGUS GEAR FAILURE



Start of right yaw manoeuvre.

Two seconds after.

SITUATION: Nosewheel and left main wheel down and indicating safe, right main wheel hanging about half-way extended. No main hydraulic pressure.

Various manoeuvres were tried in attempt to force the right main wheel to lock down. Yaws were found to be the most effective manoeuvre. However, yaws alone were not enough to force the right bogie far enough forward to engage the down lock.

With 15° flap, 2,600 RPM and an indicated airspeed of 130K, a series of wings level (or nearly level) yaws were initiated. When the maximum attainable amount of yaw was reached, quite a pronounced swinging arc was produced on the right main bogie. The pilot was using full left and right rudder and an observing aircraft estimated the degree of yaw to be 30° either side of centre. When the nose yawed to left, the right wheel would swing back and up towards the nacelle, and when the nose yawed to right the wheel would swing down and forward toward the locked position.

On one series of yaws, just after the pilot applied full right rudder and the right main wheel started its downward swing, the pilot rolled the right wing down approximately 20° and then pulled back sharply on the control column. This caused the right main wheel to swing far enough forward to engage the down lock.

Throughout the whole sequence a crew member was positioned at the starboard beam lookout position to inform the pilot as to the movement of the right bogie.

Fortunately, Major Field was able to get the gear to lock down by his experimentation and persistence in the yaw manoeuvres. His determination and diligence in so doing saved an Argus aircraft from serious damage and probably the crew from injury.

One additional parameter that was considered (but not mentioned in his safety comment) was to reduce the airflow upon the hanging gear to minimum. Two approaches were attempted during the incident:

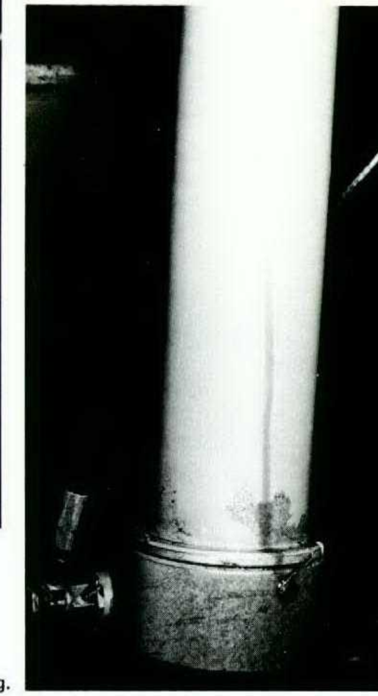
a. feathering of No. 3 prop; and
b. simulated feathering of No. 3 prop.

In hindsight the manual control of No. 3 prop to full fine with throttle retarded would probably have afforded the most blanking effect of slipstream over the starboard bogie.

But what if he was unable to get the bogie down? What then?

- unlock downlocks and let gear trail and force land?
- leave gear as is and force land?
- force land on runway or on snow covered infield?
- transfer fuel to left side and attempt to hold aircraft up on nosegear and port mainwheels on runway as long as possible?
- feather props on landing?
- leave props turning?
- activate T bars on touchdown?

Split on actuator before cleaning.



Split on actuator after cleaning.

VU32-3,370 days of accident free operations

On the 27 Apr 77 Utility Squadron 32 had completed 3,370 days (9.2 years) of accident free operations. During this period the squadron has logged over 35,000 hours and operated several types of aircraft. The T-33 "Silver Star" has been used throughout and is still the workhorse conducting fleet support duties; the CS2F Tracker was used for OTU pilot training until 1972 while its passenger version the COD (Carrier Onboard Delivery) aircraft conducted communications and passenger flights between HMCS BONAVENTURE and ashore until "BONNIE" was decommissioned; the C-47 Dakota was utilized as a transport aircraft until retired from service in 1974; and the CH 135 Twin Huey arrived in 1972 to be employed in helicopter fleet support, utility transport and search and rescue duties.

Pictured in front of the sign commemorating this accomplishment are (left to right) Lt Yvan Bourdeau (UFSO), Maj Al Hawthorne (CO VU 32), Col Larry Ashley (BCOMD), and Col R.D. Schultz (Director of Flight Safety).

AVIATION CHARACTER an essential ingredient

by Lt Col John W. Ray Supervising Editor/The Mac Flyer

If someone were to ask you what you consider the single most important trait of a pilot, what would your answer be?

This question is predicated on pilots – or airline captains or aircraft commanders, if you prefer – being fully qualified and possessing whatever level of experience you believe is desirable.

Would your answer be "self-discipline" or "leadership" or, perhaps, simply "integrity?" If you're among those who feel integrity tops the list, you're edging close to one of the most essential, though often overlooked, aspects of aircrew qualification.

Our answer, as the title to this article implies, is "character.' A legitimate question is whether character in airmanship is really more crucial than integrity and whether or not the terms mean the same thing. Semantics notwithstanding, there is a difference which could prove significant.

If you're a critical reader, you've probably observed by now that some of the questions are phrased in a manner that will allow a definite distinction between "character" and "integrity." This was no accident.

Most of you have been well versed, either at home, school, or after entering service, in the reasons for and definition of integrity. To refresh your memory, integrity is the quality or state of being of sound moral principle; it means uprightness, honesty, and sincerity. Integrity is important.

Yet, compare this with character – "moral strength, self-discipline, fortitude." All strong, active words. Character is integrity, plus. It is self-discipline, plus. And it implies a strength that integrity alone cannot match. This is why character may be the single most important trait for all aircrewmen.

Pilots and their crews toil in an environment in which life-or-death decisions must be made with frequency unequaled in most professions. And not all of these decisions are related to mechanical malfunctions of aircraft. If they were, then character would not play such an important role in aviation. Because pilots and crews must not only react procedurally to emergencies, but make crucial decisions as well, the juggernaut forces of "self-discipline, fortitude, and moral strength" often work together to head off critical problems before they arise.

Character Assurance

Gerard M. Bruggink, of the National Transportation Safety Board, has become so concerned with pilot character that he suggests research to determine the feasibility of a "character assurance" program. In a paper entitled "Human Error Accidents and Character Assurance," he links individual integrity, self-discipline, moral fibre, and innate intelligence in defining the desired pilot character.

Mr. Bruggink says that all practical means to assure top quality equipment and training for flight safety have already been exhausted. Now, he says, expertise should be directed toward assuring the quality of pilot character.

He points out that while flying accident rates have taken a nosedive in the past 25 years, the percentage of accidents attributed to operator error has remained about the same. Air Force accident statistics over the years tend to support his contention that while the reliability of aircraft has reached an unprecedented high level, pilot reliability has not risen accordingly.

There may be some disagreement as to the complete applicability of Mr. Bruggink's theory to the Air Force operation, but there can be little doubt that character plays a major role in accident potential. Judgment decisions very often reflect a person's character, and making decisions is what flying is all about.

Defining Aviation Character

While the dictionary clearly spells out the meaning of "character," the term "aviation character" is easier to discuss than to define. Who among us possesses it and who doesn't? How many have ever considered aviation character deficiency a cause factor in an accident?

Character and attitude are interrelated, and it has been evident for many years that attitude often plays a key role in accidents. In an article appearing in *Approach* magazine, published by the U.S. Naval Safety Center, Dr. Robert A. Alkov writes about a U.S. Navy study of pilot-error accidents during 1975 and 1976. A composite profile of the pilots involved in a dozen accidents during this time reveals an individual who is "resentful of authority, which he feels put unfair restrictions upon his superior performance." This pilot also acts out the role of the "hot" pilot seen in movies, novels and television. According to the article, "His model is a fictional, feisty character out of an old John Wayne movie. He sees himself as an overly aggressive barroom brawler and a two-fisted drinker." Dr. Alkov says that a commonality in the cases were characteristics of excess aggressiveness coupled with immaturity or impulsivity.

The Navy study concentrates primarily on the personality and psychological aspects of fliers, but there are definite overtones toward what may be referred to as deficiencies in aviation character.

Most of us have had our aviation character tested in one way or other. In our earlier years we may have debated whether or not to follow the leader (or our own urge) and fly under a bridge, buzz a locomotive, cattle, coyotes, or an unsuspecting farmer. Remember how, during primary or basic training, some of the students "cut out" their buddies in the traffic pattern by employing manoeuvers that today could best be described as near-misses?

Later, the challenge of character became more sophisticated: deciding whether or not to divert to an alternate when the weather was at or below minimums at the best RON base in the country; deciding whether or not to declare an emergency for a squirrelly malfunction that two previous crews didn't consider important enough to write up; coping with the prospect of backing down from what appeared to be one of your better decisions – after events proved it wrong.

And there are subtle character challenges that we face more frequently. Should I really bone up on that strange aircraft system? After all, tomorrow's flight will be strictly routine; the trip has been long and tiring, so why should I punish myself further by trying to stay alert? Or, there may not be enough room to taxi in that congested area, but my only alternative is to shut down on the taxi-way, and operations wouldn't like that. Perhaps there is enough room, after all.

As much as anything, aviation character is the triumph of humility and common sense over arrogance and overconfidence.

When It Isn't There

Obviously, not all aircraft mishaps are due to a lack of character. There are such things as *honest* mistakes that have nothing to do with character. But too often character deficiency plays a part in accidents that should never occur or, having occurred, would have had much less impact with a show of character by the crews involved.

Most of us have either known, or heard of, an instructor or flight examiner – both are supposed to set good examples – who had an accident while intentionally violating regulations or directives. Fortunately, such cases are rare. But they do occur. In one such occurrence a few years ago, three FAA officials were charged by the National Transportation Safety Board with flagrant disregard for prescribed procedures and safe operating procedures after a nonfatal crash. Investigators found that the pilot-in-command was not at the controls and the pilot in the left seat was not even type-rated for the aircraft. The right seater was the only one of the three who was legally occupying a crew position when the plane crashed on takeoff. Aviation character?

You may recall the incident in which a number of passengers and cabin attendants were injured when a foreign airliner ran into turbulence at 33,000 feet while flying over the United States. The captain hadn't bothered to advise his passengers to fasten their seatbelts although the nearby thunderstorm was clearly in view, so all hell broke loose when the turbulence was encountered. Fifteen persons injured and a destination seven hours away. What did the captain do? Land and seek treatment for the injured? Wrong. He flew to his original destination in Europe! Lack of character manifests itself in many ways.

An Expression of Qualities

While it may sound like a new term, aviation character is, in the final analysis, simply a phrase denoting certain desired crewmember qualities. You may have your own descriptive term for the same thing.

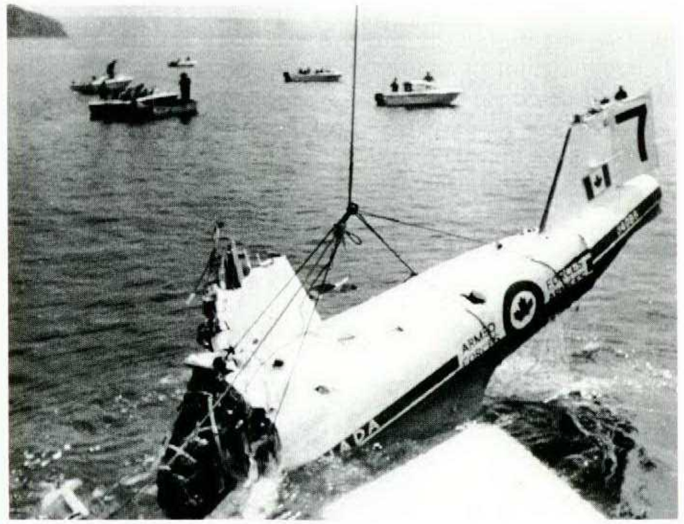
Most aircrewmembers possess aviation character. There are some who do not. Merely adknowledging its importance is not enough to ensure its existence within ourselves. A crewmember must be willing to develop – or reshape – himself to form character and this in itself requires a degree of mental discipline that some aircrewmembers may consider unnecessary and others find unacceptable.

Strong command leadership may assist in building aviation character but here again, leadership alone isn't enough. Aviation character can neither be decreed, bought, nor attained on short notice. It is made up of strong, basic, personal qualities that must be persistently nourished. If you don't have it, you can develop it. But no one else can do it for you.

courtesy The Mac Flyer

accident – SNOWBIRD MID-AIR

The Snowbirds were performing an airshow at Paine Field, Washington, USA when a mid-air collision occurred within the formation. During a formation change from "Arrow" to "Big Vic" near the end of the show, number four and number seven collided at approximately 1,400 feet above ground level. They were seen by lead to be tumbling, locked together. Both pilots ejected safely and were rescued from their dinghies by the US Coast Guard. The aircraft crashed in approximately 30 feet of water six miles west of Paine Field. The accident was a result of aircraft manoeuvering within the formation without visual contact — an unsatisfactory technique in the light of the results obtained.



an operational approach to FATIGUE

by Col R. W. Fassold, DCIEM

At a recent international aerospace medical meeting, a participant expressed his concern over fatigue levels in helicopter pilots who are supporting North Sea oil-drilling operations. Since he was in a position of legislative authority, he asked his expert colleagues what they would recommend as the maximum number of duty hours in this type of air operation. No one was willing to suggest a number, pointing out that there were too many variables involved for this to have any real meaning and that the duration of the flying day is only one, and often not the most important, in a long list of fatigue-causing factors. While any reasonable number is administratively useful, e.g. for scheduling purposes, it must be recognized that the figure is arbitrary, based to some extent on labor-management relationships and has little or no bearing on fatigue levels in a given situation. We must not be satisfied that a flying mission can be conducted safely, with regard to fatigue, simply because the prescribed maximum duration of duty will not be exceeded.

It is not fatigue per se that concerns us, but rather the known adverse effects of fatigue on human performance. There are few activities in today's society where individual human performance is as critical as it is in flying operations. Even with the present advanced technology, an exceptionally high degree of reliability is demanded of the human element in the man-machine complex; therefore, any human performance decrement, such as that caused by fatigue, can cause a breakdown in the control-loop and lead to catastrophe. Fatigue considerations should not be isolated from factors related to human performance decrements under the multiple-stress concept. Not only is fatigue one of the multiple-stress factors, but many of the other factors in this concept, e.g. minor illness, personal problems, heat stress, etc. are important, largely or entirely, because they induce fatigue.

Many studies have been conducted on both the biological effects of fatigue and its effects on human performance. When these data are considered collectively, we discover that what we all know intuitively is scientifically correct. Continuous performance of a task produces fatigue; humans do not perform as well when they are tired as when they are rested; the performance decrement is in proportion to the degree of fatigue; and, the cure for fatigue is proper rest! It is worth noting that certain of the adverse effects of fatigue are on aspects of performance that are critical in flying activities. For example, fatigue leads to uncharacteristic mistakes and errors which increase in proportion to the degree of fatigue; increased variability in performance; an acceptance of lower standards of accuracy and performance without an appreciation of doing so (can lead to sloppy flying and poor airmanship); a disintegration of the perceptual field, so that individual instrument readings are no longer integrated into an overall pattern; a narrowing of the attention range so that some instruments or tasks (particularly peripheral ones) are forgotten or ignored; and, a reduction in the quality of decision-making. Performance decrements such as these are not compatible with safe flying and their avoidance, therefore, should be regarded as an operational consideration.

The individual must assume the major responsibility for ensuring that fatigue does not jeopardize mission-safety within the time frame of maximum duty day regulations. It is suggested that pre-flight consideration of performance factors should include the human as well as the aircraft. As with aircraft weight and balance, take-off distance, etc. in some situations a very brief consideration of human performance may suffice to rule it out as a limiting factor. In tighter situations, where human performance could be a limiting factor, careful calculations may be required to determine if or how the mission can be undertaken safely.

Since there are no tables or graphs for human performance, how do we do fatigue calculations? The assessment must be subjective, but we do know that doing a task long enough without proper rest causes fatigue; fatigue results in a performance decrement proportional to the degree of fatigue; every flying mission has a demand-profile for human performance; and, the primary objective is to ensure the demands of the mission do not exceed the human performance response capability at any point in the mission. Using these relationships, a model can be developed on which any fatigue consideration can be based. The disadvantages of having to assess subjectively both the performance demands and the response capabilities is partially offset because it is the same assessor doing both and it is the relationship between the two that is of interest.

A graph of maximum available human performance during a task can be drawn from the relationships discussed (see Figure 1). The time scale and the slope and shape of the line will vary with the individual and the situation: however, in all cases point B will be lower than point A. Note that the line represents maximum **available** human performance output and not necessarily the actual output — which might be at a lower level, depending on the demands and other factors. For simplicity, the solid line has been drawn as a smooth curve although the shape probably is variable, at

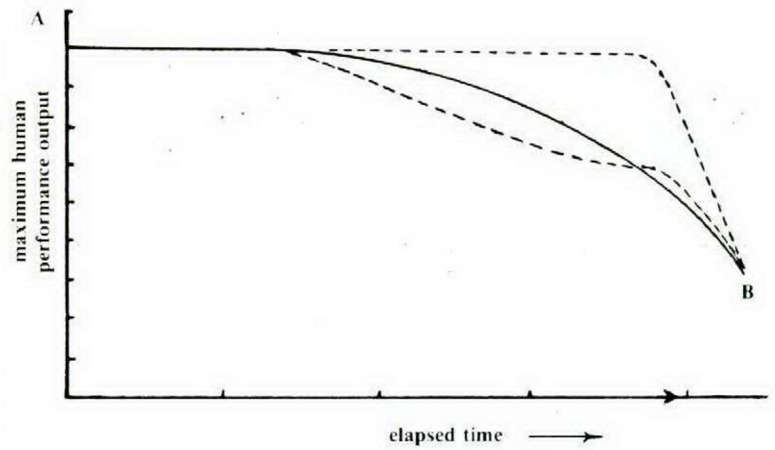


Figure 1

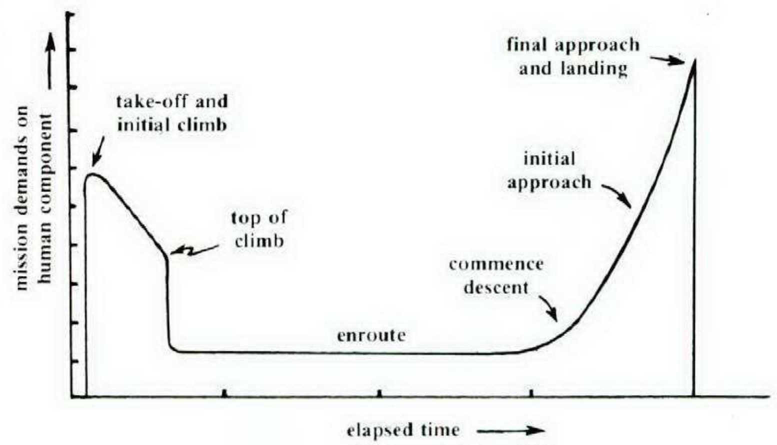


Figure 2

least between individuals. This is suggested by the dotted lines, and the configuration with the late precipitous drop may be the most hazardous.

As noted, our concern is whether the human performance available can meet the demands of the mission. We must therefore estimate the latter. This can be done graphically from an intimate knowledge of the mission. Figure 2 shows the demands that might be expected in a routine transport-type mission and can serve as a basis for developing other mission demand profiles. Many factors determine the shape of the line and it is the relationship between various points on the line, rather than the height of the line, that is important. A take-off and climb at maximum weight, on a hot day, in minimum IFR conditions and unstable air, probably puts more demands on the human component than would a light-weight take-off, in cool temperature, on a CAVU day, in stable air. The enroute demands in a transport mission are probably very low in comparison to

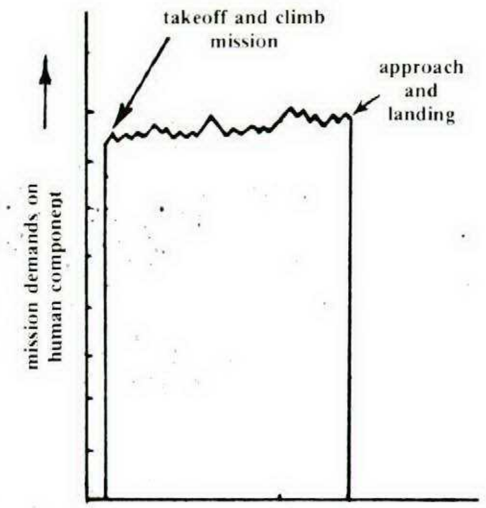


Figure 3

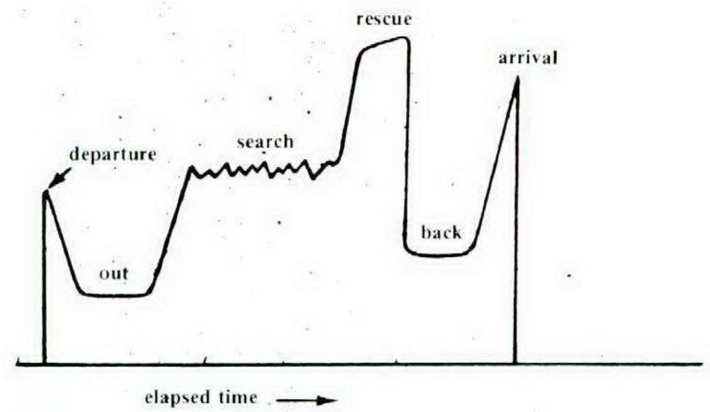


Figure 4

departure and arrival demands, provided the weather is good, there are no problems with the aircraft, and no hostile action. Given the same conditions, the demands on the human component are probably greater during the approach and landing phase than during the take-off and climb phase. The correctness of the general shape of the graph at Figure 2 may be partly verified by the fact that most transport aircraft accidents occur near the airport, with the majority occurring during the approach and landing phase.

Using this basic graph one can modify the shape to

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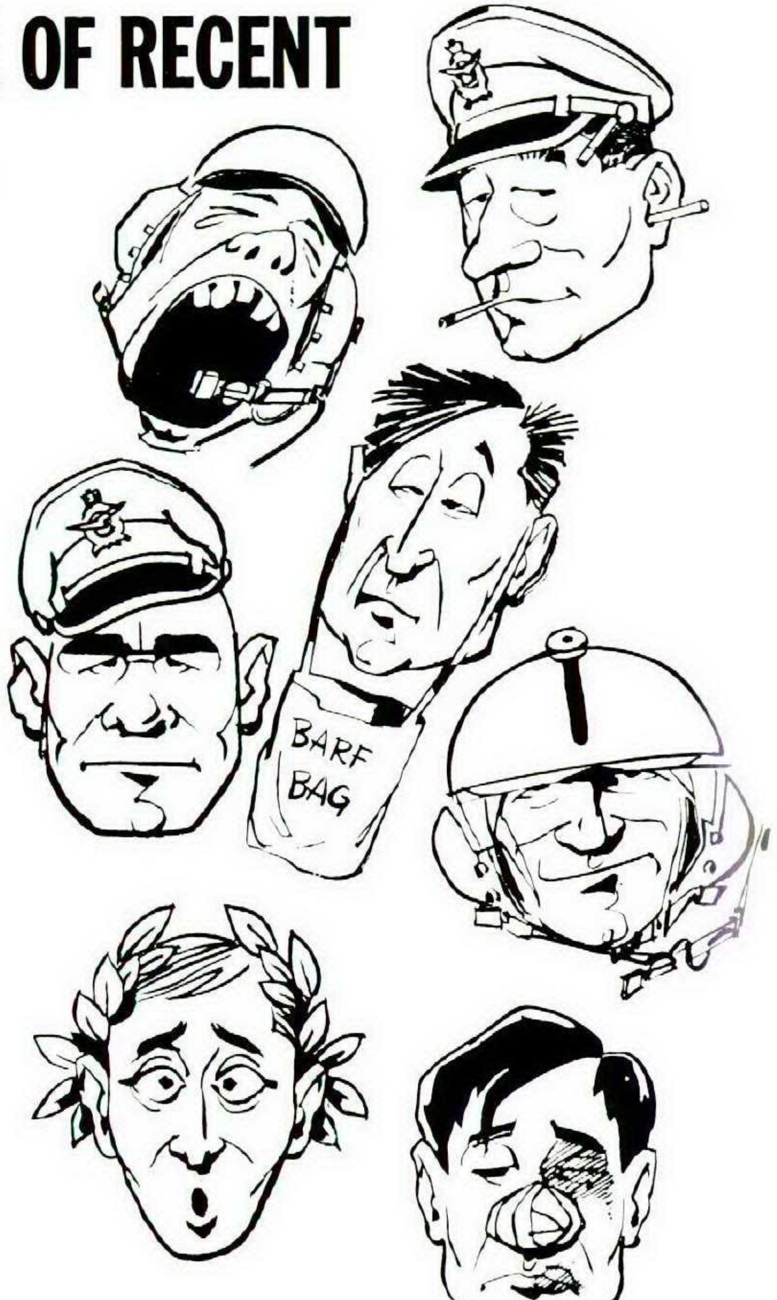
THE GRIMACE BOOK OF RECENT AVIATION RECORDS



Unintentional Bingos

Lt John P. Farthworth, 4-- Sqn, 8 January to 26 September 1974. Lt Farthworth managed to land at the alternate field 43 times during a single year, establishing a new record of .414 diverts bingos per flight. While setting the record, Lt Farthworth never once carried a wallet. He is also known as a chain smoker who never buys cigarettes.

Impromptu Public Speaking

Capt Tyrone B. Smather, 4--Sqn, 4 April 1973. Capt Smather, while waiting for takeoff at the hold-short line during unusually heavy landing traffic, mistook his mike button for the ICS. His 35 minutes of uninterrupted air time broke the previous record by 4 minutes and covered a variety of subjects from the blackout in Operations to the real color of the skipper's wife's hair. His finale was a detailed account of his activities on his last cross-country that drew wild applause from tower personnel and all crews in the landing pattern.

Innovative Barf Bags

Lt Ivan H. Green, 4-- Sqn, 31 January to 30 September 1976. Lt Green refuses to carry a regulation sick bag as a matter of pride. He is, however, frequently prone to airsickness, and has turned this difficulty into a creative hobby. Lt Green has now catalogued 97 items in an aircraft cockpit that can be used in case of emergency. His most famous, from which he is now recovering from whiplash, occurred on a recent flight when he inflated his raft.

Aerodynamic Braking

Lt Stanislaus V. Bendix, 4-- Sqn, 14 November 1975. Lt Bendix's night landing at CFB---------- illuminated the field with sparks after overrotating his aircraft for 7,382 feet of the 8,000-foot runway. The base public affairs officer received several calls by concerned citizens as to whether the base had been hit by a low-flying comet. Cromwell Aviation, which makes tail parts for Lt Bendix's aircraft, has presented him with a coffee table in the shape of a bronzed empennage.

Noise Unabatement

Maj Bob T. Rogers, 4-- Sqn, 16 June 1976. Maj Rogers pulled the old hat trick on a four-leg cross-country. Ignoring all NOTAMS, he landed his aircraft during two change of command ceremonies, a retirement, and a Sea Scout dedication. On each occasion, he scavenged his engines for 15 minutes prior to shutdown, once staying at high power for an additional 10 minutes just to see if the low fuel light would come on.

Aeronautical Ballet

Maj. Harold R. Flitty, 4-- Sqn, 2 February 1974. Maj Flitty, in his fighter nicknamed "The Red Shoes", departed from 39,000 feet performing a spectacular series of pirouettes. He scored 9.6 in the compulsories and 9.9 in the free style. He recovered at 800 feet, and it is rumored that the base laundry would not accept his flight suit. His ground crew has painted a "tutu" around the waist of his aircraft.

Flight Time Bagging

Lt Daniel P. Gresham, 4-- Sqn, 8-9 May 1975. Lt Gresham, although not on the flight schedule, suited up and stood behind the duty officer, looking over his shoulder for 37 consecutive hours, waiting for a chance to fly. Lt Gresham was finally rewarded with a compass swing.

courtesy Approach

I Check, That You Check, To Re-Check

by Capt J. A. R. Larocque CFB Trenton

Hey guy in the sky, have you noticed that you have been receiving a lot of re-check the gear calls from the tower lately? Pretty frustrating after you have already told them, "gear down and locked" eh?

Well there is a reason for it. Word has filtered down from the biggest tower of all, NDHQ, to do it.

The recommendation of a recent Board of Inquiry included a proposal that air traffic controllers be required to remind aircrew of the landing gear, even though the aircrew may have already stated "gear down". The Directorate of Air Regulations and Traffic Services has accepted this recommendation and the appropriate publications are being amended.

It is felt that the additional confirmation will trigger a re-check of the landing gear and avoid the consequence of an automatic "gear down" call without visual confirmation by the aircrew. Controllers have also been directed to vary the terminology of the gear down check to avoid the expression from becoming routine.

So that's what it's all about. Please try to accept it. After all, it is for your safety. And if you do that, we will make every effort to ensure that you never get a call saying, "I check, that you check, to re-check . . . .".

2000th hour on type

On 14 April 1977 Capt Edward H. Gosden completed his 2000th hour on the Kiowa helicopter, while serving with 444 Tactical Helicopter Squadron, Lahr, West Germany. This is the first time any pilot serving with the squadron has achieved this total.

Capt Gosden originally joined the Canadian Army in 1964. After cross-training to pilot in Oct. 1972 he was posted to 427 Tac Hel Sqn at CFB Petawawa, Ont. He accumulated most of his Kiowa time there, being posted to 444 Sqn in Aug 1976. The 2000 hrs was all operational flying during the period Jan '73 to Apr '77, with the exception of 200 hrs conversion and OTU time.

cont'd from page 21
include such stresses as bad enroute weather, strange airports, difficult approaches (e.g. mountainous terrain or minimum approach aids), short runways etc. Similarly, estimated demand profiles can be plotted for any type of flying mission. Figure 3 might represent the human performance demands for an air display team pilot, flying instructor, or NOÉ helicopter operation. Figure 4 might represent a SAR helicopter mission with a mid profile peak during the rescue phase, etc.

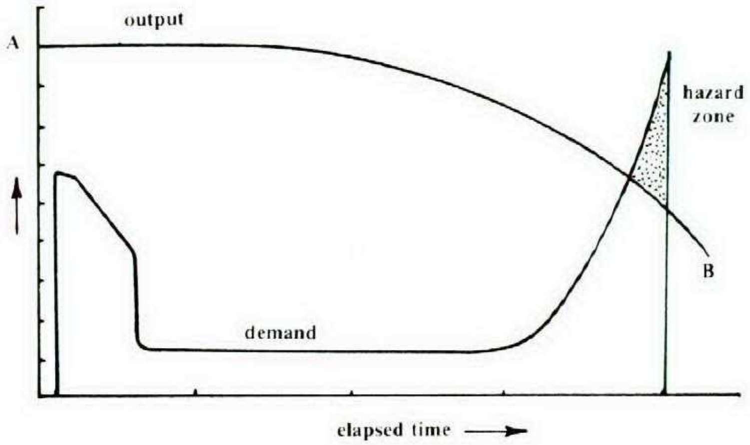


Figure 5

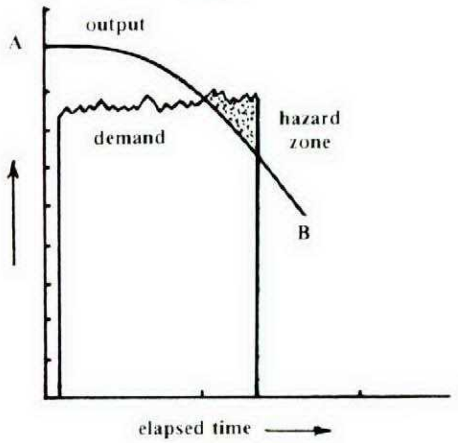


Figure 6

The next step is to superimpose the output and demand graphs as in Figure 5. You will note from this that in almost all flying missions, the greatest demand occurs at a time when the available output may be at a minimum. We have all operated in this hazard zone and the consequences depend on many variables, including good luck. One can probably say, however, that the risk of misadventure increases dramatically after these lines cross. The potential of producing this hazard zone exists for all flying missions because of the relationship between workload and fatigue. For example, the shorter flight with higher demands, depicted in Figure 3, will produce a contraction in the maximum available output line so that the slope is greater and level B is reached sooner than suggested in Figure 1. This is shown in Figure 6. The same consideration applies to situations where, for whatever reason, the demands on the human component during the mission exceeds those forecast i.e. the overall slope of the maximum output line can be increased from that forecast.

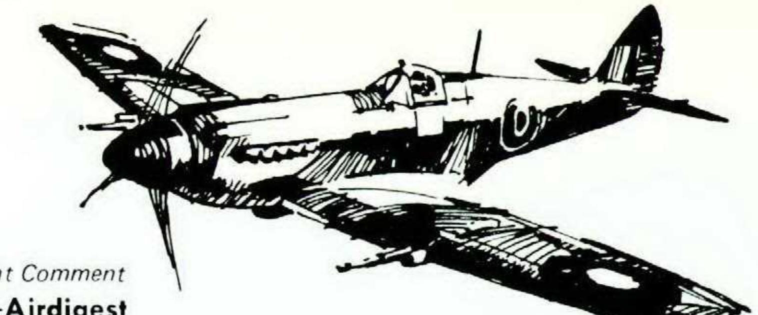
The approach described above clearly illustrates the three major methods of combating fatigue hazards in flying operations. The first objective is to start with point A as high as possible and keep the slope of the line in Figure 1 as shallow as possible. This is accomplished partly by being fit and rested before the mission. The second objective is to keep the area between the lines at a maximum by maintaining the output line as high as possible (as just discussed) and the demand line as low and flat as possible. The latter is accomplished partly by using equipment and procedures that minimize demands on the human component. The final objective is to avoid having the lines cross at any time during the mission. If this cannot be achieved through the first two objectives, then the mission should be terminated or interrupted for an adequate rest period before the lines cross.

Remember that both the demand and output graphs devised above, pertain to one individual. In multi-placed aircraft the final assessment should be based on the combined picture for key crewmembers. For example, in some transport operations, where only one flight engineer is available, the expected fatigue level of the flight engineer may be the limiting factor. Your real or imaginary 'personal' or 'crew flight log' should indicate how much flying, of what type, you think you can cope with safely on that day or during that mission. Contingency plans for the expected or unexpected should be included. In multi-placed aircraft these decisions could be discussed in the crew briefing. If you think you may unavoidably end up in the hazard zone described above, then you might pre-plan means of combating the associated risks, e.g. set higher approach limits, write a note to yourself (or brief your crew in multi-place aircraft) for greater vigilance and double checking on checklist completions and minimum altitudes, calling passing altitudes, etc.

It is important that such deliberations be made pre-flight and that you adhere to your pre-flight decisions once you are into the mission or the day's flying activities (or only revise them to the more conservative side). Like many expressions, ones such as "too tired to lie down" or "too tired to know enough to quit", are based on fact. Since your judgement can be impaired once you are in a fatigue state, you should never choose a course of action which may increase the level of fatigue. In questionable situations the safest response is "I guess I'd better pack it in" and not "I can press on (with or to whatever)". Note that cumulative fatigue (which occurs when intervening rest periods are inadequate — as may happen on long range operations), progressively lowers the height of point A and decision making quality can be decreased even before the mission.

If 'flight planning' the human performance quotient doesn't suit you, then just considering the importance of fatigue in flying operations can generate an appreciation of the operational significance of this topic. This, in itself, may serve to reduce the risks and improve flight safety, for 'preventive thinking' is the key to professionalism. You might try to plot the demand graphs for various types of mission; this can be an entertaining group exercise on bad-weather or no-aircraft days. (Individual assessments as to what parts of a mission are most demanding can differ greatly.) Don't be deterred by the speculative aspect or the lack of numbers in these deliberations. The principles used are based on fact; besides, your subjective assessment of human performance output and demands, is probably as accurate as the MET forecast.

Human Factors in WWII



specially for Flight Comment

by Robert Rickerd–Airdigest

When man had sufficiently mastered his new-found wings to be able to fly beyond sight of his home field, navigation suddenly became an important part of this new art. Though not possessed of the uncanny homing instincts of his feathered fellow travellers, the WWI aviator did have the advantage of the experience of several centuries of mariners to assist him and quickly adapted their skills and instruments to his use.

Between the wars many remarkable feats of aerial navigation were recorded, and with them some equally famous failures. Over-the-water flights tempted many pilots fatally. Attempts at Atlantic crossings became the vogue in the 1919-1939 period and cost the lives of 36 pilots and crew in aircraft lost over the ocean, some of them undoubtedly due to faulty navigation compounded by foul weather and fuel shortages. But the most humorous event in the Atlantic crossing craze was the "accidental" flight of Douglas "Wrong Way" Corrigan who parlayed the beginner's error of flying a reciprocal course into fame in 1938.

Amelia Earhart, who had become a member of the select group of successful Atlantic pilots six years earlier, was not satisfied that she had successfully proven women's equality. In 1935, she completed another "first solo" flight for a female, this time between Hawaii and California. Then in 1937 in an effort to emulate Wiley Post's 1933 feat, she set out on a round-the-world flight which was to be her last. Even with the help of Captain Fred Nooman, one of the most skilled navigators in America, who had successfully directed her course for 22,000 miles, she somehow missed an island airstrip in the Pacific and was never seen again.

Amelia Earhart's disappearance was accompanied by a rumor that after becoming lost, her Electra had strayed too close to secret Japanese military installations and had been shot down. This theory went unproved, but if true, the episode could be the first of many military actions involving the Second World War.

"Wrong Way Corrigans" can have serious consequences during hostilities — both to themselves and to the overall effort.

One of the first of these, a Luftwaffe Flight Sergeant who had gained experience with the Condor Legion in Spain, and who should have known better, got himself lost over France on November 22 1939. By turning over the latest model Messerschmidt 109 to the Allies at a time when they desperately needed to know the strengths and weaknesses of Germany's number one fighter aircraft, he probably saved a good many Allied pilot's lives.

Later, in June 1942, at a point in time when British Intelligence was planning a Commando raid on the Continent in a desperate attempt to obtain an example of the new Focke Wulf 190 which was sweeping their Spitfire V's from the sky, a Luftwaffe Flying Officer presented one intact. After following Spitfires out across the Channel, the pilot became disoriented, flew a reciprocal course and landed near Swansea, not realizing his mistake until the RAF base Duty Pilot jumped on the Focke Wulf's wing and pressed a Very pistol to his temple! Later, when the young Officer realized the significance of his gift, he perhaps understandably attempted suicide!

Further windfalls were to arrive at British airfields via navigational error as the war progressed. One of the most important being a Junkers 88G-1. Early in 1944, German night fighters were slaughtering RAF bombers with the help of new search devices. The new model JU88 was equipped with a radar which operated on a frequency unaffected by the aluminum foil "Window" strips which were being dropped by the RAF to confuse the night fighters. In addition, the aircraft had a receiver which allowed it to home on the tail warning radar of the Lancasters from as far away as forty-five miles.

On July 13th 1944, the secrets which had helped the Germans to inflict losses of over ten per cent on the RAF were revealed when a German pilot returning from a patrol over the North Sea flew a reciprocal course into the arms of RAF experts.

Nor was hardware the only valuable item delivered into Allied hands via human error. On January 10, 1940, Hitler ordered that the attack in the West through Belgium and Holland commence on the seventeenth. On the same day Hitler issued his directive, a German staff officer was captured by the Belgians complete with detailed plans of the offensive, when his pilot, another Major, became lost and was forced to land on a flight from Munster to Cologne. The German plans had to be changed, and the two little countries gained four months of grace, while Hitler turned his attention to Denmark and Norway.

On the same day Belgium and Holland were attacked, May 10, 1940, German Heinkel bombers made the first of many tragic errors in navigation which were to unintentionally snuff out the lives of unsuspecting and innocent civilians. Briefed to attack a French airfield, three of nine aircraft became separated and lost their way in cloud. Mistaking the German town of Freiburg for the French target, the bombers missed the airfield and dropped most of their bombs inside the city limits in broad daylight. Of the fifty-seven victims, thirteen were women and twenty-two were children.

There were many other fatal instances of disorientation in World War II, some of them quite well known. The "Lady Be Good" was one of these. Returning from a mission against Naples harbor in 1943, the American Liberator overflew its base and followed a reciprocal course four hundred miles into the Libyan Desert. The wreckage and bodies of the crew were not discovered until sixteen years later. In 1942, the Duke of Kent and all but one of the crew of a Sunderland flying boat were killed when the aircraft drifted off course, hit high ground and crashed in Scotland.

The exact fate of the legendary band leader Glenn Miller was never discovered. He disappeared on a flight from England to Paris in December 1944. They all could have used some of "Wrong Way" Corrigan's luck.

THERMAL RUNAWAY

By Maj Tony Helbling, Jr. USAF Study Kit

During the investigation of a recent major accident, it was determined that the nickel cadmium battery had exploded due to a thermal runaway condition. This failure does not happen often, provided adequate maintenance procedures are adhered to.

In order to understand nickel-cadmium batteries, you first have to forget all that you know about its lead-acid counterpart. Here are some examples:

–*Short out* battery cells before you charge them.
–Add water to the cells *after* you charge, not before.
–Charge it with a *constant-current* procedure.
–Electrolyte is *alkaline not acid*.

These are all critical differences and if not adhered to, can lead to a self-destructive thermal runaway.

The source of thermal runaway is heat damage to the cellophane plate separator within each cell. The critical temperature is generated by such factors as charge current, static battery temperatures and cell differential voltage. Proper battery compartment ventilation can alleviate part of this heat problem.

Hydrogen gas generated from the battery is a natural occurrence. When a battery malfunctions and heat is generated, there can be an increase in the quantity of hydrogen gas released. The flammable or explosive limits of hydrogen/air mixtures are extremely wide (4-75% by volume). The auto ignition temperature for hydrogen/air mixtures is 1085 degrees F. The minimum spark ignition energy for hydrogen/air mixtures is approximately 0.017 millijoules (a joule is defined as the energy expended in one second by a current of one ampere at a potential of one volt). A hydrogen/air explosion is extremely violent and can result in aircraft structural damage.

The actual thermal runaway occurs when an unstable relationship occurs between battery temperature, electrochemical potential and overcharge current. The individual cell loses its cellophane gas barrier which causes a loss of cell voltage. The cell with the lower voltage receives an increase in charging current. The cellophane loss, coupled with the increased current, generates heat.

The physical action of the gas bubbles rapidly rising within the cell tends to tear the cellophane barrier loose from the separator sandwich.

The integrity of the cellophane is influenced by proper maintenance. If the electrolyte level is not proper, then oxidation with increased cellophane temperature can occur.

It's all one big vicious circle and in short, that's a good description of thermal runaway!

In any case, a thermal runaway can happen in any aircraft containing a nickel-cadmium or silver-zinc battery. Typical indications may be dense acrid smoke with intense heat, and depending on the magnitude and intensity . . . a damn good fire!

Corrective procedures would be to isolate the charging source (turn off the generator switches) . . . it's not too late!

LET'S TALK

Hey guy in the sky, when was the last time you visited your local air traffic control unit? Will your next visit be your first?

In the flying business, unlike any other, good communications is vitally important to safety. In fact, without good communications, the job simply cannot be done. Should we not do all that we can to improve our communications?

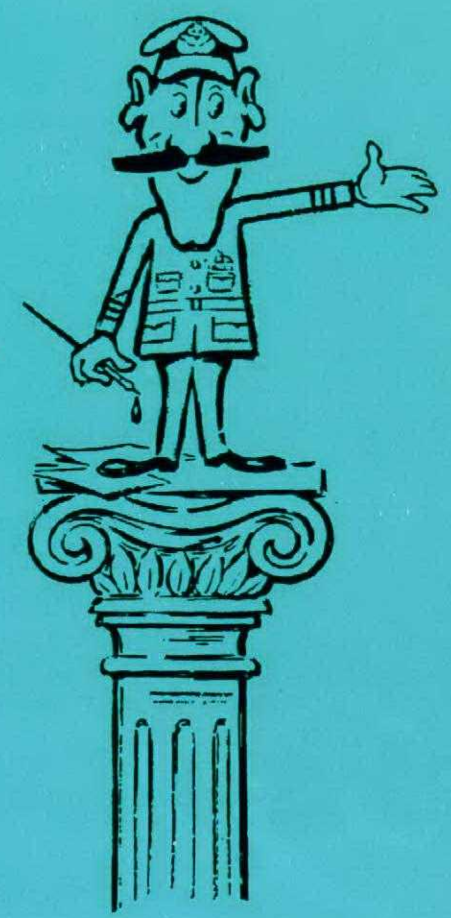
Part of a controller's in-routine at a new base is to visit each flying unit. During these visits we learn about your role, your problems, and most important, we meet you. Quite often we are given a familiarization flight to learn the local area and to see exactly what your problems in the air are.

Shouldn't this be a two way street? We'd sure like to see new squadron members visit our units so that we could discuss our roles and our problems. We'd like to explain that hairy departure clearance or show how hard it is to spot a silver and white aircraft in the haze even if the weather is VFR.

In short we'd like to talk, and preferably not on the phone. But if you can't drop by the unit, by all means please call and discuss problems with the controllers concerned. We both might learn from it.

Finally, if by some slim chance you should happen to have a bouquet, call the Base Air Traffic Control Officer and tell him. It will make up for some of the obscene calls he gets.

Capt J.A.R. Larocque
CFB Trenton



WING COMMANDER SPRY'S COLUMN

ON SELECTING A FLIGHT SAFETY OFFICER

Many supervisors in the Service will eventually be faced with the problem of selecting a Flight Safety Officer; the more important the job, the greater should be the care in selecting the right person! When one examines the attributes to be sought when selecting a Station Flight Safety Officer, one will be aware, of course, that the same guidelines will equally apply when selecting an FSO for a squadron or section role.

In selecting our FSO, let us consider what sort of person we are seeking and from what part of the station he should be drawn. Naturally, he should be an energetic, respected and experienced aircrew officer – with the potential to be a future Squadron Commander, one would hope. (I will discuss desirable personal qualities in more detail, later.) Preferably he should be current or in recent practice on at least one type of the station's aircraft; ideally he should be a pilot on the aircrew standardization team, an operations officer, or a simulator instructor.

Selection from one of these groupings would ensure that the FSO is well versed in the station's operational role and yet ensure that he will be able to express impartial views when possible areas of conflict arise between squadrons or units. In picking our man there may also be some important geographical considerations; the FSO should be located as close as possible to the centre of the station's flying activity in, say, the Operations Wing building, so that he won't have to waste valuable time in getting to the Ops Centre and being available in his Flight Safety section. This is not to say that he shouldn't get around the station; he should, but on a planned basis rather than as a commuter!

To turn to some personal qualities needed by an FSO; it is vital that he has a genuine interest in and enthusiasm for Flight Safety and also in the associated aspects of flying (e.g. servicing and support functions); he should be able to communicate readily with *all* ranks – he should not be a garrulous extrovert, of course, rather a person with an open and friendly manner who does not create barriers during personal contacts. He should be able to work well as a member of the team, taking the initiative when required but not usurping the responsibilities of the station's executives.

The type of man who is responsive and sympathetic in manner is likely to be the much needed catalyst towards the promotion of effective Flight Safety on his station; he will thus help to establish a healthy climate in which personnel will feel confident to express their Flight Safety ideas and identify problems. In this respect, it might perhaps be fair to compare an FSO with a Padre in his ability to communicate with all, irrespective of rank.

It is perhaps well to recall that the fundamental responsibility for Flight Safety does not rest on any one man, but with every member of the station.

To summarise, ideally your FSO should be based at the centre of the station activities; he must be a dedicated officer – the sum of his personal qualities revealing a positive attitude towards Flight Safety – a conviction that will drive him, one hopes, to commit a necessary proportion of his own time to his essential task for the station.

From Air Clues Magazine

MISTRIAL

by Maj D. Gauthier

THE OPINIONS EXPRESSED IN THIS ARTICLE ARE THOSE OF THE AUTHOR AND ARE NOT TO BE INTERPRETED AS DFS OR CANADIAN FORCES POLICY. WE PRESENT THIS ARTICLE "FOR THE SAKE OF ARGUMENT". EDITOR.

Now that the dust raised during my two year tour with the Snowbirds is settling down, I can sit and reminesce in my muggy barrack block office cooled by the everlasting westerly winds of the prairies (the door and east window of my office and the door and west window of the men's room are wide open).

Beside the memories of hot ramps, turbulence, crowds and evening socials, I have many thoughts some of which are associated with flight safety. What prompts me to write this letter is not only these recollections but the thoughts left behind after a command safety briefing held at our base not too long ago. I, along with the majority of the audience left that briefing with a guilty feeling, having just been reprimanded for breaking airplanes. That briefing lacked depth in the review of air accidents and a positive attitude towards their findings. In recent years, pilots have been crucified for accidents. Since this attitude has not generated any noticeable benefit, then it is perhaps time to examine some other causes and select new avenues. – How about dollars and cents, planes, operational capabilities and flexibility, technical experience, number of technicians, conditions of our supporting and operating facilities, flight training program and its machines and most important the quality of its product.

– Flight safety is everybody's business, isn't it?

First a basic fact: people, of which pilots represent a part (don't ask a navigator) have made, do make, and probably always will make errors, this is why Eagle Canada tacks erasers on their pencils. Secondly, the common, standard (sergeant loans serviceable plane to captain (F/L before '68) for one local trip – captain returns to that same sergeant "bent machine" – hang the captain!!!!) sad ending melodramas have earned great popularity and are familiar to all of us. What I would like to do is look at some causes that are very seldom discussed. Since my experience is limited to CF5 and Snowbird Tutor aircraft, my examples are going to be limited in scope and number. Perhaps similar problems exist with other aircraft types in the field.

CF5s have been ricocheting sideways and tail pipes first, down wet runways since 1968 blowing tires and damaging airframes. This has been the result of the excellent hydroplaning feature of the wide tires (sod and steel mesh operation), the high rate of chute failures (a 433 safety system sergeant discovered the main problem in 1972), and the powerful "dry surface" breaking action of its wheel assembly. After nine years of operation we are now pre-positioning drag chutes at most of our bases. This should correct the result of the causes of the deficiencies, but don't throw away these arrester cables. We also in that same period have been and are still changing radio frequencies by turning the pre-set selector knob located in front of the control column, at a height lower than the level of the knees. While you do this intricate frequency change in formation and at night you can comfortably monitor the temperature of your batteries by looking straight ahead at the instrument panel. I also remember the days when the T-33 did not have any warning system to tell the pilot that he had not secured the nose doors – I know, as per check list, he should have, but remember Eagle Canada – that one cost a few lives and planes. In our basic cum advanced jet trainer we are still operating a radio that uses vacuum tubes, old ones. Our aerobatic team's most dreadful problem is the unacceptable rate of radio failures not the formation changes at the top of the loops as you would think. The Lord, with whom the flight leader keeps in close contact daily, along with all military pilots knows how critical communications can be, especially with nine aircraft close formation. These inadequacies in the eyes of non flyers, but serious handicaps to us, have always been difficult to understand. Why they were accepted on purchase at all or not modified immediately thereafter remains to me a tremendous mystery.

There is one other factor that we seldom consider and that is "pucker". How do people react under the severe stress of an in-flight critical emergency? Personally I have witnessed two categories:

(a) Capt Kool who can't talk nor walk and appears to have severe epiliptic tremors after safely recovering his "inverter failed" Tutor; and

(b) line pilot Capt George B. who through experience, judgement and a natural phlegmatic temperament, lands his twisted machine as if nothing has happened.

How do you react when faced with a very serious emergency? – Not when you must leave your warm chair because of impendent death but when you have seconds or even minutes to speculate on the future of your pink body and the rig it's in? In our small sparsely funded force, I don't think we'll ever be able to design a selection process that can tell who will follow, step by step, the pink sheets of a check list and who won't. I assume then, that for the next while we will have emergencies that are not handled like they could be from a warm office or a simulator.

Looking back over my career, which may be shortened somewhat after this article, when I joined in '59 the RCAF pilots were the best in many tactical roles; Air Defence, Air Combat, Anti-Sub and Transport. Since then, after watching all the commotion over air accidents, financial status, manpower, present and future equipment, I have come to feel that all we are trying to do is maintain expertise in the field of take-offs, transits (not too far because of limited funds, manpower and equipment) and landings. What a challenge!

What has happened in the last few years that may give us hints? The finances have not grown in proportion to the workload which we always have accepted, (someone is bound to make a stand, forget status, and reduce the number of tasks). Morale since Feb 68 has been going down to a low level which we seem to maintain, no matter which element you are a member of (today). Our servicemen have been looking at their "8 to 4" civilian counterparts; strikes, time and a half, working conditions, equipment, etc . . . Try to get an "A" check on your complex Tutor in any transient base; manpower is low, the dart game and/or the TV room is active and if you comment, your BComd will hear – this situation appeared when our identities left. I realize that a lot is in the mill but the Aurora has not reached AETE nor have the politicians selected our new fighter yet.

What we have left is a fine group of people trying to survive with their old machines and the old tasks but with only minimum technical support and manpower. The expertise that we once enjoyed has somewhat dwindled. The handling trips are far apart, the cross-country flying is a treat, and the bar talk – in proper military attires – is done only by ex-fighter pilots in transit.

I have no magic answer to our deplorable flight safety status but hope that someone may find something in this article. Before I close I would like to say that it is reassuring to know that your superiors, from the flight commander to the commander, have a positive attitude towards their flyers and their machines. To know that you are not going to get "hung" for using your head along with your check list is most comforting.

ABOUT THE AUTHOR
Maj. D. Gauthier OMM, CD

Originates from Sherbrooke PQ. He joined the RCAF in 1959. He received his observers wings in 1961 and flew Neptune in Comox for five years. In 1966, he joined the Golden Centenaires as administration officer and bilingual commentator. Immediately after he cross trained as a pilot. In early 1969 he joined 433 ETAC in Bagotville. In late 1974 he was selected as flight leader and CO of the Snowbird demonstration team. He has now completed his two year tour and is joining the 1977/78 Canadian Staff College course.

When is a bearing not a bearing?

BY W. EGENTER, QUALITY ENGINEERING TEST ESTABLISHMENT SUB-SECTION HEAD STANDARDS AND BEARING FAILURE INVESTIGATOR

Our experience, over a number of years in the investigation of bearing failures, has shown evidence that some misunderstanding exists in "What is a bearing assembly." For the purpose of this article and for clarification we will divide some of the commonly used bearings on aircraft into groups.

Group No. 1

This is not a bearing assembly — This is the bearing assembly

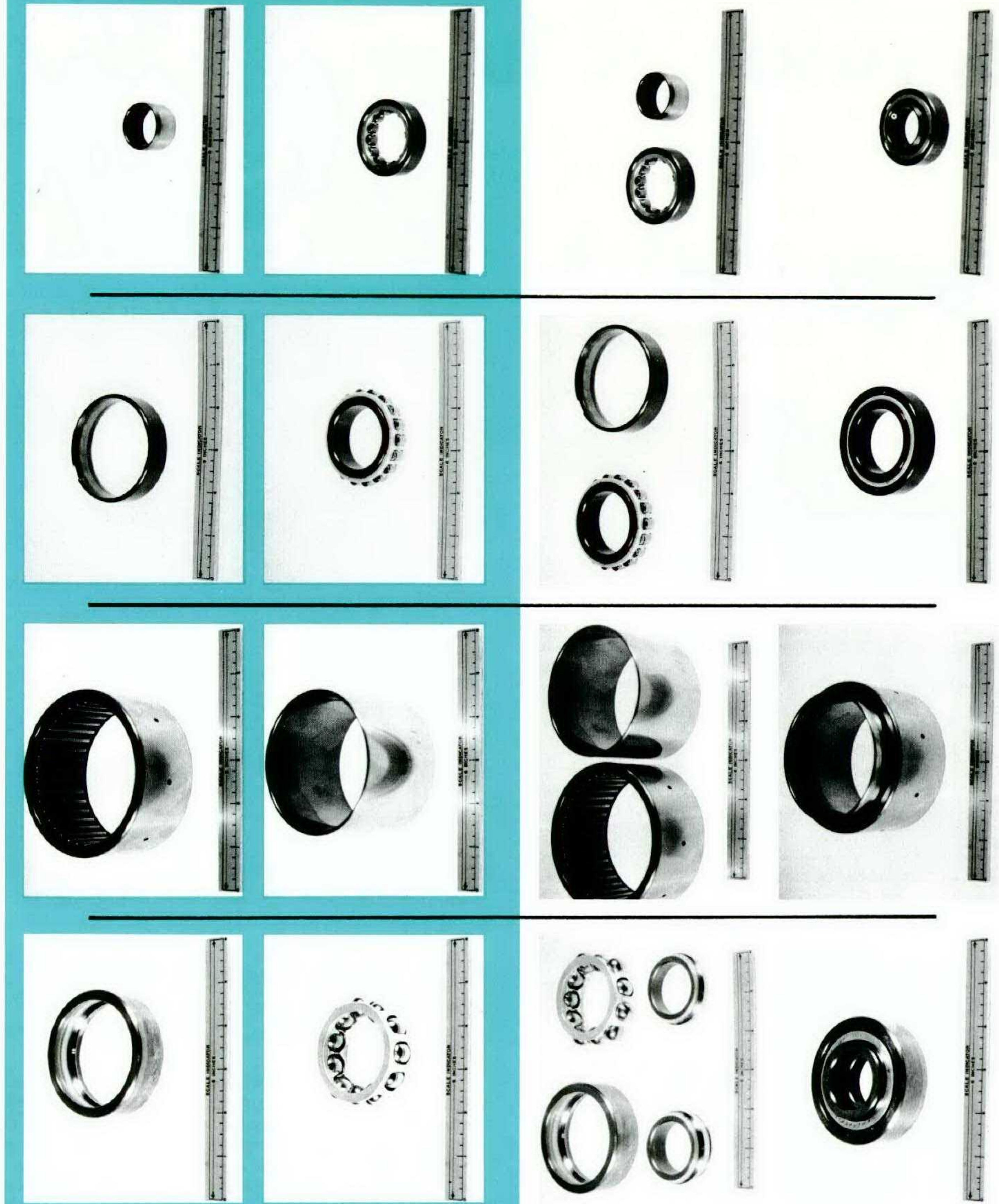
Let's discuss the bearing in group No. 1 first. The assembly in this group consists of an outer ring (also called a cup) and as a unit the rollers, the cage and the inner ring (called a cone). The cup and cone each have their own identification number. They can be purchased individually and the cup and cone can even be interchanged from one manufacturer to another. Since this is an assembly with two separate parts the problem starts after the parts have been installed. Now we have an assembly which is married and the same marriage vows apply to the assembly as the ones we know; those of us who are married that is. For all the single men and, for some of the married ones who have forgotten these vows, let me quote one which goes something like "What god hath joined together let no man put asunder." This means after you have given your blessing and married the parts don't change the rules when you have to inspect or clean this type of bearing by mixing cups and cones at will. Even steel has a life in such use and at the end of this life fatigue sets in and the part will be destroyed! Therefore the hours of use, the number of miles or the number of landings must be controlled for a bearing assembly. This permits us to discard a bearing before it is due for natural failure. If parts are interchanged we lose this control and failures are unavoidable.

Now we come to the second group. The assemblies in this group consist of a) and outer ring, cage and rollers and separate inner ring, b) Rollers, cage, inner ring and a separate outer ring or c) a cage and balls, a separate outer ring and a separate inner ring consisting of two halves. These assemblies can not be purchased individually and all the parts have been married up by the bearing manufacturer and must not be interchanged if any value is placed on the proper function of the assembly.

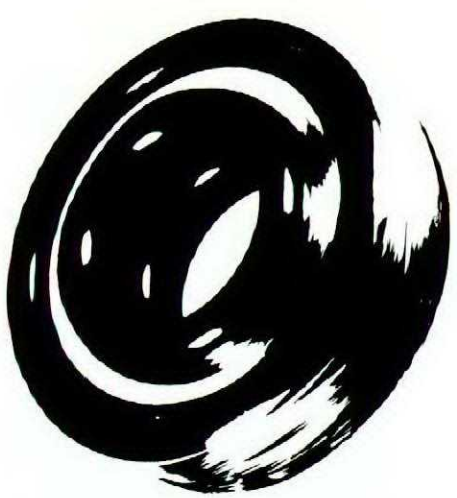
Finally: Failures will occur and if this should happen in your unit please send the complete bearing assembly and follow E075-10-5A/2, Sept. 71, shipping the components as are. You are the first link in the chain to find the cause of failure and the investigator cannot effectively do his job if some of the evidence is not submitted or is destroyed.

Group No. 2

This is not a bearing assembly — This is the bearing assembly



WARNING: bearing failure



By: W.B. Egenter, Sub-Section Head, Standards Laboratory and Tribology (Bearing Specialist) QETE

In this article I would like to highlight failures of one type of bearing which has plagued us for more than 12 years, that of "the tapered roller bearing".

Our Section investigates an average of 10 tapered roller bearing failures per year, out of up to three times of that number of incidents in the field.

It becomes somewhat of a nuisance to investigate the same type of failure year in and year out when 95% of them could have been avoided simply by following some of the basic rules of the bearing game.

For some strange reason the basic rule, applicable to bearings, is not observed or recognized by a great number of people, when it comes to tapered roller bearings.

Let us examine some of the factors initiating the problem:

a) Because this bearing comes in two parts many people treat each part as a separate bearing. Now let us identify the parts, first we have an outer ring (called a cup) and second (as one unit called a cone), the rollers, the cage and the inner ring. The cup and the cone each have separate identification numbers. They can be purchased individually and a cup of one manufacture can even be interchanged with a cone from another manufacturer. But hold on, there is more: the cup and the cone can be treated as separate bearing parts, as long as none of the parts have been used. But the story changes as soon as the two components have been mated and put to use. They now share the same wear experience and deterioration together; they should die together. Effectively the parts become *one* unit and have to be kept as one unit until the end of their life.

b) The second factor with tapered roller bearings, in aircraft wheels is, that the cup is pressed into the wheel hub and cannot be removed in the field by the technicians who perform the wheel inspection. On the other hand the cone has to be taken off the axle during an inspection for cleaning and relubrication and since the cone slides easily on and off the axle this poses no problem. But if this cone is not re-assembled in the original cup we are changing one of the basic rules in the bearing game. We are mating a young cone with an old cup: perhaps one just about ready to fail.

c) Finally, we have CFTO-C-13-010-002/AM-001 (page 2 to 3 para. 2) which starts out by saying all the right things and then contradicts its statements in a note, which makes the interpretation very difficult for the technician in the field.

Note: The writer has discussed this matter with the design authority and he is hoping that a change in the instruction will be forthcoming soon.

Case No. 1

Now let's have a look at some of these failures: Photo 1 shows the remains of the cone of an aircraft wheel bearing after failure. The failure occurred following 28 landings after installation of the cone. The cup and axle were also damaged. There are no data available on where abouts of the cup (outer ring) and because of intense failure we cannot say which component caused the failure.

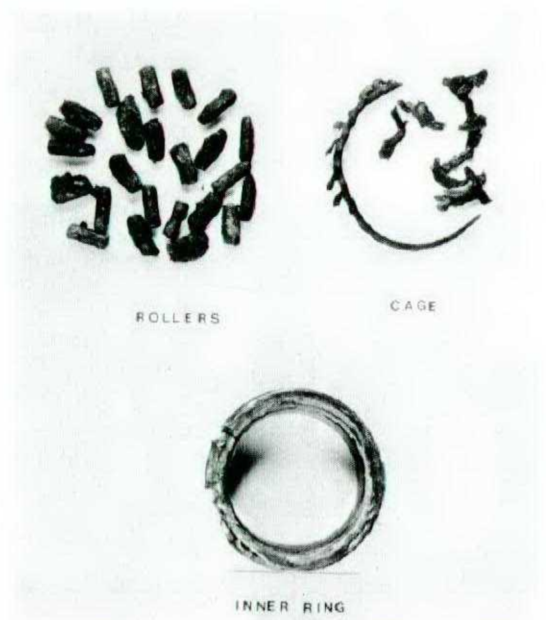


PHOTO – 1

Case No. 2

Again, we have the remains of a failed tapered roller bearing in Photo 2. Photographs 3 and 4 show the same bearing.

Photo 3 shows a closeup of one of the rollers.

Photo 4 shows the damaged race of the cup of the same bearing.

Our investigation revealed that a new cone (inner ring) was installed in the wheel, in April. The bearing failed in July of the same year. Again, no information was available on the cup (outer ring). (It could have been there for years.)

These failures are difficult to evaluate, as to the sequence of the events, since the components are in a rather advanced state of deterioration. But this type of failure can be initiated by a cup which has reached the end of its life cycle: has subsurface cracks or fatigue cracks which can not be seen during the visual inspection.

PHOTO – 2

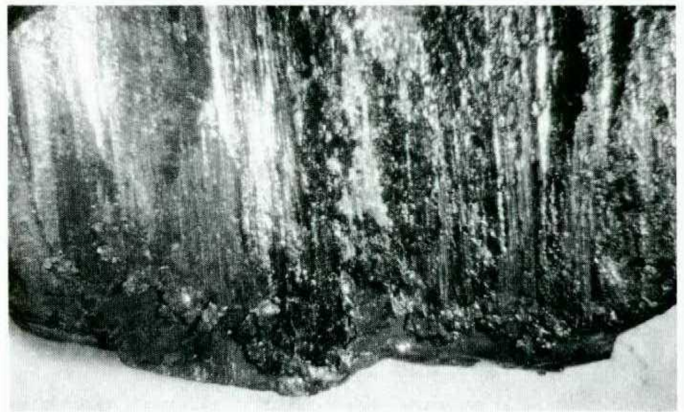


PHOTO – 3

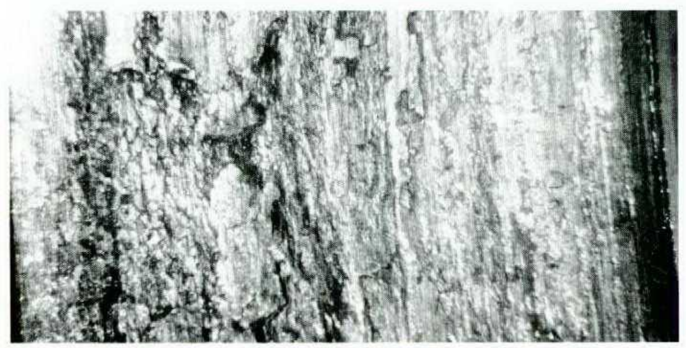


PHOTO – 4

We have encountered a number of cone failures where the cup in which the failure occurred could not be located. The comment we have in this case is: "If the cup was not removed from the wheel and scrapped another failure will occur within a short period of time."

Case No. 3

In this case we have advanced to the state where some people feel that any cone fits into any cup, as long as the cone fits on the axle, without regard to the taper or the angle of the components.

The first law of taper roller bearings is, "The angle of taper of the cone *must* match the angle of the taper of the cup for proper operation." A mismatch of the taper will result in a failure.

Photo 5 shows the end result of a mismatched component.

Photo 6 shows a close-up of the wheel upon landing.

Photo 7 shows the remains of the cup and cone after removal from the wheel.

This is not an isolated incident. The lesson is: verify the parts and the part numbers of the component prior to installation, using the TO which applies to the aircraft.

Finally, as matter of general interest, the same type of bearing is used in the front wheels of most of our cars. Disasterous failures occur in these wheels also, but not as frequently as on aircraft, because the conditions of use are somewhat less strenuous.

Solution

Since we are interested in reducing tapered roller bearing failures, we must keep the cup and cone as one unit until the end of their serviceable life. Then the bearing has to be scrapped. This means to scrap both parts, even if only one shows a defect. (Assume that when part of a bearing fails, the rest will fail soon from metal fatigue.)

PHOTO – 5

PHOTO – 6

PHOTO – 7

AN OPEN LETTER IN REPLY

to an exchange officer who spoke out

from SSO FS AIRCOM

LCol L.T.C. East

Dear LCdr Raines,

Holy Trafalgars, David! You certainly let the fox mess with the chickens – or perhaps more appropriately Her Majesty's Finest in amongst the fishing fleet! After the salt settled here in AIRCOM it was decided to (a) commend you on your candid and erudite Sea King article and to (b) reply in part to your observations and opinions in the hope that the dialogue might engender response from others, wherever. Now, before I go further "let me make it perfectly clear" that this note to you does not represent the sum total of the response your effort has solicited. There is other activity.

Your article was excellent in that you have stated your views on our Sea King operations and have taken the effort to suggest where improvements might be made. You were not totally critical and we observed with pride your favourable reactions to our helo-ship Beartrap operations, our Waterbird Course and our Canadian one-man dighy, to name a few items.

Anyway, allow an FSO/Sea King enthusiast to react.

Smoking in the Sea King. It is unfair of me to hit back where you are most vulnerable, Dave, but you literally don't have a butt to stand on. There is no oxygen aboard, no danger in igniting hydraulic fluid and no danger in igniting JP fumes *provided that* fuel vapours are not present (noticeable). – And I'll agree with you that there are more than the desired number of occurrences on file where crews have noticed fuel fumes escaping from the "manhole cover" etc. But for those cases, the crew commanders have very explicit/implicit instructions to "snuff the smoking lamp" should fumes be detected. As a sometimes smoker I appreciate the inconvenience of having to sit beside a puffer in a cramped environment. I would hope personal considerations are made before the lamp is lit.

Incidentally, my own concern about smoking and the Sea King is the degradation to night vision experienced by the smoker. On my last cruise (to Rio – eat your hearts out, Air Force) two smokers and I (then a non-smoker) stepped out of the wardroom onto the "uppers" to watch for King Neptune. I was amazed at the inability of my fellow pilots to see guy-wires and deck fittings that to me were quite visible! (there was no sauce involved). Translate *that* to the back-night DDH Sea King ops and there may be a serious basis for further discussion.

Loose Articles. Certainly in the interests of flight safety we should not tolerate loose articles on board if they are deemed a hazard to our environment – especially in emergency conditions. Most crewmen would suggest you cannot provide stowage for everything that ends up being hauled ship-to-ship in the Sea King and this is understandable, however items that are regularly carried require proper stowage. We are aware that a stowage proposal is now being staffed – now that the "Bravo" aircraft cabin configuration is in being.

Billy Pugh Net. Right on! The only obvious advantage to this rope-net basket-arrangement is that it completely collapses when not in use and therefore takes no appreciable stowage space in the helicopter cabin. Trouble is – it collapses in the water as well when it contacts the surface, just prior to the rescue attempt! The double-lift harness you mentioned sounds preferable – provided the rescuee doesn't have a broken back, but then the saving of a life takes priority anyway. We have been told that the BFSO Shearwater is pushing for trials of this device in Spring '78 and we look forward to the results.

Mae West. The only complaints I can recall concerning snagging of the Canadian Mae West were voiced by back-seat crewmen when they were required to attempt water escape via that torso-sized cabin window in the old-model Sea King. Surely with the cabin configuration change, egress is now planned via the doors – save the pilots who have jettisonable windows. There simply should not be a snagging problem of any magnitude. By the way, I have at least two reports from Sea King types who wouldn't exchange their Canadian Mae Wests for your RN style – which they have used – for any price.

Long Sleeves Flight Deck Jerseys. You brought a salty tear to my eyes where you reminded us that coloured jerseys not only made it easy for the pilot to identify who-was-whom on-deck but more importantly facilitated deck-crew personal safety. If you can convince us that the green working shirt is unsafe, then perhaps jerseys may come back in style.

O.K. I've said enough. Perhaps in so doing I might elicit action/reaction from the current Sea King community.

Thank you again LCdr Raines for putting your concern and observations into words. This is exactly the type of article on which our Flight Safety system thrives, because if we recognize deficiencies but only pay lip service to them, we will never make the required changes.

10,000 Radar Approaches

On 14 June, 1977 MWO John Gillingham completed radar approach number ten thousand. The Musketeer aircraft was piloted by 1st Lt A. Van Der Poest Clement of the Royal Netherlands Air Force on exchange duties at CFB Portage and Capt R.C. McGraw of the Canadian Forces.

MWO Gillingham began his career as a Radar Controller at CFB Gimli in 1968. He has served at Lahr, Goose Bay, Val D'or and Trenton controlling a wide variety of aircraft with every type of radar in the Canadian Forces ATC inventory. He is presently the Warrant Officer – Air Traffic Control at CGB Portage la Prairie.

In theory there is no need for flight safety officers. Everyone knows that the Canadian Forces air branch has a big job to do just keeping all of our aircraft flying on such a wide variety of missions. Both aircrew and technicians are trained to do their jobs as effectively and as safely as possible. Leaders and supervisors are selected to ensure that this is done. Of course, people make mistakes and this sometimes leads to accidents or incidents. In any efficient organization, however, the causes of these occurrences are determined and suitable measures are put into effect to prevent future mishaps. Furthermore, hazards that can cause accidents are searched out and eliminated. What you don't need is someone like a flight safety officer interfering with your job and probably trying either to make you look bad or to interfere with a smooth running operation.

If that's the way you see flight safety, we both have a problem. You, because the record shows that we haven't eliminated all of the preventable accidents and hazardous conditions; we in flight safety, because we can't help you if you don't want help. The flight safety organization exists simply to provide specialized advice and assistance to operators and maintainers to do their jobs more effectively. If you think that mission accomplishment and a safe operation are conflicting requirements, you and your unit are living with problems that should be corrected. Perhaps, your accident record shows that; if not, you've been lucky. Flight safety is nothing more than an attitude towards your work. If you believe in it, it can help you; if not, good luck. You are going to need it!

COL. J.R. CHISHOLM
DIRECTOR OF FLIGHT SAFETY

Comments

The year 1977 draws rapidly to a close. Take a good look around you – specifically at your life and its relationship with "the Service." How have things changed since the day you first accepted "the Queens shilling?" For the better – for worse – how? Now, how have *you* changed in the same period? Has one change caused the other – and if so – which changed first? Has the change been beneficial or otherwise?

In todays society – and the military is after all only a small fragment of that society – but an integral part – we recognize the fact that changes have occurred within the last decade which have materially affected our collective way of life. Standards of morality have been relaxed in some areas, standards of education and behavior have in the eyes of many been lowered – yet few seem to have asked the basic question "Why?".

I suggest that in many cases change has crept into the situation not because of any conscious decision on anyones part – but because of a reluctance to criticize that which is trendy or "in keeping with the times" and thereby appear to be out of step.

Recently I watched a decision being made which I knew very well was utterly wrong – yet I stood back and silently allowed this to happen because it was not in my own area of responsibility. Shortly thereafter my conscience (quaint term eh?) began to bother me – and so I took the action I should have taken initially – I spoke out.

No, I am sad to report – the wrong was not made instantly right – in fact it may never be – but I at least have done my part in setting things right.

For the past few years I have fallen prey to the habit of criticising the Service for its apparent acceptance of lowered standards in many or all areas, for its lowered morale, for the loss of the sense of identity which once was ours. Now I am beginning to wonder if the problem isn't one of our own making.

"We have met the enemy and he is us" is the famous misquote from "Pogo." I think it is applicable to our problem. If I say to myself "They accept a lower standard now", when what I am really saying is "I will accept this low standard." – then who is in the wrong? – I have become "They." Dreadfully simple isn't it?

What is to be done about this problem?

Actually the solution is incredibly simple.

Each of us individually and all of us collectively must resolve to return to the higher standard of yesteryear – to perform personally up to that standard and to demand it from those around us. I'm not talking about haircuts and I'm not talking about shoeshines – I'm talking about preflight inspections, about brake changes, weapons uploads, drag chute packing and airspeed control on radar final. I'm talking about "Doing it by the book" – because that is the only way – the way it works best until – if need be – we change the book.

There is only one question which any of us need ask – ever – and that is "Am I doing this task to the best of my ability – and does that ability meet the standard. Not the "minimum standard" – a term created by those who apparently revere mediocrity – THE STANDARD – the highest and best – the one we seem to have lost.

Think about it – and in 1978 from the very first day – live by it. There is much to be gained.

Capt J.D. Williams

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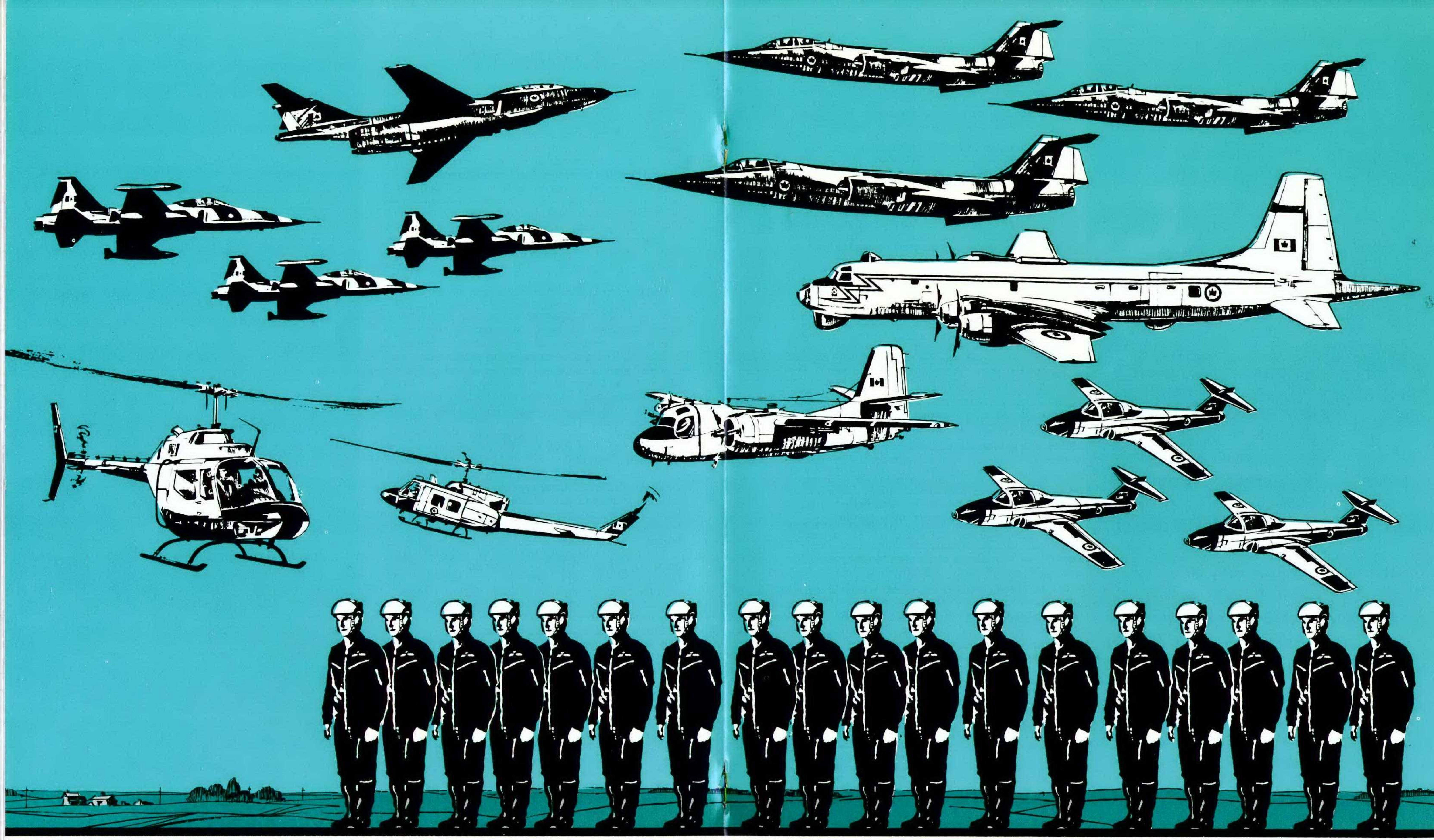

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