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Flight Comment

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Photo by Jacek Szymanski, Combat Camera, 26 April 2002

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The Commander's Views on Flight Safety

Since assuming command of Air Command and the duties of Chief of the Air Staff on 18 July 2003, I have been tremendously impressed with the work that our Air Force is doing. Every operational fleet — fighters, tactical aviation, transport/ SAR, maritime (both fixed wing and rotary wing) and Combat Support — have been heavily tasked on live operations; primarily the war on terrorism. This has placed additional demands on aircraft maintenance organizations, aerospace control units, air movements units and all Air Force support organizations. In addition, all training fleets and training schools are operating at or very near to capacity. In other words, the ops tempo throughout the Air Force is unprecedented at a time when our limited resources are clearly stretched. The good news is that this has presented the capabilities, professionalism and dedication of the Air Force to the Canadian public, our civilian leadership and our military allies. Rest assured that the feedback that we have received on your performance has invariably been very positive. The challenge is that this ops tempo, when combined with our resource shortages and relatively low experience levels, has presented us with a very demanding flight safety environment.

In an ideal world, there would be a number of ways in which this situation could be improved. Unfortunately, we do not live in a perfect world, and many of the factors are beyond our purview. In addition, some factors, such as experience levels, cannot be resolved in the short term. All this to say this challenging flight safety environment is not going to go away for a while, and we must focus on ways to mitigate this situation.

We have recently started to use risk management techniques whereby threats are identified, the level of risk posed by these threats is assessed and appropriate mitigation measures are developed. While risk management is excellent, it is not enough. In order to safely operate in the demanding environment in which we find ourselves, we must also foster a strong flight safety attitude. While there are many important elements necessary to achieving this objective, we would like to highlight two. The first prerequisite for a positive flight safety culture is teamwork. Stated simply, there must be trust in one's subordinates, peers and superiors, as well as trust in the organization itself, for the concept of a flight safety culture to work. Consequently, everyone on the Air Force team needs to work at strengthening and maintaining this trust. Secondly, while the Flight Safety team has a responsibility to develop a strong flight safety culture, the onus is actually on the chain of command. Without the full and active engagement of the chain of command, a positive flight safety attitude is unachievable. Therefore, commanders at all levels must actively work at improving our flight safety culture.

There is no doubt that Canada's Air Force is currently faced with unprecedented challenges. However, with our high quality people, we will meet these challenges. ◆

Lieutenant General Ken Pennie,
Chief of the Air Staff

Is Flight Safety suffering?

How many of our flight safety incidents and accidents are truly avoidable? I've asked this question many times and always seem to get the same response — a shrug of the shoulders and "All of them… I guess." This is an honest and accurate answer except for the "I guess" part. Why the doubt?

After a few years of Flight Safety Officer (FSO) duties in the multinational, flying world of NATO AWACS aircraft, I have heard "I guess" too many times and in too many languages. I suspect you are hearing it as well. With all of the effort put into Flight Safety (FS) programs and training, and with all of the lessons learned at so great a cost, why are so many people still so uncertain or unaware of FS itself?

Perhaps by asking yourself the questions we've been asking, you can determine if the FS awareness is suffering in your line, support, or Headquarters (HQ) unit:

- *Do we take FS seriously?* Naturally we do…but the real question is are we taking it seriously enough?
- *How healthy is your FS program?* Is it healthy enough to actually prevent accidents?
- *Are we training the right people as FS experts?* Does your unit have FS course graduates spread widely in all crew positions, from cockpit to tower to maintenance? Have you identified key personnel, ensured they attend a course and assume FS duties?
- *Do all personnel feel personally responsible for FS?* A safe and successful mission occurs when all the links in the FS chain hold firm. No matter how strong your program is, there is likely someone who believes that their job has no impact on FS.
- *Is the message getting out?* Is your FS strategy successfully ensuring that everyone hears or sees the message? Safety boards, training day briefings, websites, and seasonal emphasis on birds and winter ops work — but are they actually working at your unit?
- *Have you developed an FS frame of mind?* Is there mistrust in any FSO activities or are they viewed with contempt or seen as merely trying to apply blame after the fact? FS experts should be colleagues who teach and train — seen as allies instead of enemies.

By asking yourself these questions, perhaps you can improve your unit's understanding and awareness of the FS program. Hopefully, with work and a bit of time, you can help take out the guesswork, and we can get the answer we all want to hear: How many flight safety incidents and accidents are truly avoidable? All of them, period. ◆

Captain Bruce Barnes serves within the 1 Canadian Air Division Headquarters in Winnipeg.

DFSO 1 CAD responds:

These are excellent questions posed by Capt Barnes. If we are indeed asking ourselves these questions, then 'yes', the program is working. Every organization rewards actions in its own unique way. From there, one can observe the behaviours and norms which our 'reward culture' has fostered. In the perfect world, we want to reward people for decisions based on the principles of smart risk principles, i.e. that they are operating at an acceptable level of risk. If this is done, then many of the 'preventable' incidents will in fact be prevented! The essential point in all of this is that flight safety is a matter of leadership, both personal and organizational.

Lieutenant Colonel Gary Hook, Divisional Flight Saftey Officer

DFS COMMENTS

No guess work is needed to determine that Capt Barnes has put some thought into this issue and submitted an excellent, thought provoking article. In addition, thanks to LCol Hook for his amplifying comments. Well done to both of you... period!

Colonel Al Hunter, Director of Flight Saftey ◆

Troubled vision?

Several years ago, after having drank our suitable intake of wake-up coffee, my partner and I proceeded to begin our day's work. We loaded the section truck with all the Delmar equipment we knew we would require for our numerous morning loads. Of course, all went as planned and rehearsed. In virtually no time at all, we had the mighty T-Bird ready for its playtime with the Navy. All we had left to do was a continuity check on the launcher's cable-cutter cartridges. That sure doesn't take long to do for a couple of experienced young fellows, the likes of us!

The process is extremely simple, after all. One fellow disconnects the cartridge and hooks up a Fluke metre to the aircraft wiring; the other one sits just on his duff in the cockpit, waiting for the thumbs-up to hit the switch. Being the quicker of the two of us that morning, I jumped into the cockpit so I didn't have to crawl under the wing to disconnect the cartridge. It's much easier to climb up than crawl down — an excellent plan on my part, no doubt! My partner scurried under the port side and disconnected the cartridge, hooked up the Fluke metre and gave me the thumbs-up. I hit the switch; the metre said to my partner "one cartridge would have fired." I could relax again while he reconnected to the starboard side.

That is when things didn't exactly go the same way as we had practiced or performed in the past. He connected the Fluke metre's leads to the wiring of the cartridge, gave me the thumbs-up and watched our trusty Fluke expectantly for "one cartridge would have fired." The look on his face when I hit that switch, and fired the cartridge was unforgettable. Remarkably similar to the time I jumped at him out of a locked tool board, as a matter of fact! Total shock and disbelief bringing on the "Casper" appearance is what I like to call it. No one was injured.

I watched him get under the launcher, open the access panel, hook up the metre, and give me the thumbs-up. I fired. Why neither one of us realized that he had not disconnected the cartridge is beyond us, to this day. We were both watching… We certainly learned the importance of **seeing** rather than looking. ◆

Corporal Warren Wade serves with 410 Squadron, 4 Wing Cold Lake.

Photo by Sergeant Jeff de Molitor, Arabian Gulf Region, 23 April 2003

Weather OR NOT?

Canada is quite unique in regards to its weather. We operate our aircraft from one extreme to the other; the coldest to the hottest and most humid conditions of anywhere in the world. It's amazing, though, how some of us forget this. We take our aircraft from a cold, dark, wet winter and deploy to hot and humid climates. The aircraft starts to display unusual operating characteristics, and some people are quick to blame the climactic conditions.

Case in point: an Aurora deploys to Naval Station Roosevelt Roads, Puerto Rico. The temperature on the ramp is +30ºC (no hotter than Canada in the summer). During the engine start procedure, the Auxiliary Power Unit (APU) is used to pressurize the bleed air manifold and thus start the first engine. A minimum of 25 psi is required in the manifold to effect a successful start; any lower pressure 16% rpm is an immediate "stop start" by the Flight Engineer. This procedure is highlighted in the Aircraft Operating Instructions (AOI's) as a "caution."

Low manifold pressure can cause hot starts, slow starts, stagnated starts or stalled starts. During our starts, we had a manifold pressure of 19 psi, thus AOI procedures were carried out. Discussions then ensued on the flight deck as to what the problem may be. Some crewmembers blamed the hot weather because they had the same problem in other hot climates.

I had the experience operating the aircraft in Guam at +40ºC without any manifold problems. Also, we operate these airplanes across Canada, in the summer, in very humid, +30ºC to +40ºC temperatures without any problems. Another interesting point is that, on the ramp, next to us, there were a Dutch P-3, another Canadian Aurora and a squadron of US Navy P-3s, and neither one of them had manifold pressure problems during starts!

Our aircraft was telling us that it was sick. Without getting technical, our problem was somewhere in the bleed air system or with the APU. We were not out of the exercise because we had another method to start the engines. An external air-start cart was used, resulting in success.

The point is that we need to remember where we come from, where we operate our aircraft and not to be so quick to blame weather or temperatures. I am not saying that weather extremes don't cause problems, but let's listen to the air-planes; they have an amazing way of telling us when they are not well. ◆

Anonymous

Innocuous FOD

Goose Bay's 5 Wing has long been an important and active military airfield. In order to gather imagery to be used by the Wing, I was on the south ramp on foot, dragging two or three cameras with me. I had entered the ramp by the German gate, where my staff car was parked. I felt that being out on foot made it easier to get the shots I required. I had photographed some German Air Force (GAF) Tornado and Phantom jets, and I was making my way towards the British Royal Air Force (RAF) hangar that they shared with the Italian Aeronautica Militare. There, I knew, I would get some good shots of the Tornado and Harrier. I passed through an area that is frequently used to park aircraft maintenance support equipment (AMSE) and aircraft, and that was when I saw, or rather felt, the clevis pin. It rolled under my boot and wheeled away across the concrete.

Remembering the Wing Flight Safety Officer's (WFSO) constant harping about foreign object damage (FOD), and the dangers it represents to aircraft and people, my first thought was that I would have to find that pin and get it off the ramp. I cursed under my breath and then hunted around for a few moments before locating my prize. It was about three inches long and 3/8 of an inch thick. At one end it had a small head, not much larger than the body of the pin itself, and a small hole for a cotter pin at the other end. I looked about for one of the red 45-gallon FOD drums to drop it into, but the nearest one was over by an access road, several hundred metres away. Dragging loads of camera gear and on foot, I was not looking kindly on trudging over to the access road to drop a pin in the garbage.

Knowing that there was "no way an airplane could ever suck up this thing from the infield," I cocked my arm back to fling the clevis pin into the grass. The pin would be off the concrete, the south ramp would, again, be FOD-free, and all would be right with the world. As my arm started forward, I thought to myself: "I wonder what this pin is from, anyway." I checked my throw, suddenly desperate to hang onto that pin. What if this pin was used to retain some vital component from one of the tankers that routinely parked here? The GAF ground crew behind me must have thought that I was trying to rehearse some elaborate dance step as I tried desperately to stop myself from throwing the clevis pin away while remaining standing, and not eating a camera.

With a heavy sigh, I started towards the RAF hangar. Once inside, I talked to the RAF Flight Safety Officer, explaining to her where I had found the pin and pointing it out on a map. She turned it over in her hands and explained that all the various Allied engineering and maintenance staffs would examine the pin and try to find out its purpose and origin. "Thanks for bringing it in!" she said brightly, "unfortunately, most people discard these types of objects that are found on the ramp"

Would she have thanked me if I had just pitched that clevis pin into the infield grass and forgotten about it, as I had originally planned? Not likely. More importantly, would I have thanked myself if this had been part of some vital aircraft component or if I had endangered someone's life because I was too lazy to do the right thing? Not likely. ◆

Captain David Muralt serves as a Public Affair Officer at 1 Canadian Air Division Headquarters in Winnipeg.

Photo: Captain David Muralt

From the

Flight Surgeon

Welcome to the first of a new regular column which I hope will appear in every issue of *Flight Comment*. It is my intent to bring up relevant aviation medicine topics in each column and discuss any military wide Flight Safety issues from an aeromedical perspective. Some of you in the Aviation/Flight Safety community may not be aware that the Flight Surgeon position has been reestablished at DFS after an absence of approximately five years. Both the CF Operational and Medical organizations recognized that the lack of direct Aerospace Medicine support was a major deficiency in supporting the safe flying operations of the Air Force.

On that note, it has come to DFS's attention that, due to the present shortage of Flight Surgeon's at several Wings, aircrew **may** be grounding/ungrounding themselves. We are all aware that there has been several changes within the Medical Units at all Bases/Wings, and there is often only one Flight Surgeon at large operational bases. However, it is still a violation of CF Flying Orders for aircrew to self-medicate or unground themselves. It is imperative that, if there is insufficient Flight Surgeon support at your Wing, you bring this deficiency up (preferably in writing) to your CO and/or U/WFSO who should then forward it to your Wing Commander. The Wing Commander could then discuss the situation with the Clinic Manager of the Medical Unit who is in a position to rectify the situation.

Folks may not be aware, however, the restructuring of Medical Units has resulted in Units becoming lodger units at each Wing and, as such, do not directly report (in a chain-of-command sense) to the Wing Commander. An administrative Clinic Manager, i.e. a non-medical officer, now commands the Clinics, and the Wing Surgeon now reports to the Clinic Manager. It is for this reason that written concerns forwarded through the Flight Safety chain to the Wing Commander could have a significant impact on Flight Surgeon support at your Wing. If this is an issue at your Wing, I encourage you to follow through and report this potentially serious deficiency through your Flight Safety chain.

I look forward to continuing this column in upcoming issues. Since this is my first attempt, any feedback and/or topic suggestions would be greatly appreciated. Any issue deemed to be of general interest to the aviation community will certainly be considered for publication. Please feel free to contact me. I can be reached on the DIN at: Sardana.TM@forces.gc.ca ◆

Major Tarek M. Sardana, DFS 2-6, Flight Surgeon

Aircraft – Vehicle CONFLICT

Over the last 5 years, the Flight Saftety Information System (FSIS) database shows an average of 100 runway incursions per year, with a peak of 122 incursions in 2001.

Reprinted with kind permission of System Safety, Civil Aviation, Transport Canada.

"Golf-Alpha-Bravo-Charlie, cleared to land runway 05. Caution — maintenance crew on taxiway alpha, 100 feet from runway 05."

A basic requirement for all pilots, air traffic controllers, flight service specialists, airport managers and airside vehicle operators is an ability to make decisions and exercise sound judgement. Aircraft – vehicle conflict is a major concern to everyone, at both controlled and uncontrolled airports. The increase in incursion frequency and the potential for resulting damaged equipment, serious injury, or loss of life is too great to ignore.

What can you do?

Pilots

- Report position and intentions on appropriate frequencies.
- Acknowledge or read back instructions using proper phraseology.
- Ensure you understand instructions; don't assume.
- Read back all hold or crossing instructions.
- Ensure flight path is, and will remain, clear before taking off or landing.
- If in doubt — hold your position or go around as applicable.
- Expect the unexpected.

Air Traffic Controllers, Flight Service Specialists

- Give clear and concise instructions and advisories to vehicles and aircraft.
- Use proper phraseology.
- Advise aircraft and vehicles early of any possible conflict.
- Remind pilots and vehicle operators often of potential conflict.
- Repeat information as often as necessary to ensure it is understood.

- Implement a system to remind yourself of the locations and intentions of all traffic.
- Remember — safety takes priority over operational convenience.

Vehicle Operators

- Know aircraft control procedures and approved areas for vehicle movement.
- Ensure you have the authority to operate a vehicle on the airside of the airport.
- Ensure aircraft manoeuvring areas are free of potential conflict before entering.
- Keep a visual look out as well as monitoring the radio and communicate often with ATC/FSS.
- Read back all hold-short instructions.
- If in doubt about an instruction or radio transmission request "Say again."
- Check an area prior to entering your vehicle to ensure a complete, unobstructed view.
- Ensure your rotating lights and other safety equipment are functioning.
- Vacate the runway immediately if an aircraft is observed or reported in the circuit.
- Remember, aircraft are not very manoeuvrable, and the pilot's visibility is limited, as is the controller's and flight service specialist's.

Airport Managers

- Review and revise training plans for vehicle operators, as required.
- Ensure all operators are properly trained and kept aware of changes to procedures.
- Check security gates often to ensure only authorized vehicles and personnel have access to the airside.
- Check runway and taxiway signs to ensure adequacy and visibility. ◆

The Editor's Corner

Cool acknowledgement

In the Fall 2003 *Flight Comment* issue, we gave credit to "*Vortex*" magazine for the wind chill poster reproduced. In fact, Environment Canada (EC) created the charts based on a wind chill study done by Defence Research & Development Canada (DRDC), formerly DCIEM, in Toronto, Ontario. The revised index for the wind chill charts is the result of an international collaboration effort but relied heavily on the research done by Randall Osczevski and Michel Ducharme of DRDC and Maurice Bluestein of Purdue University. The most current wind chill charts can be found on the EC site at http://www.msc-smc.ec.gc.ca/education/windchill/index_e.cfm

Flight Comment Editor

E-mail from Captain David Nelson, J3 NDCC Analyst (Balkans)

Sir, please note; on page 29 of subject regarding a CC130 CFIT, the English definition for the abbreviation of MANPADS is incorrect. It should be Man Portable Air Defence System vice man portable anti-aircraft devices.

Best regards,

Editor responds

David, good observation! You are using your analyst expertise skillfully. We stand corrected.

Editor's Departure

Captain Newman will retire from the Canadian Forces on 13 May 04. We would like to thank her for her excellent work as the Editor of *Flight Comment* over the last three years and wish her all the best in her future endeavors. ◆

Dynamic ROLLOVER

"Dynamic rollover may cause a helicopter to be irreversibly committed to rolling over at angles of less than 10 degrees, depending on the rate of roll. The principle contributor to this condition is the build up of angular velocity of the helicopter mass about the skid or wheel in contact with the ground. Contributory factors are the angle of slope of the ground and the lateral control authority available to the pilot. Other factors which affect the likelihood of dynamic rollover are the total mass of the helicopter, the distance of its centre of gravity from the undercarriage and the tail rotor force which adds to the rolling force." [1]

Article reproduced from Aviate 2 of 2003 with kind permission of United Kingdom Defence Aviation Safety Centre.

Over the last 18 months or so, three British Sea King helicopters have crashed due to dynamic rollover. This is not a new phenomenon. However, because the instances of this happening over the last twenty years have been few and far between until recently, the awareness of this danger seems to have dimmed into the collective subconscious. When airborne, a helicopter can cope with large cyclic control inputs; however, on the ground, rather serious problems can easily occur from slight control inputs that cause small angles of tilt on the main rotor disc. What is also rather dangerous is that the human physiology does not easily pick up small motion cues, and an unaccelerated angular motion disturbance can go unnoticed for quite some time until it has reached the point where it is potentially perilous. Because movement is often picked up through visual cues before the other senses, if you are operating at night and possibly using optical night vision devices, much of the normal movement prompts are degraded. If you are distracted or not fully concentrating when you lift off, you can easily be caught off guard.

"The crucial time between a safe take off and rollover can be measured in milliseconds, and once it starts, the process tends to become inevitable."

Most American-designed single rotor helicopters have their rotor blades turning in an anti clockwise direction when viewed from above, and these helicopters tend to hover with the left landing gear low. This is caused by the main rotor being tilted to the left to counteract the rightward thrust being generated by the tail rotor. The degree of fuselage tilt depends on the hinge offset in the main rotor hub and the vertical position of the tail rotor in relation to the main rotor, as well as the aircraft's centre of gravity.

When the helicopter is in the process of lifting off the ground and into the hover, the total rotor thrust is increased. This also increases the tail rotor thrust, amplifying the turning moment (See Figure 1). In our case, the rotor flapping will roll the helicopter to the left if no cyclic input is made to counter this effect. The more you raise the collective lever, the more you will increase the rolling moment. Normally, the pilot subconsciously corrects for the roll, centring the rotor disc so that the aircraft rises vertically away from the surface, albeit with the fuselage hanging left side low. However, some pilots may inadvertently input too much right cyclic on the ground in order to correct for this tendency, setting up a rolling moment in the opposite direction (See Figure 2). If the helicopter is allowed to continue to roll on its landing gear, the stabilizing moment caused by the centre of gravity, which is normally acting down through the fuselage between the undercarriage, goes rapidly to zero as soon as the centre of gravity moves over that wheel or skid (See Figure 3).

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[1] *Quoted from AP 3456*

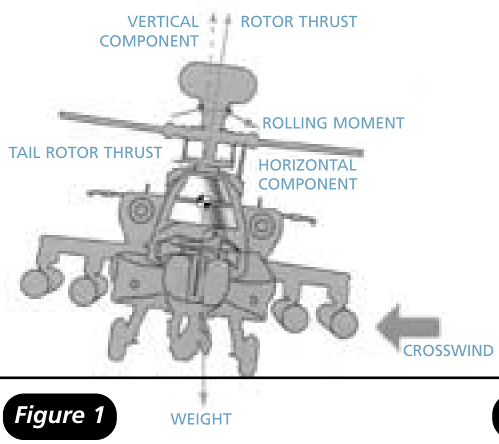


Figure 1

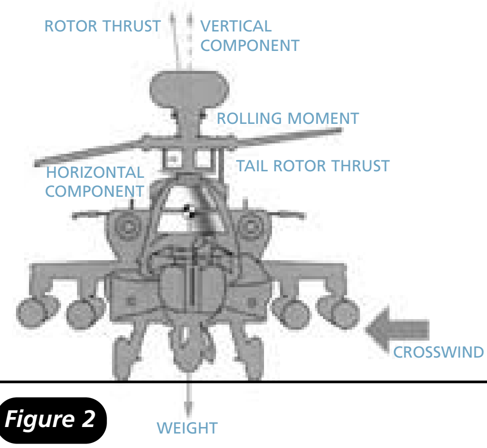


Figure 2

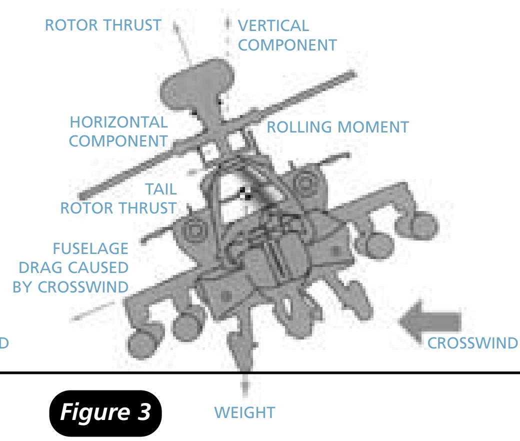


Figure 3

Of course, increasing the all-up weight will increase the overall torque required, consequently increasing the tail rotor thrust and thereby increasing the tendency of the aircraft to roll. If the centre of gravity is allowed to get close to the lateral limit, you can clearly exacerbate the rolling moment. A high centre of gravity makes the helicopter less stable in this condition. As pitch is increased, the induced flow from the main rotors is dispersed outwards when it comes into contact with the surface. Should there be a cross wind, the vortex created from the into-wind blade can cause the downwash to recirculate, reducing the lift in that part of the disc. This loss of lift requires an increase in power to the main rotor, which also increases the tail rotor thrust, amplifying the existing problem.

Onboard ship, the movement of the vessel or the disturbed air flowing across the deck can exacerbate the conditions required to produce dynamic rollover. Lifting off from sloping ground is also problematical. In this situation, the rolling moment of the fuselage has already begun as the aircraft lifts the down-slope gear from the ground. If the movement is sharp or poorly controlled, the pilot is already inducing the danger but if, as a result of this mishandling, the fuel in the tank sloshes across from one side of the aircraft to the other, the lateral centre of gravity can shift markedly and aggravate the roll. Naturally, an aircraft with a narrow track landing gear is much more prone to dynamic rollover than one with a widely spaced undercarriage. Furthermore, if the pilot inadvertently tilts the rotor prior to lift off against firm oleos or a springy undercarriage, he is setting up an adverse condition from the moment he unsticks the helicopter from the ground.

As every student knows, the classic situation that causes rollover is when one wheel or skid is either trapped or stuck to the ground by mud, ice, tie-downs or anything else which can manage to lash one side of the undercarriage to the surface. In this case, the helicopter pivots around the fixed anchor point, in the manner of a hinge, until the rotor blades come into contact with the surface.

An unfortunate instinctual action by most pilots when they perceive the roll starting is to raise the collective faster in an attempt to climb into the hover. However, all they achieve is to accelerate the rollover, since they are increasing the total rotor thrust that is causing the problem in the first place. Applying opposite cyclic may also seem like a good idea, but the slowing and reversing of the rolling motion takes time, and the speed that the rollover occurs after onset is faster than most pilots' reaction. The crucial time between a safe take-off and rollover can be measured in milliseconds, and once it starts, the process tends to become inevitable. That said, the only sensible corrective action is to lower the collective lever as soon as possible when the condition is first perceived.

Dynamic rollover can catch any helicopter pilot off guard. Although Sea Kings seem to have been rather accident prone recently, if you are about to get airborne in a narrow track, wheeled helicopter with firm oleos, which has a high centre of gravity, and you are taking off from sloping ground with a crosswind, at night using optical devices, please concentrate very hard on your actions. ◆

FSIS REPORT #88339

On 10 February 1984, the Kiowa helicopter landed in a field when freezing drizzle was encountered. After touchdown with partial power on the collective, the pilot reached forward to change radio frequency, inducing a left cyclic input which resulted in dynamic rollover. The helicopter was destroyed, with the pilot and passenger escaping uninjured.

Birds

In 2002, Transport Canada commissioned a study to assess the risk associated with aircraft flying between 3000 and 10000 feet, at speeds above 250 knots (kts).

As a result, the airspeed limitations in the Canadian Aviation Regulations (CAR) 602.32 are in the process of being amended.

Of note, the new regulations will no longer include the exception that allows aircraft to exceed 250 kts on departure.

This does not affect speed limitations imposed by the General Pilot Handbook 204 at the moment.

Big birds… little birds… fat birds… skinny birds… red birds… blue birds…

No matter what they look like, birds have always posed a flight safety threat to aircraft.

Ever since man took to the skies, he has been competing with birds. Did you know the first human fatality as a result of a bird strike occurred way back in 1912? It happened to Cal Rogers, the first man to fly across the US. A seagull jammed his flight controls, and he crashed off the California coast and perished.

Since 1950, there have been over 350 serious military aircraft accidents documented — including 165 fatalities — directly caused by bird strikes.

All aviators must protect themselves against the threat of bird strikes.

Consider this: there are no consistent worldwide standards for reporting bird strikes, nor is it mandatory. Some countries are even reluctant to publish their bird strike statistics because of the potential liability and negative public sentiment. It is commonly accepted among wildlife management experts that only 20–30% of bird strikes are ever reported.

Here are some general facts about birds:

Populations

It is estimated that, in North America, there are more than 20 billion birds, and that number is on the rise. Flocking birds — particularly gull and geese — populations are most notable. An example is the ring-billed gull of the Lower Great Lakes region. Their population has been steadily increasing by 12% per year since the mid 1970s. Also the number of Canada Geese has tripled from 2 million to 6 million birds between 1990 and 1999.

Daily activities

Over the course of the day, birds are generally most active in the early mornings (from sunrise to 11 a.m.) and early evening. There are exceptions, however, such as owls and nighthawks, as well as some other migratory species.

Altitude

The majority of birds fly between 30 and 300 feet above ground level (AGL), with significantly reduced occurrences of flight above 1000 ft AGL. This explains why over 80% of bird strikes occur below 300 ft.

However, don't be fooled. A Boeing 747 struck a vulture off the west coast of Africa at Flight Level (FL) 370. In another incident, a pilot reported a flock of migrating swans at FL270 between Iceland and Western Europe. In Europe, radar reports indicate that most migrating birds fly between 5000 and 7000 ft AGL. However, lower and upper limits of 1600 and 11500 ft have been documented.

Migration

Almost 80% of North American birds migrate each spring and fall. The majority of these birds follow established migratory routes and fly in flocks. These routes are published in the Aeronautical Information Publication and are also available on the Transport Canada website http://www.tc.gc.ca/CivilAviation/Aerodrome/WildlifeControl/AIPHazards.htm.

Weather Influences

Bird activity is greatly affected by the weather. During periods of extreme weather, such as a heat wave or cold snap, birds tend to be less active. However, as soon as the weather improves, bird activity increases.

Bird/Aircraft Interaction

Generally, birds have sufficient time to avoid aircraft — if they are travelling at less than 90 kts. After that … the operative word is feathers! When birds encounter aircraft their reactions are unpredictable. They generally dive away from an aircraft, but may also try to out-fly it, fly away at a right angle, or even attack. Their reaction depends on a variety of factors, such as:

- Species, age and condition of the bird
- Time of year and weather conditions
- The bird's familiarity/experience with aircraft and airport environment

The Damage

Aircraft are generally designed to withstand a single bird strike without significant performance degradation. Unfortunately, most birds have flocking tendencies. This means that the odds of multiple bird strikes are greater. On 22 September 1995, an AWACS aircraft departing Elmendorf AFB, Alaska, crashed after striking about three dozen Canada geese.

The impact force from a bird strike is proportional to the mass of the bird and the square of the impact speed (E = mv2). ◆

Approximate bird-impact forces (lbs)

	100 kts	250 kts	400 kts
Ring-billed gull (1.5 lbs)	2 775	17 343	44 399
Canada goose (15 lbs)	9 118	56 985	145 883

Birds of a feather... we all must flock together... ***SAFELY!!!***

References:

– Transport Canada (http://www.tc.gc.ca/CivilAviation/Aerodrome/WildlifeControl/menu.htm)
  - Sharing the Skies — An Aviation Industry Guide to the Management of Wildlife Hazards
  - Airport Wildlife Management bulletins
  - Bird Avoidance Brochure

– http://wildlife-mitigation.tc.faa.gov/
– http://afsafety.af.mil/afsc/Bash/home.html
– http://airsafe.com

Wildlife Control Program

The key element in reducing the risk of bird strikes on and around airfields is to have a comprehensive wildlife control program. This is called the Bird Strike Prevention Program (BSPP) in the A-GA-135-001/AA/001, which directs that a BSPP for an aerodrome must have, as a minimum, the following objectives:

- Management of the environment
- Dispersal of birds
- Educating the aircrew
- Reporting bird strikes and bird sightings.

Bear in mind that each BSPP is unique, as no two airfields experience the same wildlife problems.

Also, from a global perspective, Transport Canada, other international agencies and the industry use data collected (yes, ours too) to produce not only statistics, but also new strategies in reducing bird strikes.

Managing the aerodrome environment requires two methods: passive and active. Each is equally important.

Passive techniques are long term and primarily deal with the aerodrome environment and its surrounding areas. It can include methods such as cutting grass to a specific length, removing trees, underbrush and standing water, or even fencing.

For example, at 5 Wing Goose Bay, some areas of the aerodrome have been over run by partridgeberries and blueberries, which of course attracts birds in late summer. This year, these bushes are being scraped up and the areas reseeded with grass.

Active techniques would include activities such as scaring, harassing, removing or even destroying wildlife.

An example from 4 Wing Cold Lake is its ongoing and significant problem with gulls. During the summer, grass-hoppers attract gulls. In fact, in 2001, there were over ***6000*** (!) gulls observed on the airfield. In 2002, the aforementioned active techniques were employed to reduce the grasshopper population. Gull sightings were significantly reduced to just over 300, a 95% decrease in just one year!

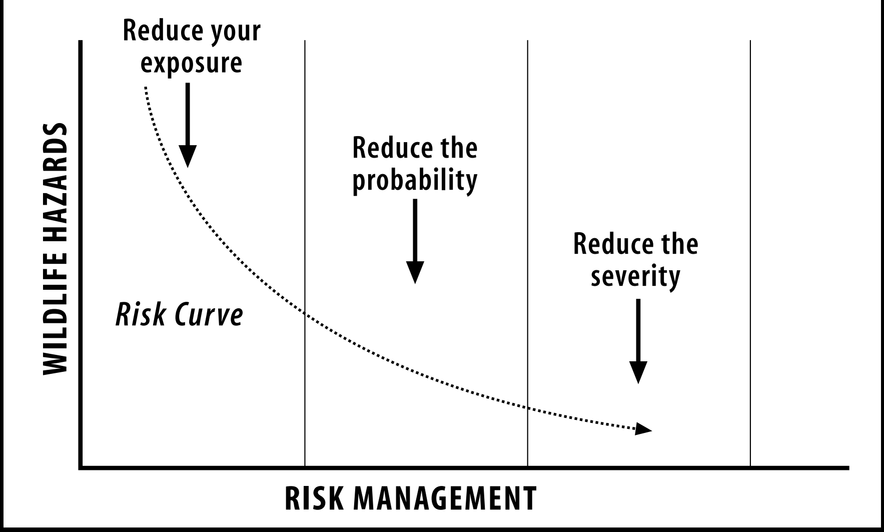
Wildlife Control Programs are an essential element in reducing the risk of bird strikes with aircraft. ◆

Research and article by Captain Andrew Tissot van Patot, DFS 2-2-3 of the Directorate of Flight Safety.

How can the risk of bird strikes be reduced?

By using a risk management process, it is possible to see more clearly how the risk of bird strikes can be reduced. As the graph below indicates, reducing the exposure to the bird hazard will achieve the greatest reduction in risk.

We all play a role in reducing the risk of bird strikes.



Reduce your exposure…

- Fly at a higher altitude (above 10 000 ft),
- Avoid:
  - Inland waterways and shallow estuaries
  - Shorelines and off shore islands
  - Wildlife sanctuaries, landfill sites and fish plants
  - Flying during peak bird activity times
  - Migratory routes during the busy season
  - Flying at night during peak migration periods
- Check
  - AIP for bird migratory routes and seasons http://www.tc.gc.ca/CivilAviation/Aerodrome/WildlifeControl/AIPHazards.htm
  - US Bird Avoidance Model (BAM) for bird activity in the USA http://www.usahas.com/bam
- BIRDTAMS for migratory bird forecasts for Northern Europe https://www.notams.jcs.mil/common/birdtam.html

Reduce the probability…

- Plan departures/arrivals to avoid bird concentrations
- Operate aircraft landing lights when below 10 000 ft
- Fly at a reduced speed (give the bird a chance to get out of the way)
- Increase rates of descent where practical
- Report bird sightings by advising ATC and other aircraft
- Disperse birds away from approach or departure flight paths

Reduce the severity…

- Fly at a reduced speed
- Use windshield heat or defrost below 10 000 ft
- Keep visors down ◆

Types of fog

Article reproduced from Bulletin de Sécurité des Vols, no. 215, Armé de l'air française (2003/2), with kind permission of the Chief of Flight Safety.

Definition. Fog consists of microscopic droplets of water that are suspended in the air and reduce visibility. To be more precise, the term "fog" is used when visibility is less than 1 km, while the term "mist" applies when visibility is between 1 and 5 km.

Process of fog formation. What are the three main processes, that lead to the formation of fog?

- Evaporation. Water in liquid form (e.g. at the surface of a lake) evaporates and raises the partial pressure of the water vapour in the air above it. Condensation occurs and fog forms as point M1 (see Figure 1) crosses curve EW along the path indicated ①.
- Cooling. A very moist air mass, point M2, on the gas side of curve EW, cools and causes the water vapour to condense into fog along the path indicated ②.
- Mixing. In this process, two moist air masses, represented by points M3 and M'3, combine. The air masses are almost saturated and at different temperatures. As a result of the mixing of the air masses, the point representing water vapour can move above the EW curve along the path indicated ③, and fog may then form by condensation.

Types of fog. Different types of fog are possible, depending on the source and the cause. Soe of these fogs are explained below:

- Fog that forms by evaporation: surface fog and frontal fog.
- Fog that forms as a result of cooling: upslope fog, advection fog and radiation fog.
- Fog that forms, as described above, through the mixing of moist air masses of different temperatures.

Frontal fog

Conditions favourable to its formation: Evaporation of relatively warm rain.

Formation process: When a warm front arrives in a region, rain falls from intermediate clouds. As this warm rain passes through the cold air mass ahead of the front, it evaporates to form fog. This type of fog is seen in winter when winds are low (see Figure 2).

Favourable weather patterns and features: Favourable weather conditions can occur in fall or winter, when a disturbance penetrates a cold continent. Frontal fog forms under the following conditions:

- the temperature of the cold air is markedly colder than the temperature of the warm air,
- the pressure gradient is weak, and
- the surface of the front is close to the ground.

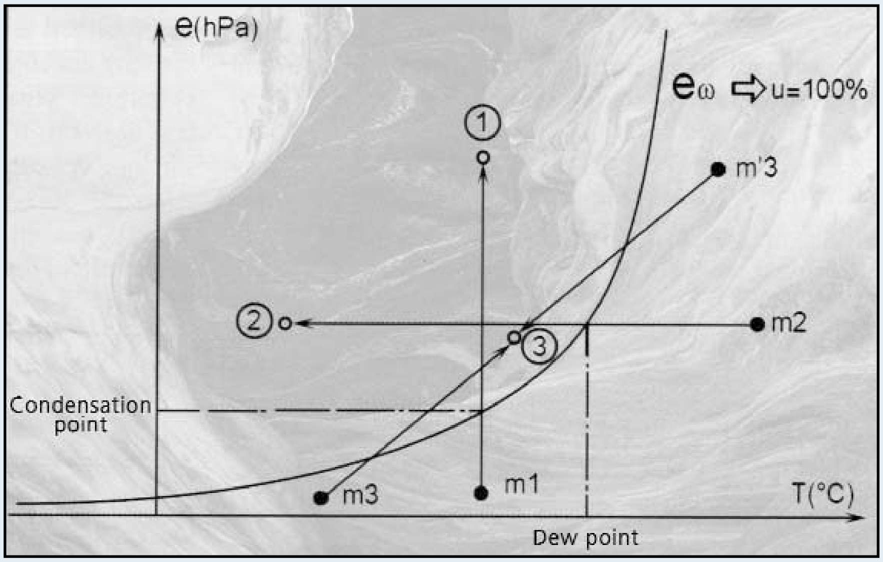


Figure 1: Process of fog formation

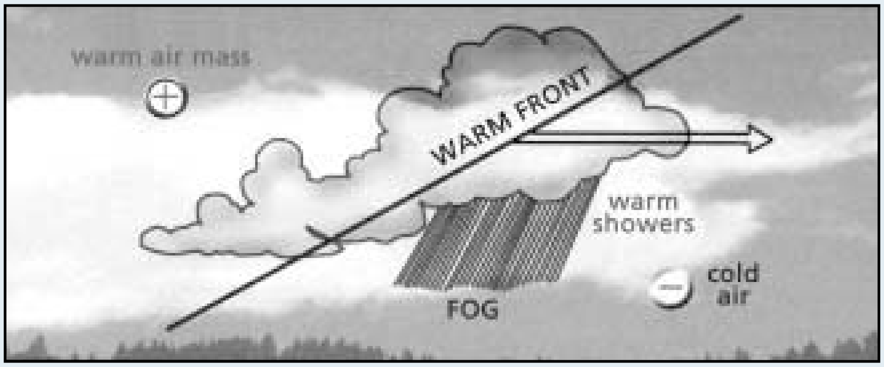


Figure 2: Example of frontal fog

Advection fog

Conditions favourable to its formation: Passage of a warm, humid air mass over a cold surface.

This fog requires:

- a vertically stable air mass,
- light turbulence, and
- a substantial temperature difference between the warm air and the cold surface.

Formation process: When a warm, moist air mass moving slowly with (winds of less than 10 knots) moves over a cold surface, dense fog forms at the base of the air mass, where it then cools. This fog is slow to dissipate and may persist for several days. Only a shift in the wind can cause it to disappear. This type of fog is particularly common in coastal areas.

Favourable weather patterns and features. This fog forms:

- along coastlines in early winter, when warm, moist winds from the sea blow across a cold continent (e.g. winds blowing across Europe from the west and southwest), as shown in Figure 3,
- along coastlines in summer when cold, moist winds from the sea blow across a warm continent, or
- when two ocean currents of different temperatures coexist; the result is the type of fog typically seen in Newfoundland, where the cold Labrador Current is in contact with the Gulf Stream.

Advection fog is widespread and slow to dissipate. In fact, the fog will not lift until the phenomena that caused its formation disappears or, in other words, until there is:

- a reduction in humidity (a possible, but weak element of change), or
- a warming of the cold surface; although this is really the only element of change that varies significantly, it is still weak, which explains the slow progress of these fogs.

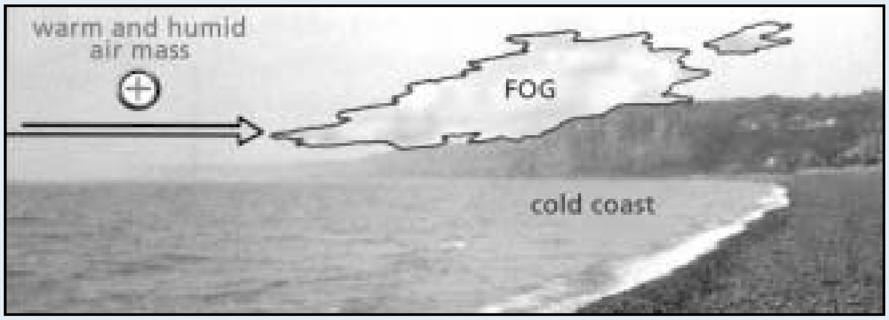


Figure 3: Example of advection fog

Radiation fog

Favourable weather patterns and features. High relative humidity and low winds combined with clear or lightly clouded conditions that are favourable to nighttime radiation.

Formation process: When the sky is clear, terrestrial radiation is not compensated by radiation emitted by clouds, which actually store and re-emit heat themselves. As a result, the ground cools and the drop in temperature is transmitted to the lower layers of the atmosphere if the air above the ground is moist and calm. This is particularly common in maritime, anticyclonic air masses characterized by light turbulence or low winds. The layer of air is thus cooled as its relative humidity rises, and it can reach saturation if the temperature drops sufficiently.

If the wind is too calm, the drop in temperature does not reach higher levels, and only the layer of air closest to the ground cools; the result is the formation of hoarfrost or dew. If the wind is too strong, a thicker layer of air is agitated, and the cooling effect is transmitted too high and is too small to cause saturation.

Favourable weather patterns and features. This fog forms:

- in weather conditions characterized by a weak, anticyclonic gradient,
- in fall, winter or early spring, when nighttime cooling is significant, or
- in flat-lying areas, lowlands, valleys.

These fogs remain close to the ground and disappear as a result of daytime heating (slowly, at times, because the fog reflects the sun's rays) or if a wind builds up. ◆

Landing on FUMES...

"OK, First Officer (FO), the Patrick Air Force Base (AFB) weather is below landing limits. Let's talk to Air Traffic Control (ATC) and request routing to our alternate, Orlando, for landing." ATC responds that Orlando weather has gone below landing limits as well, despite the "better than alternate" weather forecast. "Alright, so what now?"

Serious concern (just short of panic) is setting in. With our destination and alternate destination weather below landing limits and our fuel limited, our options were becoming critically limiting. ATC advised us that the closest airfield with suitable weather for landing was Miami. The flight engineer (FE) verified our available fuel and determined that we could make this airfield, but only just. Direct routing was requested and a low fuel emergency was declared. When we were on final approach, to say our hearts were in our throats would be an understatement. The less than exact fuel gauges read empty, but the engines kept operating. We sighed with relief as the four-engine jet touched down onto the runway. "We've made it." On the landing roll, just as we are getting ready to taxi clear of the runway, two fuel-low lights illuminated. This was positively one of the worst situations I had experienced, but one that could definitely have had a more disastrous outcome.

So, how did I allow myself to get in this situation? It all started at 4:30 in the morning, when we reported for duty at the Command Post (CP) in Charleston AFB, where I was employed as an exchange duty pilot on the C-141 Starlifter. The day's mission included flying to Patrick AFB to deliver some cargo, refueling, and then proceeding on to Ascension Island for crew rest, before returning to Charleston the following day. The FE and loadmaster (LM) went out to pre-flight the jet, while the FO and I conducted the standard flight planning duties. Nevertheless, this was not to be a standard day. Charleston AFB weather (including the east coast down to central Florida) was reporting reduced visibility and ceilings with fog. This fog, however, was forecast to burn off with the rising sun. Since Orlando was farther inland, this forecast weather was well above alternate limits for the entire period. Due to the adverse weather conditions at our departure and destination airfields, we elected to take a little more fuel than the instrument flight rules (IFR) minimum requirement, although taking too much extra was frowned upon by the system for cost saving reasons. The CP accepted the requested fuel load, and the flight plans were filed, so the FO and I proceeded to the aircraft. This procedure proved to be more challenging than normal since the visibility was barely fifty feet in heavy fog.

The FE and LM had completed their pre-flight checks, so once the crew briefing was completed, we proceeded to our flight positions. Once in the cockpit, it quickly became apparent that the visibility hadn't improved at all. On contacting the CP, they directed us to go ahead and start up since the meteorological office was still forecasting the weather to improve shortly, in time for take-off. They also mentioned that we needed to depart on schedule so that we would complete the day's mission within our crew day. Wanting to get the job done as briefed, we pressed on. When the pre-taxi checks were completed, the visibility was still so poor that we needed a "follow-me" vehicle to guide us to the runway holding point. We did this because the Command Post insisted that we be in the "ready to launch" position as soon as the weather lifted. Well, there we stayed, in the "ready to launch" position, for the next 40 minutes, waiting for the weather to lift. According to the weather office, this was to occur "at any moment." After this unplanned burning of fuel, we checked the destination and alternate destination weather once more. It hadn't changed since our flight planning, time and we determined that we had ***exactly*** the required IFR fuel for the flight-planned route. We thus launched for Patrick AFB, and the rest is history.

Are there any actions that I would do differently in the future? You bet… "Once bitten, twice shy." I will never again be inhibited about determining my fuel load when adverse weather is in question. Also, the days of letting someone else on the ground make pilot decisions for me are over. Running low on fuel leaves such a petrifying, long-lasting effect that I have never let this happen to me again. By the way, I still regret not having filed a Flight Safety report. ◆

Lieutenant Colonel van Haastrecht serves as the Central Region Cadet Air Operations Officer.

Old Corny Clichés

Corporal Greg Ewing, a member of 427 Tactical Helicopter Squadron, refuels a Griffon helicopter during a "hot refuel" at Camp Black Bear in Velika Kladusa, Bosnia-Herzegovina.

Photo: Master Corporal Paul MacGregor, Canadian Forces Combat Camera, 31 October 02

How many times have you heard them? You know, the old clichés; we hear them all of the time. How many times have you ever stopped to think about where they came from? Somebody screwed up and went to the "trouble" (over a few cold ones, probably) to joke about it and come up with a cliché so we could all benefit from the experience.

I was a relatively new detachment commander in charge of two Twin Hueys. We were tasked to support an artillery exercise for ten days. This was the last day of the exercise, and I was the aircraft commander of the remaining Huey. I had released the other aircraft the day before, as it was no longer required. We had one last task before we could start the long trip home. We had to transport the Commanding Officer (CO) of the artillery unit to a rear location, shut down and then return him to his HQ. I asked the CO specifically if he had any other helicopter requirements. The answer was no! While waiting for the CO, we could either stay there and eat a leisurely IMP or rush to the rush to the Forward Arming Refuelling Point (FARP), refuel location, refuel and then rush back to get the CO. We discussed the options and went with the first one. We had enough fuel to complete our mission and return to the FARP to refuel, while still maintaining the required fuel minimums, and we wanted to eat now so we could start heading for home as soon as possible after we were released. Also, there was some weather heading in, which made us want to save any time we could. That was our plan!

When the CO returned, we were just cleaning up from our gourmet field lunch. He was ready to go right away, as he had to make an "O-group" timing. You know, the last exercise "O-group", which, hopefully, would order his men to finally drive the fictitious evil forces out of the victimized country in the middle of the ranges.

"No plan, no matter how simple, ever survives contact with the enemy."

I told him that we would be airborne in about three minutes. "Great Captain, here is the grid," he stated as he strapped in. The blank stare he received must have given away my confusion. The "O-group" location was not at his HQ. It was further away; more importantly, it was further away from the FARP. Some quick cursing (to myself, of course) and some quick mental gymnastics during the start, and I decided to go with the current fuel load. The CO had a timing to meet, we were in a hurry, and my mental calculations showed that we would only burn "a bit" of our reserves. "Besides, that's what fuel reserves are for, aren't they?"

When we arrived at the grid location, there was nothing there! Now I was starting to sweat. Luckily, we only took a couple of minutes to locate the command post; darn lucky when you consider that the grid was three kilometres off, and we were capped at 50 feet above ground level (AGL) due to fighters in the area. Heading back, the fuel gauge had suddenly grown: it was the largest and most important gauge in the cockpit. We were discussing options as a crew and decided at what fuel load we would land and call for a bowser. When that fuel load came, we were only two or three minutes back. You guessed it, we decided to press on! For those of you who don't know, the Twin Huey burns approximately 10 pounds of fuel per minute. We were already below the 15 minutes of fuel that we were supposed to land with.

You will be happy to know that this story has a happy ending. We made it to the FARP without incident — that is, if you don't count the dumb decision I made to press on. This chain of events would have made an interesting flight safety incident.

"One of the most useless things to a pilot is fuel in the bowser."

What did I learn? One of the biggest lessons was that those clichés were golden rules, and now I don't break, bend, or otherwise deform any golden rules. They might be corny but they can, sure as heck, keep you from backing yourself into a corner. Here are two that I put to use every time I go flying now: no plan, no matter how simple, ever survives contact with the enemy; and, one of the most useless things to a pilot is fuel in the bowser. ◆

Anonymous

TACTICAL PRESSURES

The collapsible cot was as hard as the tarmac but afforded me the luxury of knowing I was above the ground and away from the scorpions and other night crawlers. The breeze felt great from under the belly of the aircraft. Most of the crew were inside the aircraft trying to sleep while the CC130 radiated its daytime heat both inside and out. The Airborne Security Officers (ASOs) were outside securing the perimeter of the aircraft. I finally fell asleep under the wing, using as a pillow my 9mm pistol wrapped in a hand towel that I kept with me for those hot desert starts. Surprisingly, all of us had some sleep that night. The aircraft eventually cooled down and those of us outside were fortunate to get relief from the night breeze. The Navigator had, probably, the best bunk of the entire camp. He managed to be the first to grab the cushion from the

Tactical CC130 on final turn to runway 29 in Kabul with Northern Kabul in the background.
Photo: Captain Gary Moore, 426 Squadron

CC130 bunk and a cot that an US Airborne unit in Mosul had lent us.

Sleeping in the field may be commonplace for many, but the CC130 Hercules is rarely the accommodation of choice. This day had historical significance for many reasons. It was the day of independence when Saddam Hussein took power in Iraq, the day the Baath Party was formed, and it was my sons' first birthday, over 5000 miles to the west in Trenton, Ontario.

The intelligence briefing that morning suggested that, if there was to be an attack in Iraq, this was the day. It was expected that attacks throughout the country would take place at night. The US military was on high alert. At that time, surface-to-air missile threat from Man Portable Air Defence System was considered "high". A tactical, low-level approach at our destination was the best plan affording the least risk.

Crew 29 with author on the ramp in Kabul, Afghanistan, a few days after the mission to Mosul, Iraq.

The plan was simple from the start. In Kuwait City, we picked up 40 passengers and two pallets bound for Mosul. The load was ready when we arrived, and within the allotted time we were northbound through the Iraqi airspace for Mosul, located about one flight-hour north of Baghdad. At the appropriate point, we began our descent and flew a random route into our destination at 200 ft above the ground. About 15 miles prior to touchdown and inside our tactical landing check, the Prop Low Oil light for number two engine illuminated. The checklist was carried out and we quickly discussed our options and whether to land or return to Kuwait.

There was sporadic remorse for the final decision to land on three engines in Mosul. Hindsight is always 20/20. Given the circumstances, we would have likely done it again anyway. Forty passengers, two pallets, probably just low oil in the propeller, no visible leak and theatre authorization for a three-engine takeoff if required: we had outs, and we decided to land.

We shutdown the engine at 180 knots (kts) on final and landed without any problem. With the load off and engine panels opened, the engineer began the relentless procedure of prop oil-level checks, adding one litre at a time between checks until the prop was full. Still, the Prop Low Oil light on number two engine did not go out. The fact that the light was still on suggested that the level float mechanism had failed, and there was a chance of contaminated fluid in the prop. The engine, for all intents and purposes, was unusable.

By this time, night was falling, and I was concerned about the obstacles on departure out of Mosul: a ridge crossing the flight path, with hydro lines crossing the valley, unlit of course. In order to conduct a three-engine takeoff, we would have to de-fuel 6000 lbs, which gave us just barely the minimum fuel required for the flight back to base. Mosul was a helicopter operation controlled by the American Army. CC130s were common. They occasionally uplifted a few thousand pounds, but never de-fuelled an aircraft. Negotiations ensued with our American counterparts who were unfamiliar with the procedure. It took me almost two hours to convince the ground crew that our engineer had the expertise and qualification to conduct the de-fuelling. Furthermore, I reminded the American Operations that if we didn't de-fuel, we weren't leaving. Foreshadowing in any case.

They had to make room in the bowser for the fuel, as precious daylight receded. Start up, taxi to the other end of the airport, coordinate an engine-running de-fuel condition and prepare for take off took altogether longer than the daylight available to us. At 21:10 local, while we were performing the engine-start checks for the final time, I informed the crew that the departure was too dangerous for an asymmetric power takeoff because of many factors, mostly the obstacles in the departure area and inadequate visual reference. We would be spending the night. Unfortunately, the Night Vision Goggles (NVGs) were not available for this operation. NVGs would have easily allowed us to depart and safely return to base for security and repair. The crew wanted to depart badly but respected my decision not to attempt a takeoff in these conditions. If I was uncomfortable with the takeoff then surely it should not be attempted. I based my decision on three key factors:

- In the morning, we would have the benefit of daylight conditions.
- Morning temperature would be a favourable 25°C vice the 40°C that we had that night. The CC130 would be much more powerful.
- The intelligence report had informed us that mortar rounds had been lobbed into the fuel pits at night, and small arms fire around the airfield was a regular occurrence. The Air Force Liaison Officer had assured us that there was a significant perimeter security force that included a company of M1 tanks; hence, the aircraft would be secure.

With the decision made, and with engines running, we taxied back to the terminal apron at the south end of the airport where the US had their logistic HQ. We parked the aircraft and prepared for the night. Throughout the night, I awoke to the sounds of dogs barking and howling, or was it the ASOs who were lurking about. In any case, daylight broke the horizon at about 5 a.m. I went into the aircraft only to see the rest of the crew members scantily clad and sprawled throughout the cabin on the troops seats. It was time to leave Mosul.

"Pitter patter let's get at er" shouted one of the loadmasters, and the remaining crew sprang to life to begin preparing the aircraft for departure. Except the 'Nav', of course, who was still wiping his eyes after a full and comfortable night's rest. After reviewing the AOIs and completing all pre-flight checks, we woke the tower controller with a request for start, taxi and take-off. Three-engine takeoffs are only practiced in the simulator and definitely not taught on the tactical course. But there was no doubt that this was to be a tactical three-engine departure. That said, with the exception of a little bit more rudder, the takeoff and departure was uneventful, and we soon found ourselves cruising back to base for a hot shower and a well-deserved rest.

Lessons learnt, you ask? Well, this is not a case of what we learnt post 'close call' event, but rather what may be worthy of passing on to crews who could be placed in a similar situation. Numerous pressure points could have lead us to a potential tunnel-vision decision, on the strength of an idea. We were in enemy territory, no one wanted to spend the night in Mosul, nor was it even considered an option originally. We were undertaking numerous abnormal operating procedures and calculating a fine line for takeoff limits. I was sure of one thing: I was not going to rush any crew member because of time constraint. For me, that was the surest way to decrease the safety margin and possibly get one of our crew or an inexperienced US Army personnel injured, or worst. The pressure to depart increased, and time eroded away. Finally, the classic 'This Is Stupid' thought crossed my mind.

It took team effort to bring this mission to a successful conclusion. A contribution that is typical of the level of performance, vigilance and professionalism of crews like mine rotating through Tachtical Air Lift Detachment Southwest Asia. ◆

Capt Gary Moore serves with 426 Training Squadron, 8 Wing Trenton.

The "Weekend"

My first mission in Search and Rescue left me with an impression that not only influences the way I make decisions today but, when it comes to safety, also makes me always speak up. The world of Search and Rescue is challenging work, and it can be very difficult to plan a normal, scheduled life. Early Friday morning, our Labrador crew was called to a mission in Gaspé, Quebec. At that time, the squadron was stationed in Summerside, P.E.I.

We arrived at work, loaded all of the equipment into the plane and met in Operations (Ops) for a mission brief. Everything was running as it should, and I was especially glad to see that our pilot was one of our senior pilots on the squadron. Once we got airborne, the first indication that this was going to be a long day came from the pilot when he told us about plans he had for the weekend in Halifax. It took about five hours to reach the search object, with another two hours on the ground, and then we returned to Gaspé where we experienced a rotor-brake problem on shutdown. All day, the subject of the weekend in Halifax kept popping up.

We were all in the airport coffee shop at 16:00, and still the rotor brake and a few more problems were not fixed. Someone on the crew suggested that maybe we should check into getting rooms. Every crew member agreed except the pilot, who said we should really try to get the helicopter home because tomorrow was the weekend, and there was a possibility that there would not be a helicopter at home base to hold standby. At 18:00, the helicopter was serviceable, and we all met outside for a quick brief before departing. One person mentioned crew day, but it was ignored.

The trip home would take three hours, and that would bring us into the 20+ hours crew day. The first hour, everyone was talking about the mission and joking around. The second hour, everyone started to fall asleep, including the people flying.

I was very uncomfortable with this situation and started a conversation with the first officer, who flew for most of the flight. I had a very hard time staying awake and an even harder time keeping the others awake. I kept thinking that here we were, supposed experts, and we were breaking all of the rules. Why? Because someone had a weekend planned! ◆

Anonymous

CRM LESSON?

There was a bad storm coming down the east coast and the weather office was calling for low visibility and ceilings between 800 and 1000 feet for most of the Maritime provinces. Winds were forecasted to be high, especially in the Cape Breton area, where they could reach as high as 60 knots.
I had been following the weather forecast all day; as a new Search and Rescue (SAR) aircraft commander (AC) on the CC130 Hercules, I was keeping track of many things, including the weather and the planes on the line. I figured that if I received a tasking from the Rescue Coordination Centre (RCC), having a good idea of the present situation would compensate for my lack of experience. Earlier that day, the SAR Hercules went unserviceable, and another airplane had to be reconfigured to cover the standby duty. It was another Hercules, but with one major difference — it was not equipped with FM radio. FM radio is the primary means of communication for maritime traffic so, when we are involved with missions at sea, it becomes a very important piece of equipment. A hand-held radio would compensate for the lack of equipment, but it could possibly give us a few problems.

The opportunity to find out came along; RCC tasked us to provide assistance to a few fishing vessels that were reporting taking in water. After a few minutes of discussion and flight planning, we were airborne and flying towards the Northumberland Strait, in the Cape Breton area. Among my crew of seven, I had an experienced navigator and a fairly new co-pilot. After about 25 minutes of flying and talking with RCC on HF radio, the co-pilot started a descent in the search area while I conducted the different briefings. We broke out of clouds at about 900 feet, and the weather conditions were as forecasted; high winds that giving us a very bumpy ride. The navigator advised me that he was going to remove his headset and attempt to contact with one of the fishing vessels with the handheld FM radio. Shortly after, he was back on intercom, inputting the boat's position in the global positioning system (GPS). The boat was behind us, and the navigator gave us a heading to proceed towards its position. The co-pilot initiated a very shallow turn; I asked him to increase the turn rate in order to get on heading and proceed to the boat position quickly. He declined my request, explaining that he was not comfortable with high-bank turns while flying so low. That should have been a good clue for me on what I could expect from him during the mission, but I missed it. We located the vessel in distress and offered assistance. A coast guard cutter, who took over escorting the boat, quickly relieved us.

CRM: Crew Resource Management

CC130 Hercules during Exercise Repatriation.

Photo of CC130 Hercules by Jacek Szymanski, Combat Camera, 26 April 02

Meanwhile, RCC contacted us via HF radio, requesting us to provide assistance to another fishing vessel taking in water. The navigator input the boat's position in the GPS, gave us a heading, and advised that he was removing his headset to attempt contact with the vessel in distress. We located the boat; it was a small 22-foot grey vessel. We offered to drop a pump to help get rid of the water in the boat, but the offer was declined. We were asked, instead, to provide an escort to the nearest port. While the co-pilot, in the right seat, was flying left-hand orbits around the distressed vessel, the SAR technician, in the left hand spotter window, and myself were trying to keep an eye on the grey boat. With 15- to 20-foot waves, 60-knot winds, and an airplane with a turning radius of about 3/4 mile, it was pretty hard to maintain visual contact with our boat. Every 10 minutes, the navigator had to remove his headset, get the boat's position on the handheld radio and input it in the GPS to help us relocate it. The fishing boat was making his way towards the coast of Cape Breton. For those not familiar with the Maritimes, the coast of Cape Breton is bordered by cliffs up to 1500 feet, which make for spectacular scenery on a beautiful day, but are quite an obstacle for planes flying at low level in bad weather. We were getting close to the coast, probably within two to three miles, when we lost sight of the boat, and the navigator had to get the position again via FM radio. Simultaneously, we got a message to call RCC on HF radio. Usually, the navigator takes care of HF communications; however, he was off headset, and I contacted RCC myself on HF radio. I left the co-pilot in control, trying to locate the boat. I was just initiating communication with RCC when I heard through my headset "we almost hit the mountain" coming from the co-pilot. I dropped the phone patch with RCC and took control from the uncomfortable co-pilot. During his last turn, he had lost visual contact with the mountain on shore and thought we were being pushed towards them because of the high winds. I was very comfortable with our location, but the co-pilot was not at all. The Hercules crew members were also concerned, since they could not see our flight path and had only heard the co-pilot's reaction to a situation that was pretty normal for me.

Once the boat got within about two miles from the bay entrance, and we confirmed that the situation was under control, I decided to discontinue the mission and fly back home. I was flying with a scared co-pilot, the back-end crew was uncomfortable, the weather was not cooperating, and the fact that the navigator was off headset most of the time was not helping at all. That day, I learned that I had to adjust the way a mission could be completed, not only depending on my skills, but also depending on those of my crew, the environment we were flying in, and the equipment we were using. ◆

Anonymous

WHAT'S THE BIG DEAL WITH INDEPENDENT CHECKS?

The fact that independent checks are being carried out improperly, or omitted altogether, and are being signed for by unauthorized or unqualified people is becoming a serious cause for concern for maintenance and Flight Safety organizations alike. As maintainers, it is our responsibility to ensure that all required maintenance, including independent checks, is carried out and signed for in accordance with prescribed maintenance procedures and regulations. So what's the big deal with independent checks?

For starters, according to *The Canadian Oxford Dictionary*, "independent" means **impartial**; conducted or originating outside a given institution, group, etc.. The key word is **impartial**. It is important to keep that in mind because the reason we have someone do an "independent" check is to ensure that the work has been carried out correctly. It is a way of confirming the quality of the work and, therefore, the serviceability of the weapon system. And it must be done by someone who has not "been employed in any manner (hands-on work or on-job supervision) in rectifying the condition requiring an Independent Check."[1]

Why does the independent check need to be done by someone who has not worked on or supervised the task? One reason is that a new set of eyes may be able to pick up things that have been left out or installed incorrectly. Another reason concerns the impartiality of the independent check. How can a technician who has worked on the system be truly impartial? I believe it is impossible.

Technicians who have put an assembly back together or reinstalled a component in an aircraft obviously carried out the task believing they were doing the job properly and professionally. I am certain nobody goes out to an aircraft thinking he or she will leave plugs out or lines untorqued for example. However, on occasion, maintenance is not carried out properly, unbeknownst to the technicians. And, if these technicians did not see the error in the first place, they will most likely not see it during another check. Our brain can play funny tricks on us. Since we were convinced from the start that we were doing everything right, we will see what we want to see, not

Figure 1: C-12-188-000/NE-000

GENERAL INSTRUCTIONS

1. The ECIR of the CF188 HORNET consists of Parts 1 to 6.
2. The contents of Part 1, Section 1 are listed by Work Unit Code (WUC) in alphabetical sequence by system.
3. The data contained on each page is arranged in tabulated form as follows:

WUC	TYPE	ITEM NAME	FIG & REF	QTY PER A/C	TASK FREQ	PREV MAINT TASK	INSP REF	SECT	IND	T/F REQ	REMARKS

Figure 2: C-12-188-000/NE-000 — Explanation of header (extract)

i. SECT — Items contained in Part 1, Sections 2, 3, or 4 are indicated by a corresponding Section Reference, e.g. 2, 3, or 4 in this column. When a 2 is shown, the type of life, OVHL (overhaul) or RET (retirement) shall be indicated in the remarks column.

j. IND. — Items which require an independent check IAW C-05-005-P05/AM-001 (Maintenance of Aircraft Weapon Systems, Part 2, Independent Checks after Maintenance) after being replaced, disconnected or disturbed for any reason will be indicated by an "X" in this column.

k. T/F REQ — If an "X" appears in this column refer to Part 3 to determine if the requirement is for a full card flight test, partial card flight test or a flight functional.

l. REMARKS — This column is used to clarify the requirements listed in the foregoing columns, and always indicates the reason for "replacement". Sample abbreviations used in this column are:

OVHL	Overhaul
RET-NAR	Retirement-not-AMMIS-reported
RET	Retirement
SHOP	Inspection Performed in a Shop
ARR	Arrival
FACO	Final Area Close Out
NDT	Non-Destructive Testing

[1] *C-05-005-P05/AM-001, Part 2, Paragraph 9.*

necessarily what is in front of us. Hence the importance of having someone else inspect the work.

But not just anyone who happens to walk by the aircraft can do the task. To carry out and sign for an independent check, the person has to be qualified and authorized. (Please refer to *Flight Comment*, No 1, 2004 for an article on that subject.) And, as mentioned above, the person **shall not** have been employed in rectifying the condition requiring the independent check. In other words, the person signing the independent check on the CF 349 should not have his or her signature in the "Rectified by" and/or "Inspected and Passed by" column for the same task.

Not every maintenance task requires an independent check. However, when you replace, disconnect or disturb for any reason an item in an aircraft, an alarm bell should ring loudly in your head, and you should ask yourself: "Is an independent check needed?" You will find the answer to that question in the aircraft Equipment Code and Inspection Requirements (ECIR) — AKA Work Unit Code book — applicable to the aircraft you are working on. It is important to check the ECIR when filling out the CF 349 to ensure the requirement for an independent check has been identified and noted on the CF 349. See Figure 1, 2 and 3 for extracts of the CF188 ECIR and Figure 4 for examples of items on the CP 140 requiring independent check.

Keep in mind that not every item requires an independent check, which highlights the fact that the ones that do are items **critical to the safety of flight**. Independent checks are over and above the normal maintenance checks and balances to ensure an aircraft is airworthy and thus safe for the crew operating it. That's the big deal with independent checks. ◆

Sergeant Anne Gale
DFS 2-5-2-2

Figure 3: C-12-188-000/NE-000 — Example of items requiring an independent check

*******		SERVO CYLINDER, HYDR (HORZ STAB), SEE ACBA									
*******		SERVO CYLINDER, HYDR (RUDDER), SEE ACCD									
EDAB		CMPTR ROLL/PITCH/YAW CP1330/ASW44 (FCCA)	*570/MS WP003*						X		
*******		FOR INTERNAL BREAKDOWN, USE EDAC									
EDAC		CMPTR ROLL/PITCH/YAW CP1330/ASW44 (FCCB)	*570/MS WP003*						X		
EDACA		CCA-ANALOG NO. 5(A1)									

Figure 4: C-12-140-000/NE-000 – Example of items requiring an independent check

WUC CUT	TYPE	Item Name	Nom de l'élément	Figure and Reference Référence figure	Qty per A/C Qté par aéronef	Task Freq. Fréq. des travaux	Prev. Maint. Task Travaux de maint. prév.	Inspection Reference Référence inspection	SECT.	IND.	T/F Req. Vol d'essai requis	Remarks Remarques
ACDFKC		Push Rod Assy Link Force Tab Mech	Bielle de poussée de mécanisme de tab de force de tringle	MY002-06-19								
ACDFKD		Bellcrank and Bracket Assy	Guignol et ferrure	MY002-06-19						X	X	
ACDFKE		Cartridge Assy Link Force Tab Spring	Cartouche de ressort de tab de force de tringle	MY002-06-19								
ACDFKF		Idler Assy	Levier intermédiare	MY002-06-19						X	X	
ACDFKG		Push Rod Assy Aileron Rudder Balance	Bielle de poussée d'équilibrage aileron et gouverne de direction	MY002-06-19						X	X	
ACDFKH		Bellcrank and Bracket Assy PN 931037-101	Guignol et ferrure n° de pièce 931037-101	MY002-06-19						X	X	
ACDFKJ		Cartridge Assy Spring PN 909265-1	Cartouche de ressort n° de pièce 909265-1	MY002-06-19								
ACDFKK		Cartridge Assy Link Force Tab Mech	Câble de mécanisme de tab de force de tringle	MY002-06-19						X	X	
ACDFKL		Push Rod Assy PN 832033-1	Bielle de poussée n° de pièce 832033-1	MY002-06-19						X	X	
ACDFKLA		Bearing Rod End PN MR4	Palier d'embout de bielle n° de pièce MR4	MY002-06-19	2							
ACDFL		Damper Assy Viscous	Amortisseur hydraulique	MY002-06-13		2-4	VIS	AF-63				
ACDFM		Panels Access	Panneaux d'accès									
*******		Static Dischargers, see FJGAE	Déperditeurs d'électricité statique, voir FJGAE									
ACDG		Elevator Assy RH	Gouverne de profondeur D	MY002-06-15		1-2-3-4	VIS	AF-59	4	X	X	
ACDGA		Skin	Revêtement									

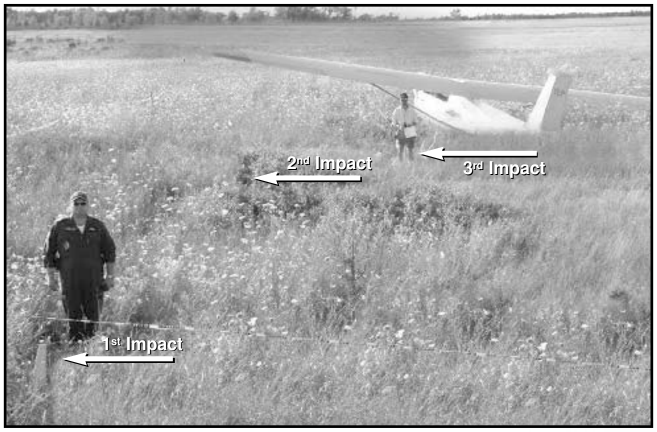
ÉPILOGUE

TYPE: **Schweizer 2-33A C-FYLP**
DATE: **18 August 2003**
LOCATION: **Mountainview, ON**

The accident occurred during a routine mission at the Air Cadet Central Region Gliding School (CRGS). The launch, area work, and circuit rejoin for runway 34 were all normal. While on downwind, the solo student temporarily encountered significant sink and, because she was low, angled in towards the airfield. After an early turn to base, the student realized that she was still low and once again in sink; however, this time she continued on a normal base pattern without angling in or closing the spoilers. The student turned onto final low while still in sink. In an attempt to stretch the glide and make the landing area, the student eased back on the control stick and did not notice the resultant decreasing airspeed and the approach of the ensuing aerodynamic stall. From a slightly nose-high attitude and in a stalled condition, witnesses observed the glider to drop from a height of 10'-15' and land firmly on a large rock. The aircraft suffered "C" category damage; the pilot was uninjured.

The student had never flown from runway 34; the three previous flights, flown from runway 06, resulted in low final approaches. Due to an unfamiliar site picture in the circuit to runway 34 and the existing conditions, the demands upon the student's attention were very high, such that her task management likely became saturated in the latter stages of the flight.

The student correctly dealt with the sink encountered on downwind by angling in towards the field, turning early onto base leg, increasing airspeed to exit the area of sink and keeping the spoilers closed; however, she failed to employ these techniques after once again encountering sink on base. Had the student done so, she would have exited the area of sink sooner, positioned herself closer to the airfield, slowed the rate of descent, increased the glide distance, not been required to attempt stretching the glide, and therefore likely reached the designated landing area.



Finally, during the student's circuit, the monitoring instructor noted that the glider was lower than normal; however, the instructor felt that the student was not low enough to warrant verbal assistance via the on-site VHF radio. Had he done so, perhaps the outcome would have been different.

As a result of this accident, CRGS staff received training on the requirements for inflight student monitoring. It was also recommended that radio availability, and its usage by monitoring instructors, be mandated in the 242 Air Cadet Gliding Program. ◆

ÉPILOGUE

TYPE: **Schweizer 2-33A C-GBZG**
DATE: **27 September 2003**
LOCATION: **Summerside, P.E.I.**

The glider was flying in support of the Atlantic Region Air Cadet Fall Glider Familiarization Program from runway 24. The auto-tow launch began normally and, after the "all out" signal was given, the glider was observed to accelerate slowly. The air cadet assigned to signal the glider's progress to the tow driver noticed that the glider's ground run was unusually long and, subsequently, gave the launch-abort signal. Although the tow vehicle had already initiated a launch abort, the glider became airborne and climbed to approximately 50' Above Ground Level (AGL). The glider was observed to descend rapidly, land hard in a level attitude and come to rest on the runway. Both the pilot and passenger exited the aircraft unassisted. The glider suffered "C" category damage to the main wheel axle and support tubing.

The investigation revealed that the tow vehicle was unserviceable in that it required a slow acceleration in order to avoid sputtering or stalling. In the interest of keeping the operation going, the vehicle driver believed this situation to be acceptable. The site supervisor, pilot, and launch personnel were also aware of this problem.

During the takeoff, the pilot observed the airspeed to decay from the 50 mph minimum tow speed to 45 mph, at which point she released the tow rope. The pilot's admittedly slow reaction to the low airspeed further aggravated a deteriorating situation as she rapidly ran out of both airspeed and height to safely land the glider.

As a result of this accident, greater emphasis on vehicle launch aborts within the Atlantic Region Air Cadet Gliding Program will be provided during training, with applicability being considered for all Air Cadet Regions. This accident again reinforces the need for supervision and decision-making training for supervisory personnel within the Air Cadet Gliding Program; this will be included for future review by the Air Cadet Standards organization. ◆

ÉPILOGUE

TYPE: **Schweizer 2-33A C-GCLN**
DATE: **1 September 2002**
LOCATION: **Miramichi, N.B.**

The instructor pilot (IP) was participating in the Air Cadet Familiarization Gliding Program. The objective of this first flight of the day was to reposition the glider from the button of runway 10 to the upwind area at the button of runway 28. Due to the tailwind, the glider experienced poor climb performance on takeoff even though the tow vehicle was being driven at full power. Recognizing that no further height was to be gained, the solo IP released the tow rope at 350' Above Ground Level (AGL). Intending to land straight ahead, the IP forward slipped to reduce altitude; however, it soon became evident that insufficient landing distance remained before the airfield boundary fence. The IP then attempted a right 180° turn to position into wind beside runway 28. The glider had nearly completed the turn when the right wingtip impacted the ground. The glider sustained "A" category damage and the IP received minor injuries.

At launch time, the airport Unicom reported winds to be 250° at eight knots, gusting to 15 knots. Although the Launch Control Officer (LCO) heard the Unicom report, the nearest windsock indicated little wind. Additionally, based on his local area knowledge, the LCO knew that winds reported by both the launch site and the Unicom often differed. Although a hand-held anemometer was on site, the LCO, who was confident in his assessment of the winds being less than five knots, chose not to use it. Because the Unicom's wind measuring equipment was elevated higher than both the LCO and his reference windsock, it was able to register the stronger winds aloft. The consequence of this inaccurate pre-launch wind assessment was that the glider encountered decreasing performance shear as it climbed out on tow.

Because the IP had never before conducted a downwind takeoff to reposition a glider to the opposite end of the runway, the Site Supervisor briefed the IP to gain as much altitude as possible before carrying out a modified circuit. However, just prior to launch the LCO briefed the IP to land straight ahead. As a result, the IP combined the two procedures and attempted to gain as much altitude as possible before landing straight ahead. The combination of an unexpectedly low release altitude and conflicting supervisory direction placed the IP in a low-altitude position with rapidly diminishing landing space ahead, forcing her to attempt a low-level turn. Because low-level turns are inherently hazardous, it is preferable to land straight ahead in a controlled fashion and accept possibly unsuitable landing terrain.

As a result of this accident, all downwind launches to position gliders for operations were prohibited in the Atlantic Region until the completion of this investigation and training was given to all Atlantic Region Site Supervisors about the hazards of low-level turns. Additionally, it was recommended that an accurate quantitative wind measurement, as well as an assessment of winds aloft just prior to the first launch of the day, be made a requirement; the practice of downwind takeoffs be reviewed; and consideration be given to providing Human Performance in Military Aviation (HPMA) training to Site Supervisors.

The decision to conduct a downwind takeoff to reposition the accident glider may not, by itself, have been dangerous. However, a number of factors combined to create the conditions for this accident to occur. Firstly, the two supervisors failed to co-ordinate their plans for this launch and consequently, the IP was given conflicting direction. Secondly, the IP did not resolve this conflicting advice prior to takeoff. These two conditions were then exacerbated by an inaccurate wind assessment that did not consider all available information. This accident highlights the importance of effective communication to ensure that everyone involved in the operation has a consistent and accurate mental picture of what is to take place. It also highlights the importance of considering all available information when making decisions. ◆

FROM THE INVESTIGATOR

TYPE: Griffon CH146434
LOCATION: Valcartier, Que.
DATE: 28 August 2003

The CH146 Griffon helicopter was on a training mission in support of the Canadian Forces "Skyhawks" Parachute Demonstration Team when the left cargo door departed the aircraft and fell 10 000 feet to the ground.

The aircraft departed from the Valcartier Heliport at 10:46L; with eight parachutists on board. Once at 2500 feet, the Jump Master (JM) opened the left cargo door and dropped wind drift indicators to assess wind speed and direction, as well as the drop position for the jump sequence. The JM then closed the cargo door, and the aircraft climbed to 10 000 feet.

Once at altitude the JM again opened the left cargo door while the Flight Engineer (FE) opened the right one. The parachutists then successfully exited the aircraft and established good chutes before the pilot initiated a left descending turn at approximately 80 knots, and the Flight Engineer (FE) closed the right cargo door. As he reached over to close the left cargo door, two loud bangs and a jolt were felt by all the aircrew. The FE simultaneously observed the left cargo door depart the aircraft.

With an in-flight check determining no damage to any systems or controls, the aircraft landed without further incident at the Valcartier Heliport. Post shut-down, the crew found that all four main rotor blades were substantially damaged.

This aircraft suffered "C" category damage. The investigation is focussing on the rigging of the cargo door assembly. ◆

FROM THE INVESTIGATOR

TYPE: **Griffon CH146408**
LOCATION: **Cold Lake Air Weapons Range, Cold Lake, Atla.**
DATE: **06 November 2003**

The CH146 Griffon Helicopter was conducting an advanced Night Vision Goggles (NVG) training mission in the Cold Lake Air Weapons Range (CLAWR) as part of a 408 Tactical Helicopter Squadron (THS) NVG upgrade program.

The aircraft took off from 4 Wing Cold Lake and then proceeded to the CLAWR for a 50 foot NVG low level navigation exercise. At the end of the navigation leg, the Aircraft Commander (AC) gave a simulated number two engine fire. The First Officer (FO) then selected a landing area, which appeared to be an open field covered with tall grass, low shrubs and shallow snow.

In reality, the landing surface was frozen muskeg. The FO landed gently and performed a seating check in accordance with CH146 Standard Manoeuvre Manual. A few seconds later, the aircraft settled down approximately 12 inches with a 5 degree left roll. The FO immediately increased power to prevent further settling, and the AC took the controls.

Not realizing that the aircraft had now moved forward slightly and that the left skid toe was caught under the ice surface, the AC increased the power further. Full aft and right cyclic input was reached before the aircraft finally broke free and stabilized in a four-foot hover.

The crew then elected to fly to the Primrose Lake Evaluation Range (PLER) helicopter landing pad, approximately 10 km away, to land safely.

Following shut down, damage was found on the underside of the Griffon and consisted mainly of pushed up skin and web damage forward of the tail boom attachment bulkhead. The damage was initially assessed as "B" Category damage. The damage Category was later downgraded to "D" Category following final disposition. ◆

FROM THE INVESTIGATOR

TYPE: **Griffon CH146475**
LOCATION: **Within the boundariew of 5 Wing Goose Bay, N.L.**
DATE: **17 September 2003**

The aircraft crashed in the "Webber drop zone" within the boundaries of 5 Wing Goose Bay. The crew was conducting Out of Ground Effect (OGE) hover Stokes litter transfer training for a second Flight Engineer (FE) at the time of the accident.

The Stokes litter transfer was at the stage where the litter was on the hoist, the cable was in the full up position and the FE was requesting: "Pilot override out." On hearing this request, the non-flying pilot is supposed to activate the hoist override switch, located on the right collective, to pay out the hoist cable, thus allowing the FE to use both hands to recover the litter into the aircraft. In this occurrence, the flying pilot, who was in the right seat, noted the aircraft sinking and yawing to the right within seconds of the crewman's request. The attempt to control the sinking with collective did not appear to be effective and the "Low Rotor RPM Warning" sounded, indicating rotor speed (RRPM) below 97%. The flying pilot called "Power loss, power loss" and simultaneously rolled off both engine throttles in response to the perception that a tail totor loss had occurred. Without power to the rotor, the aircraft descended rapidly and despite full collective application, the aircraft impacted the ground with a force of about 5 to 8 g. The aircraft landed in a flat attitude and, while still intact, the received severe damage consistent with a "B" category accident.

Post-crash investigation showed the hoist and Stokes litter still in the full up position, and the non-flying pilot confirmed he did "make and hold" a switch on the right-hand (RH) collective. The next (lower) switch on the RH collective is the rotor RPM governor (beep) switch. Full down "Beep" will reduce the main rotor RPM to about 97%, the same rotor RPM value that the flying pilot noted as he rolled the throttles off. Investigators examined the rotor RPM governor actuator for position, and found the actuator in the full "beep" down position. Of note, the helicopter is fully controllable at 97% RRPM.

The crew and Squadron were briefed on the investigation findings, as an immediate preventative measure.

Furthur investigation will focus on autorotation training for CF helicopter pilots, with emphasis on hover autorotation recoveries. The flying pilot had not completed an autorotation from hover to touchdown for 5 years, other than in the simulator. Also, an examination of the human factors associated with the accident will be undertaken. ◆

For Professionalism

CORPORAL MARC FECTEAU

Corporal Fecteau is an aviation technician working at 425 Tactical Fighter Squadron (TFS). He works at first line maintenance, in servicing.

In order to prepare Hornet 188748 for a test flight following a periodic inspection, Corporal Fecteau was directed to carry out a before-flight inspection. Even though the engine's intake is a dark and awkward place to inspect, he detected scratches on the left-hand engine compressor while going through his inspeciton. With safety in mind, and to get a better picture of the damage, he crawled inside the engine's intake. With this closer engine inspection, Corporal Fecteau discovered that the engine was heavily damaged. After he reported the problem to his supervisor, the engine was declared unserviceable. It was removed and routed to engine bay for repair.

Corporal Fecteau's attention to detail, his alertness, and his quick reaction revealed this problem, thus preventing the potential for disastrous consequences.

The thoroughness and professionalism displayed by Corporal Fecteau lead to a flight safety report and the prevention of, possibly, a more serious incident. Corporal Fecteau is commended for his initiative towards the Flight Safety program. ◆

Corporal Fecteau still serves with 425 Tactical Fighter Squadron, 3 Wing Bagotville.

CORPORAL LUC PARÉ

In August 2003, Corporal Paré was tasked to carry out an avionics after-flight ("A") check on Arcturus aircraft 140120. Though not required to do so, he completed an additional survey of the radar antenna and noticed that 10 of 12 screws securing the inner ring of the radar antenna flex mount were missing. Corporal Paré immediately informed his supervisors, and a foreign object check was carried out. The inspection resulted in no screws being found in the radome. The radar antenna was replaced, and the aircraft returned to service.

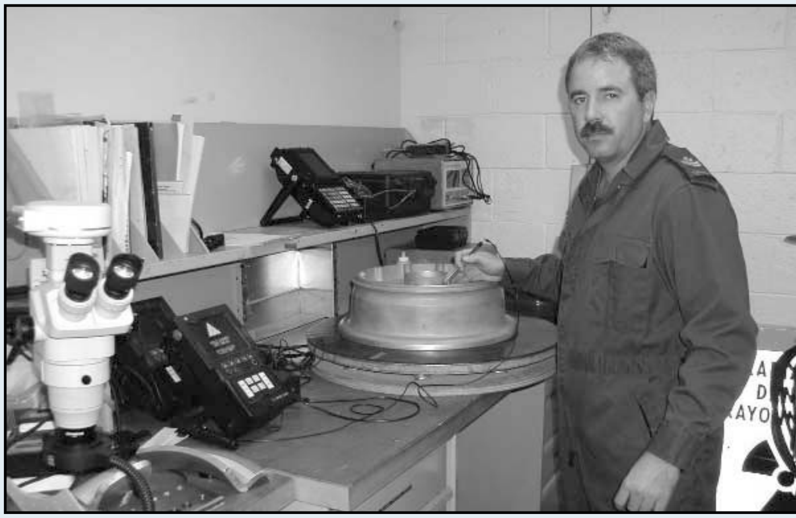
Corporal Paré's professionalism and initiative allowed him to discover and rectify a significant flight safety hazard. The consequence of this situation going uncorrected could have led to significant in-flight damage to the aircraft. His attention to detail, in an area not requiring an inspection during "A" check, eliminated a critical flight safety hazard. ◆

Corporal Paré still serves with 14 Air Maintenance Squadron, 14 Wing Greenwood.

MASTER CORPORAL WAYNE PICKFORD

During a routine maintenance inspection of drag angle cracks on Hercules aircraft 305, Master Corporal Pickford noticed the onboard maintenance ladder that he was about to use had a crack in the lower leg area. Suspecting problems with other ladders and being concerned about the safety of other personnel, he proceeded to do a quick visual inspection on another aircraft, and discovered its maintenance ladder also had cracks in the lower leg area.

After discussing this problem with Aircraft Servicing Officer (ASO) senior supervisors and flight safety members, it was decided that an inspection of all available aircraft ladders should be carried out. Master Corporal Pickford proceeded to investigate all other aircraft and found that every maintenance ladder had multiple cracks. This resulted in a technical alert bulletin being issued from 435 Squadron and, through the flight safety members, other units were notified of the situation. The early detection of this fault, and its subsequent fix, averted potential injury to aircrew and maintenance personnel who routinely use these ladders in the performance of their daily duties.



Master Corporal Pickford's efforts have resulted in the mitigation of this risk before any personal injury resulted.

This demonstrates Master Corporal Pickford's exceptional professional attitude and attention to detail. ◆

Master Corporal Pickford still serves with 435 Squadron, 17 Wing Winnipeg.

WARRANT OFFICER DARRYL "KNOCK" KNOCKLEBY

In September 2003, during Op ATHENA, Warrant Officer Darryl "Knock" Knockleby was completing a pre-flight inspection before a CC130 mission into Afghanistan. The Hercules had been unserviceable for a rudder boost pack, which had recently been replaced and verified by maintenance. Warrant Officer Knockleby's natural curiosity led him to take extra time during his pre-flight check to inspect the boost pack replacement — an inspection not normally done by a flight engineer. His keen eye immediately picked up the fact that the four bolts attaching the stabilizers to the boost pack were installed upside down.

Should the retaining nuts have loosened and fallen off, the bolts could have become dislodged. Furthermore, it appeared that the resulting clearance above the bolts was insufficient and could have possibly led to interference during the movement of the connecting rods. In follow-on discussions with technicians and maintenance supervisors, Warrant Officer Knockleby was adamant that the installation was unsafe. Further investigation led to the discovery that a supplemental inspection on the rudder boost pack had not been carried out correctly.

Warrant Officer Knockleby's keen sense of curiosity, coupled with his experience and common sense, revealed a problem that could have been easily missed, with tragic consequences. His professionalism and dedication to duty in this case were above and beyond the norm expected. The result was clarification of a confusing set of directions and prevention of a possible flight safety incident. ◆

Warrant Officer Knockelby serves with 429 Transport Squadron, 8 Wing Trenton.

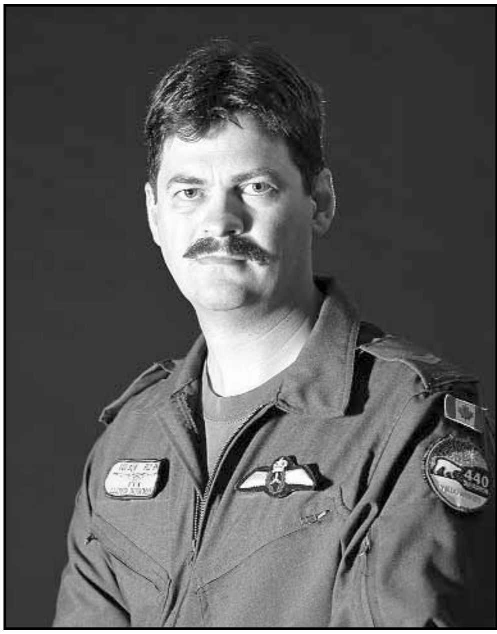
For Professionalism

CORPORAL LLOYD BOWMAN

On 29 May 2002, while training with a qualified flight engineer (FE), Cpl Bowman was reviewing CC138 Twin Otter pre-flight checks, with an emphasis on enhancing systems knowledge. During a demonstration of the autopilot portion of the pre-flight check, aircraft panels were removed to allow observation of the elevator control cable and the associated autopilot components. With fore and aft movement of the yoke, Cpl Bowman observed misrouting and chafing of the elevator control cable against the autopilot servo-mounting bracket. Recognizing this potential hazard, Cpl Bowman brought this irregularity to the attention of the instructor FE.

While still under training and new to the CC138 Twin Otter, Cpl Bowman's inquisitive nature, tenacity, and experience led him to recognize a situation that was abnormal and to take timely action. Had this irregularity not been discovered, it could have resulted in a critical disruption in the aircraft elevator control. Cpl Bowman's superior judgement and professionalism averted a potentially catastrophic occurrence. ◆

Corporal Bowman serves with 14 Air Maintenance Squadron, 14 Wing Greenwood.



SERGEANT JAMES PORTMAN

During a pre-flight inspection on Hercules 320, Sergeant Portman discovered the forward nose landing gear was improperly installed, with the forward trunnion bolts installed from the bottom up. The correct installation is from the top down; an incorrect installation could result in the trunnion bolts dropping out if the nuts back off. The potential loss or failure of these bolts could have led to an in-flight landing gear problem or a failure of the landing gear on touchdown. Sergeant Portman's keen attention to detail and excellent airframe knowledge allowed him to detect an incorrect installation, which had existed on this aircraft for almost a year. Sgt Portman's vigilance resulted in the elimination of a potential flight safety hazard. ◆

Sergeant Portman still serves with 413 Transport and Rescue Squadron, 14 Wing Greenwood.

MASTER CORPORAL MIKE MAR

Master Corporal Mar is a flight engineer on the Labrador helicopter with 413 Squadron, at 14 Wing. In the summer of 2003, while augmenting 442 Squadron at 19 Wing, Master Corporal Mar made significant flight safety discoveries on two separate days. While conducting a pre-flight inspection on Labrador 312, he noticed that the aft pitch link assembly did not look right. When he moved the pitch arm, he noticed that the lock washer on the pitch arm was moving in and out slightly from the pitch arm assembly. Knowing that there should not be any play, he reported the situation to the Aircraft Commander and to the servicing section.

When the technicians checked the nut, they found that it was loose. In fact, they got another 2 1/2 turns on the nut. The very next day, on the same aircraft, Master Corporal Mar found the same problem on one of the forward rotor head pitch link attachments. When the cotter pin was pulled out, the technicians found that the nut was barely finger tight.

If either of these snags had gone undetected, it would have almost certainly caused a premature failure of the bolt. If the bolt had failed, it could have lead to a catastrophic failure of the rotor head. It is clear that Master Corporal Mar's outstanding attention to detail and his methodical approach to troubles-hooting prevented a serious accident. ◆

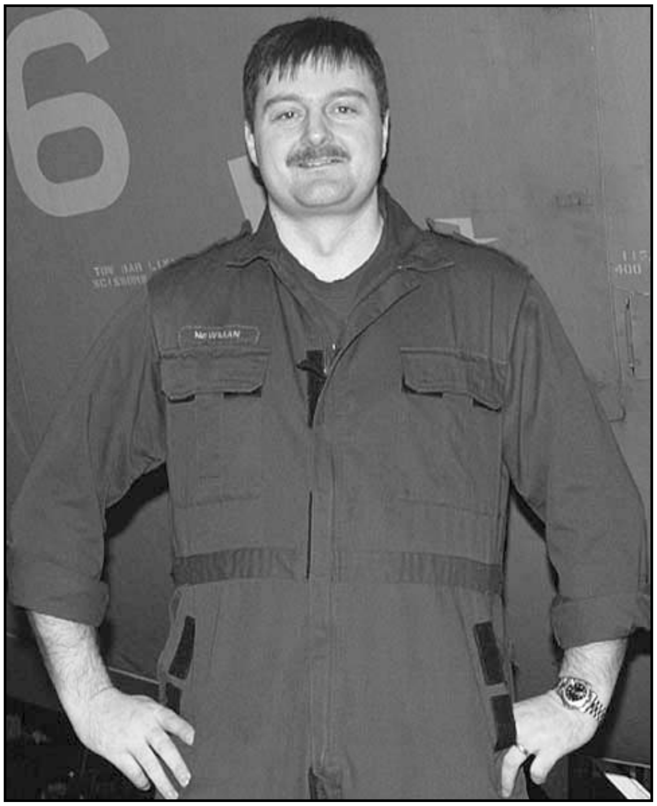
Master Corporal Mar still serves with 413 Transport & Rescue Squadron, 14 Wing Greenwood.

CORPORAL KEITH NEWMAN

While conducting the installation of a new windshield on a CC130 aircraft, a technician dropped a spacer, which ended up in the belly of the aircraft. In attempting to recover the lost spacer, Corporal Newman removed the nose wheel access panel. Once inside the confined area of the panel opening, he retrieved the spacer and then noticed the glare of a shiny part about three feet from where he was situated. Further investigation revealed that the rudder pedal adjustment bearing had come loose and was about halfway out of its housing. The loss of this bearing could have resulted in a significant controllability problem for the pilot.

Corporal Newman's attention to detail and perseverance prevented a potentially dangerous situation from arising. His action exemplifies an outstanding attitude toward the Flight Safety Program and a commitment to the safety of his fellow Squadron members. ◆

Keith has been promoted to Master Corporal and still serves with 413 Transport & Rescue Squadron, 14 Wing Greenwood.



For Professionalism

MASTER CORPORAL PETER TREMBLETT

Master Corporal Tremblett is an avionics technician employed in the aircraft maintenance control records organization of 19 Air Maintenance Squadron. In July 2003, he volunteered to be a member of the servicing crew for the 19 Wing air show. In preparation for the air show, Master Corporal Tremblett was tasked to stand by as ground man for the start-up and repositioning of a visiting USAF turboprop aircraft from its present location to its static position on the runway.

The visiting pilot carried out his walk-around and proceeded to strap himself in for start-up. Master Corporal Tremblett repositioned himself to the front of the aircraft to get ready for the engine start. It was at this time that he noticed the pilot had forgotten to remove the engine intake cover. He immediately notified the pilot of this situation. The pilot exited the aircraft, removed the intake cover and carried out another walk-around. It appeared that the foam-type intake cover was originally inserted by the pilot into the engine intake approximately three inches deep instead of being installed just on the intake lip. This situation made it difficult to see the intake cover. The aircraft was finally started and marshalled to the new location without further incident.

Although not familiar with this type of aircraft, Master Corporal Tremblett demonstrated professionalism along with a keen eye for detail. Had this intake cover gone unnoticed, the consequences could have been costly, involving a possible engine change due to foreign object damage (FOD) caused by the cover. Master Corporal Tremblett's alertness and professional attitude eliminated a potentially serious safety incident. ◆

Master Corporal Tremblett still serves with 19 Air Maintenance Squadron, 19 Wing Comox.

CORPORAL ANDREW DUFF

While carrying out an "A" check on Hercules 311, Corporal Duff noticed that the bumper stops on the aft nose landing gear (NLG) door were not in contact with the fuselage. Instead of simply aligning the bumper stops, which would have been the quickest fix, Corporal Duff elected to carry out a complete rigging check. Although newly trained on the aircraft type, his conscientious troubleshooting revealed a serious rigging problem, including a missing cotter pin and loose main attachment arm bolts. Had this problem remained undetected, the NLG door would likely have become exposed to the airflow with a resultant departure from the aircraft.

Corporal Duff's professionalism, attention to detail and willingness to look beyond normal maintenance requirements averted a serious safety threat. ◆

Corporal Duff serves with 413 Transport & Rescue Squadron, 14 Wing Greenwood.

MASTER CORPORAL JOE GLYNN
MASTER CORPORAL KEN POOLE

In October 2002, Sea King 12434 was being prepared to deploy on a Salty Dip Exercise with HMCS Iroquois. At the same time, Sea King 12428 was being prepared for a cross-country transit to 443 Squadron in Pat Bay. One of the steps in preparing an aircraft for deployment is to move electronic copies of the aircraft's maintenance and configuration data records over to a deployable Automated Data for Aerospace Maintenance (ADAM) system, so that maintenance actions can be recorded while the aircraft is deployed.

On this particular day, Master Corporal Poole was reviewing the data records for the aircraft, prior to them being imported to the deployable ADAM laptop. He discovered that the file contained only 130 of the 391 records that should have been exported. Master Corporal Poole raised his concern of such a discrepancy with Master Corporal Glynn, and together they began to determine the extent of the problem and how to rectify it. Master Corporal Glynn's knowledge and experience with the ADAM software allowed him to quickly troubleshoot the deficiency and contact the appropriate people at the ADAM help desk in Ottawa for assistance. Early the next day, a software patch was provided, which rectified the problem of the incomplete records. The complete aircraft records were then exported from the ADAM server, imported to the deployable ADAM system, and the aircraft were ready for deployment.

The requirement to maintain an accurate and complete maintenance history is paramount to recording the aircraft's configuration. Any interruption or break in the documentation of the maintenance history of an aircraft would be considered a flight safety infraction, as it would have serious airworthiness implications. Master Corporal Poole's and Master Corporal Glynn's efforts in recognizing and rectifying this discrepancy are indicative of their high level of professionalism. ◆

Master Corporal Poole still serves with 12 Aircraft Maintenance Squadron, 12 Wing Shearwater.

Master Corporal Glynn has been promoted to Sergeant and now serves with Canadian Forces School of Aerospace Technology and Engineering in the Standards Section, 16 Wing Borden.

MASTER CORPORAL GREG MARTIN

On 17 July 2002, Master Corporal Martin was tasked to carry out an aviation before-flight inspection ("B" check) on Sea King 12428. Due to a missing cotter pin found the previous day on the flight control rods in the electronic bay, Master Corporal Martin paid particular attention to all flight control rods. In doing so, he noticed too many threads exposed on the adjustable rod end for the pilot and co-pilot cyclic sticks.

Upon further investigation, he checked the safety inspection hole on the adjustable rod end using a .020 inch piece of lock wire, and discovered that the rod was not properly rigged. He immediately notified his supervisor of these findings and initiated a flight safety investigation. Due to these results, a fleet-wide special investigation was conducted and more occurrences were found and rectified.

Master Corporal Martin's professionalism and meticulous attention to detail while inspecting components not called for on a "B" check certainly led to the elimination of a serious threat to flight safety which, in time, could have had disastrous consequences. ◆

Master Corporal Martin still serves with 423 Maritime Helicopter Squadron, 12 Wing Shearwater.

Good Show

MR. TIM CLARKE

On July 3, 2003, Mr. Tim Clarke, a maintenance journeyman, was assigned to 4 Hangar to repair an unserviceability on CT156102, a NATO Flying Training Centre (NFTC) Harvard aircraft. The fuel-related problem required a procedure that eliminates residual fuel in the wing of the aircraft. While carrying out this process, Mr. Clarke overheard a nearby workman verbalizing a problem he was encountering with the battery of a powered man-lift stand he was using on a construction project in the hangar. With the man-lift stand approximately 10 feet away from the Harvard he was working on, Mr. Clarke correctly diagnosed the construction worker's comments to be related to a battery thermal runaway condition, following a recent battery recharging on the man-lift stand. Mr. Clarke immediately recognized the significant and imminent danger to personnel, the aircraft and the hangar, especially with the abundance of fuel fumes present, from his nearby fuel elimination process.

Mr. Clarke asked the worker to assist him in pushing the man-lift stand out of the hangar. As the stand cleared the sill of the hangar door, the overheating battery exploded. Fragments were strewn widely, and one piece contacted the face of the construction worker. Once he determined that the man-lift stand was in a safe area and no further danger existed to personnel, the aircraft or the hangar, Mr. Clarke quickly led the construction worker to an eyewash station, to flush possible debris and/or acid from his face.

Mr. Clarke's presence of mind, skilful and accurate analysis of an imminent danger, and his timely action most certainly prevented a potentially larger disaster. His follow-on action, to mitigate possible battery acid burns to the construction worker, also ensured the prevention of further personal injury. Subsequently, an Occupational Health and Safety Report and a Flight Safety Initial Occurrence Report were filed. Mr. Clarke's flight safety work ethic and his professional excellence, in a highly dangerous situation, are most outstanding. ◆

Mr. Clarke works for Bombardier Aerospace at the NATO Flying Training Centre (NFTC), 15 Wing Moose Jaw.

CREW 130316

On 23 February 2003, a Hercules maintenance test crew was carrying out a post progressive structural inspection (PSI) test flight on aircraft 130316. The crew consisted of Major Baldwin, the aircraft commander, Captain Cameron, the first officer, Captain Felberg, the navigator, Warrant Officer Maurice Audet, the loadmaster, and Warrant Officer Magee and Sergeant Wall, the flight engineers. An unserviceability forced a return to Edmonton City Centre Airport before the completion of the test flight. When the landing gear lever was selected down, the left main landing gear did not move.

The emergency checklist was initiated and the situation was discussed between the crew. It was determined that the alternate gear lowering procedure would be required. Sergeant Wall detailed the procedure and Warrant Officer Magee carried it out. The procedure rapidly came to a halt as Warrant Officer Magee found that the gear would not free fall when the emergency engaging handle was pulled. Additionally, when the hand crank was installed on the stub shaft, it would not turn. Sergeant Wall went to the cargo compartment to assist, but to no avail. Warrant Officer Magee and Sergeant Wall ensured that the checklist was completed correctly; however, both the normal and the manual extension system failed to lower the gear.

The next step was to carry out the emergency extension procedure. Sergeant Wall returned to his station in the cockpit as Warrant Officer Magee, assisted by Warrant Officer Audet and Captain Felberg, began to open toolboxes, set up the ladder, and started to remove panels from the inside of the cargo compartment in the wheel well area. Sergeant Wall directed the emergency extension procedure from the aircraft operating instructions; the final option to get the landing gear down and safe was under way. After removing the panels and completing the checklist, Warrant Officer Magee applied pressure to the screw jack with the emergency extension wrench. Much to the surprise and dismay of the remainder of the crew his only words were, "It won't move."

Warrant Officer Magee, Sergeant Wall, Warrant Officer Audet, and Captain Felberg all tried in vain to turn the wrench. At times, there were three and four men trying to break the lock. The crew worked at freeing the landing gear for more than one hour. Everyone was becoming convinced that the left main gear would not come down, but the crew would not give up. Luckily, there was sufficient fuel on board to carry out the work and to make alternate plans. Finally, the screw jack gave way and the first few turns were made with the ratchet. Unfortunately, the ratchet end of the emergency extension wrench broke in the process. This made the completion of the gear lowering very slow and laborious. Two and a half hours after the initial attempt to lower the landing gear, it was finally down-and-locked. The aircraft returned to the City Centre Airport without further incident.

The efforts of the crew exemplify the meaning of the word "teamwork." Due to the perseverance and expertise of the entire crew, a gear-up landing with possible crew injuries and severe aircraft damage was avoided. ◆

Major Baldwin and Sergeant Wall are still serving with 429 Transport Squadron, and Warrant Officer Magee serves with 426 Squadron, 8 Wing Trenton. Captain Cameron now serves with the Central Flying School, 17 Wing Winnipeg and Captain Felberg serves with 2 CFFTS, 15 Wing Moose Jaw. Warrant Officer Magee has now retired.

Good Show

SEA KING "STINGER 28"

On 23 May 2003, Sea King STINGER 28 launched for a Crew Operational Readiness Exercise (COREX) off HMCS VANCOUVER under IFR conditions. Thirty minutes before sunset, while approaching HMCS OTTAWA for parts transfer, the electrical power within the aircraft was momentarily lost. Simultaneously, the Automatic Stabilization System (ASE), the system used to aid the pilots in the flight control of the 10-ton helicopter, failed. As the flying pilot, Captain Laurianne Denis retained control of the aircraft and directed the co-pilot, Captain Trevor Lantz, to begin analysis of the problem, while directing the tactical coordinator, Captain Dale Arndt and Airborne Electronic Sensor Operator (AESOP), Master Corporal Dave Rowe to carry out cabin/cockpit checks and assist the copilot with the analysis. Shortly thereafter, the electrical power within the aircraft began to cycle off and on several times per second, leading to a very distracting "strobing" effect, as instrument and equipment lighting began to flash on and off several times per second. This flashing was also accompanied by loud static over the intercom and a flickering Master Caution failure indication for both Transformer Rectifier Units (TRUs). Since the aircraft had been flying for the past few hours in moderate to heavy rain, water ingress to the electrical system was suspected. Declaring a PAN, the aircraft was turned towards recovery on HMCS VANCOUVER approximately four miles away. While carrying out the checklist items for an electrical failure, the crew began the necessary load shedding of all electrical equipment, with the exception of the TACAN.

With the ceiling at 150 feet and visibility rapidly fading as sunset approached, Captain Denis positioned the aircraft directly into the Delta Hover Astern position and waited until the ship reported that they were closed up at emergency flying stations. Once cleared over the deck by the Landing Signal Officer (LSO), she smoothly flew the aircraft, and despite gusty wind conditions maintained an Aircraft Stabilization Equipment (ASE) – Off hover while the hauldown cable was hooked on to the aircraft. Unfortunately, the hauldown cable separated from the aircraft while entering the main probe and STINGER 28 was forced back to the Delta Hover Astern to wait for a second attempt at landing. At this point, both TRUs and all fuel boost pumps failed. However, it was quickly confirmed the aircraft remained flyable. Moving back over the deck, a second attempt was made to hook up the hauldown cable when the electrical winch failed, resulting in a manual hook up. Captain Denis then positioned the aircraft in the low hover and skillfully executed a rarely done ASE Off landing.

Post shutdown investigation revealed the upper centre console in the cockpit had suffered water ingress. In addition, several circuit breakers and fuses within the electronics compartment had popped with such force that they had shattered. The crew of STINGER 28 are to be commended for their outstanding display of flying abilities, professionalism and crew cohesion during a complex aircraft emergency, under less than ideal weather conditions. ◆

Captains Lauri Denis, Dale Arndt, James Hawthorne and Trevor Lantz serve with 443 Maritime Helicopter Squadron, at 12 Wing, in Shearwater. Dave Rowe has been promoted to Sergeant and he is also serving with 443 Squadron.