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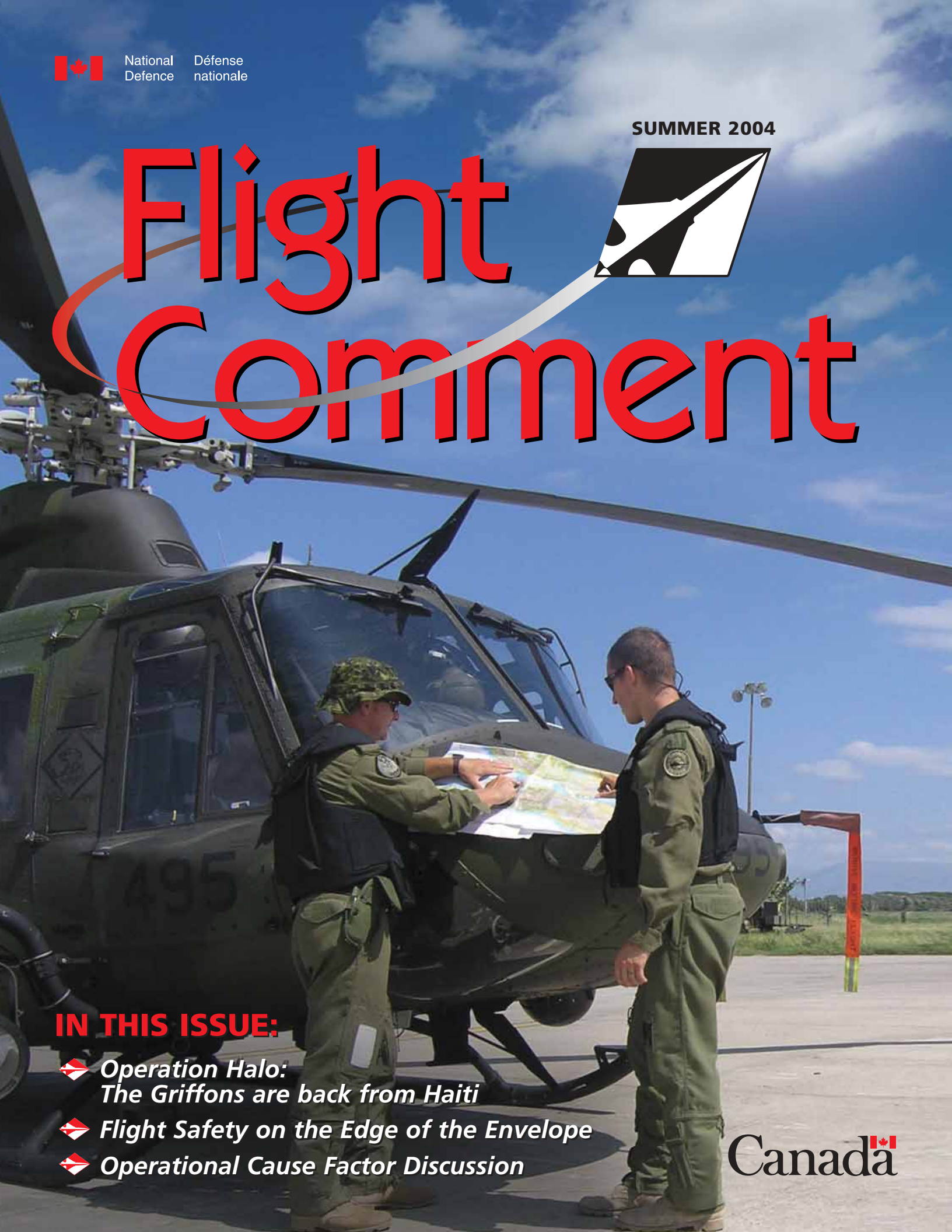
Flight Comment



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Canada

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***Cover page:** Captains Aldo Cordisco (on the left) and Jeff Beaudry completing their mission planning during Operation Halo in front of a Griffon Helicopter.*

Photo by Master Corporal Pascal Dupuis, Operation Halo, 430 Squadron, April 2004.

DIRECTORATE OF FLIGHT SAFETY

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THE CANADIAN FORCES FLIGHT SAFETY MAGAZINE

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The Director's Views on

Flight Safety

It is hard to believe but it has been almost a year now since I assumed the position of Director of Flight Safety (DFS). Since that time, I have had the opportunity to visit just about all Wings as well as most of the units within the Air Force. I continue to be tremendously impressed with the quality of our people and the manner in which they continue to meet the numerous challenges that we face. In addition, the enthusiasm of the ab initio aircrew, maintainers, controllers, and flight line support personnel is truly amazing.

However, that is not to say that there are not some concerns. In the last issue of Flight Comment, Lieutenant-General Pennie outlined the serious flight safety challenges that are currently facing the Air Force. These challenges include a high operations tempo, low experience levels, equipment replacement and modernization programs, and challenges associated with various theatres of operation. The Air Force is doing what it can to mitigate this situation; but there are two serious threats that are starting to become noticeable: shortcuts and fatigue.

The issue of shortcuts is currently manifesting itself within the maintenance community, but it is equally applicable to all parts of the Air Force. Given our current situation, the temptation to cut corners and get aircraft on the ramp is huge. The practice of performing tasks from memory vice referring to the technical orders, omitting essential paperwork, and allowing unqualified personnel to complete maintenance tasks without the appropriate level of supervision are some of the shortcuts that we have seen. These are not only unacceptable flight safety practices, they are illegal from an airworthiness perspective. Therefore, although the temptation is there, it must be resisted as the consequences are huge. In the past, aircraft have been written off and lives have been needlessly jeopardized by cutting corners. I would ask you to remember this if and when this temptation arises.

Fatigue is a more insidious problem that all members of the Air Force team face. Our more experienced personnel are contending with a heavy workload as they try to get the job done while simultaneously training/ mentoring the large number of ab initio aircrew, maintainers and ops support personnel that are now in the system. While there is nothing wrong with a bit of hard work, we are currently facing some unprecedented challenges and we therefore have to realize that we all have our limits. There have been several serious occurrences in the recent past where fatigue played a part. While we all pride ourselves on ability to get things done, we have to honour the threat that fatigue poses to a safe operation.

The Air Force is going through some tough times from a flight safety perspective. It is therefore crucial that we use the system's built in safety processes and avoid shortcuts and that we remain vigilant against the threat posed to a safe operation by fatigue.

In closing, I would like to mention two key members of the flight safety team who are moving on this summer. Lieutenant-Colonel (LCol) Gary Hook, the 1 CAD Divisional Flight Safety Officer will assume command of the Central Flying School. LCol Hook has had a huge influence on flight safety within the Canadian Forces (CF). He has been a key element in today's flight safety organization by training and shaping the thinking of flight safety personnel both within the CF as well as foreign militaries. He will be replaced by LCol Peter Young who I would like to welcome to the flight safety team. Chief Warrant Officer (CWO) Jacques Mercier, who has been the DFS CWO for the past three years, will be retiring from the CF after over 37 years of dedicated service. CWO Mercier's dedication, passion for flight safety and terrific sense of humour will be sorely missed by all of us at DFS. We wish CWO Mercier all of the best in his retirement. In addition, a warm welcome to his replacement, CWO Michel Bernier. ◆

Colonel Al Hunter,
Director of Flight Safety

From the

Flight Surgeon

HEAT STROKE

"Heat exhaustion and heat stroke is a continuum of increasingly severe heat illness caused by dehydration, electrolyte losses and failure of the body's thermoregulatory mechanisms."

Hello from OP HALO in Haiti! With only one-days notice I went from occupying my nice and comfortable Air Force cubicle at the Directorate of Flight Safety (DFS) to playing army in Haiti living in a tent. Who said you can't be at DFS and not be part of a Rapid Reaction Force!! As a result, I did not have time to gather my files and produce the article I had originally wanted to publish, however, there are flight safety lessons to be learned from our operation here in Haiti with our six CH146 Griffon's from 430 Sqn. My point with this article is to refresh everyone's minds on the signs and symptoms of heat illness and to stress the point that it does not take much to become afflicted.

Operating in hot environments is now a routine aspect of Canadian Forces (CF) deployed air operations, certainly within the last three years. We are operating in and out of hot environments constantly. Heat stress injury is a common diagnosis amongst CF personnel and aircrew can be particularly susceptible as they are often operating in some of the hottest environments within our flight decks.

Heat exhaustion and heat stroke is a continuum of increasingly severe heat illness caused by dehydration, electrolyte losses, and failure of the body's thermoregulatory mechanisms (i.e. the way your body manages its core temperature). Heat exhaustion is an acute injury with hyperthermia (i.e. increased core body temperature) due to dehydration. Heat stroke is extreme hyperthermia with thermoregulatory failure and profound central nervous system dysfunction and even death.

Common signs and symptoms of heat exhaustion include: fatigue, weakness, dizziness, nausea/vomiting, headache, muscle pain, profuse sweating, increased heart rate, low blood pressure, lack of coordination, agitation, and intense thirst. The common signs and symptoms of Heat Stroke are all of the previous symptoms plus the following: exhaustion, confusion, disorientation, coma, and hot flushed dry skin. The predisposing factors are: poor acclimatization to heat, poor physical conditioning, salt or water depletion, obesity, acute febrile illness or gastrointestinal illness, alcohol/caffeine use, poor air circulation in environment, and heavy or restrictive clothing.

We have had four cases of heat injury down here in Haiti and in all cases, the personnel became affected within 48 hours of arriving in theatre. None were doing any particularly heavy work, just setting up their living spaces, etc. All experienced nausea and vomiting and all were surprised how little it took before they got knocked down. All did well after resting for 24–48 hours and returned to their duties. So, check yourself, your environment and your crew, and take appropriate precaution in order to mitigate the risks. ◆

Major Tarek Sardana,
DFS 2-6, Flight Surgeon

"Supposed" OPERATING PRODECURES

Tactical Fighter Controllers (TFC's) — some call us "wanna-be" fighter pilots. What we are is not important, but what we do is! One of the TFC's main occupations is to maintain a constant lookout during the simulated combat operations and spot any possible flight safety incidents before they happen.

One day, during a simulated air combat exercise, I noticed an aircraft with a transponder code of 1200 pop up close to four CF-18 Hornet's in simulated combat. For those of you that do not know, 1200 is a code that indicates that an aircraft is flying under visual flight rules (VFR). This aircraft's heading and altitude indicated that he was flying in the restricted airspace reserved for our CF-18's. The aircraft was close to the engagement, however it was flying away from the fighters. I was convinced it was a civilian aircraft that had gone astray!

Before knocking off the fight and losing precious training time, I decided to ask my missing CF-18 what his "squawk" was. The pilot answered "1200." Intrigued, and now reassured of my sanity, I asked him why he was squawking a VFR code. "Because it is Squadron Standard Operating Procedure (SOP) for a dead man," answered the pilot. I requested that our "dead" friend change back to his previous code, and we agreed to discuss it on the ground.

Being 50 feet from the squadron and not 50 miles like the CF-18, I had the chance to discuss the situation with the Unit Flight Safety Officer (UFSO) at the squadron, who is also a pilot, before the Hornets landed. The confused look on his face to my request for information answered my question — either a 1200 code was ***not*** a SOP or there was a definite lack of communication. Just then, in walked the pilot who said that he was convinced that the procedure was SOP. A decision to research the situation was reached by both pilots, and the next day the UFSO informed me that a "Dead Man" code of 1200 was NOT a squadron SOP and that it had merely been a misunderstanding between a junior and a senior pilot. End of story… not quite!!

Two weeks later, during a pre-mission brief, the pilot responsible for the exercise informed us that a "Dead Man" code of 1200 was to be used. Before I could even raise my hand to comment on this repeat situation, another pilot mentioned that 1200 was inappropriate and said that a code that didn't conflict with civilian codes should be used. Another code was chosen and we went off to play for yet another day.

People in the flying community have to discuss problems that have arisen so that they are not repeated and so that information passes clearly and rapidly- communicate, communicate, communicate. Procedures are ***NOT*** SOP's until they are written and promulgated in the publications. ◆

Captain Stephen Hansen now serves in the United States at Tinker Air Forces Base, Oklahoma.

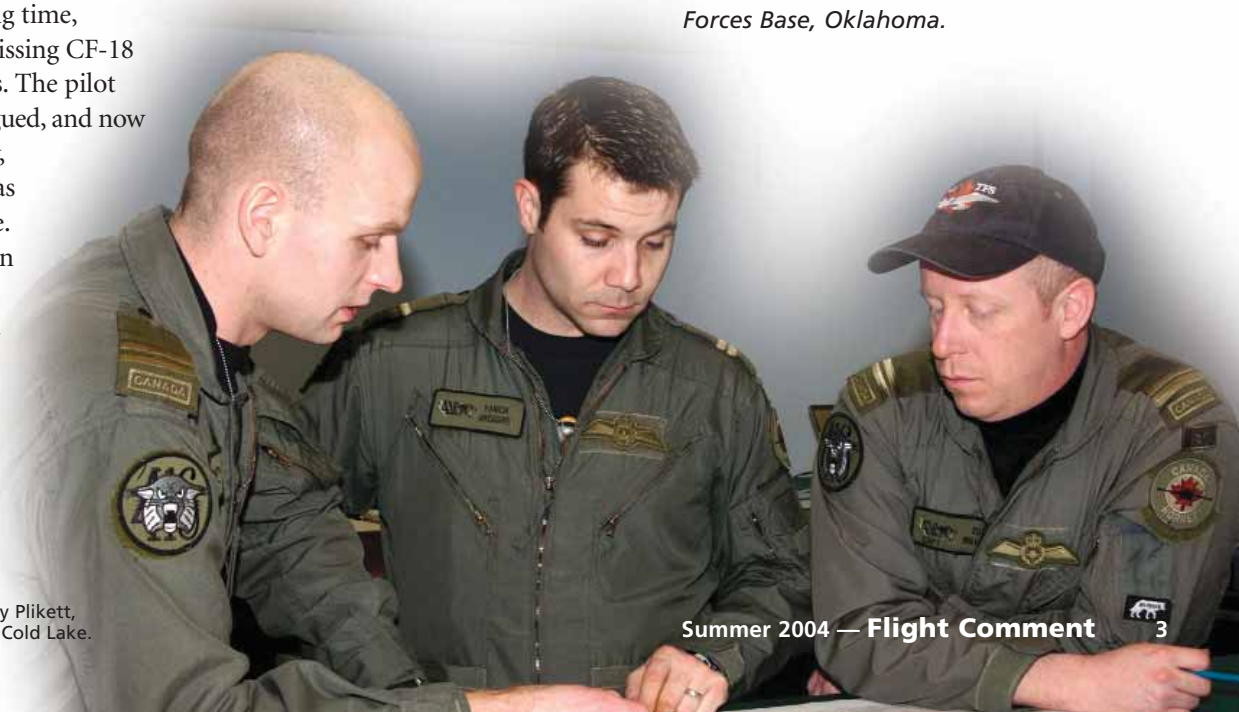


Photo by Corporal Kimberley Plikett, 1 AMS Wing Photo, 4 Wing Cold Lake.

Behind SCHEDULE

It was the morning after the first leg of a transit to Argentina. The Aurora crew had spent the night in Panama City, Panama at an American Air Force base, where the crew enjoyed the night in a hotel. Inevitably, the planned early departure was slipping to the right. This was due to late checkouts by some of the crew, the bus to the airfield showing up late, traffic, and most of all, an unplanned stop at the Naval Exchange store.

The crew, already thirty to forty-five minutes late, attempted to contact transient servicing for a start man, but had no luck. The day was getting hot and muggy, and the crew was trying to make up some time. Subsequently, the on-board check was carried out alone by a crewmember that, due to qualifications, required full supervision. The checks were all completed and the aircraft was ready to start.

Photo by Master Corporal Jeff D. de Molitor, Combat Camera, Arabian Gulf Region, 23 April 2002.

Photo by Master Corporal Jeff D. de Molitor, Combat Camera, Arabian Gulf Region, 14 January 2002.

The crew once again tried to radio for the start man, but still there was no one available. A decision was made to continue the start without the ground man. A normal start was carried out and taxi clearance was received. The brakes were released and an attempt was made to taxi, but the aircraft would not move. The pilot confirmed with the flight engineer (FE) that the chocks had been removed, but he was not sure. The ground man, just prior to engine start, normally carries this out and this is a flight deck check prior to engine start. The flaps were retracted to allow the aft observers to check for the chocks, and it was confirmed that they were still in place. A discussion ensued to decide the best course of action and, since the crew was already behind schedule, it was decided to try to run over the chocks. The attempt was made and then aborted.

Another discussion took place, and a decision was made to stop #1 and #2 engines and exit the aircraft to remove the chocks. Upon exiting the aircraft, the FE noticed that a fire bottle was located just right of the nose, approximately 25–30 feet in front of the #3 engine. It was in a spot that was not in clear view of the pilot, and not noticed during the on-board check. The ground man also normally moves this after the start. It was determined that the bottle was of sufficient height that it would have contacted the #3 prop resulting in major damage.

The crew dismissed the incident as lucky. Unfortunately, there was no further discussion of the incident. ◆

Sergeant Dan Murphy serves with the Maritime Proving and Evaluation Unit of 14 Wing in Greenwood.

Story based on facts as related to Sergeant Murphy by a third person.

BAD HABITS DIE HARD

This is an example of what can happen if one develops bad habits that are allowed to continue unchecked. I was one of four pilots taking a four-ship of Tutor aircraft to Mountainview for retirement. We took the first day to get to Toronto and spent the night there, as we were to do a four-ship flyby over Downsview for Canada Day celebrations. We all got a good nights rest in anticipation for the next day's events. We woke up to a beautiful sunny day without a cloud in the sky and we all commented on how great the weather was to do a fly-by. The fly-by was planned for 1300 hrs so we all arrived at the flying base of operations (FBO) around 1000 hrs, which gave us plenty of time to brief and discuss the mission for the day. After confirming the weather, frequencies, and timings we briefed the trip and everyone was clear on what was supposed to happen. I was the deputy lead in the third aircraft.

We had a planned start time of 1230 hrs so we all had time to complete our walk-around and be ready to start in time. We all started normally and got our clearance to taxi out. We had already talked to Air Traffic Control (ATC) on the phone, so they were prepared for us. We started to taxi off the line in order and, when it came my turn, I advanced the power to leave the line as there was a bit of a hill to get over. A few seconds after advancing the power I felt some rumbling. I pulled the power to idle and checked my engine gauges, which were all indicating normal. I attributed the rumbling to sticking brakes, which I had felt a few times in the past. I wasn't in the same aircraft as I had flown yesterday, so I didn't know if it had had any previous problems, but the pilot hadn't reported anything. I radioed to #4 of my suspected problem and he replied that he had had some trouble getting off the line as well. With this, I dismissed the problem and continued to taxi.

Being excited about the mission, I conducted my taxi checks with enthusiasm and was fully prepared to go. We were issued hold short instructions for the runway in use and we were all prepared for the inevitable "cleared immediate take-off" that comes with trying to depart a four-plane formation from Pearson airport. We were cleared for take-off and all powered up to get into position quickly. When I powered up I again felt the rumbling noise and felt vibrations. This time I checked my engine instruments prior to reducing the power and noticed that the Exhaust Gas Temperature (EGT) was rising and the RPM had fallen from where it should have been, a clear indication that I had a compressor stall. I powered back and informed lead that I had to abort. I taxied back to the FBO without further incident and shut down.

After shutting down the aircraft, I went to install the gear pins and appropriate covers and pins. When I went to cover the pitot tube, I found that I couldn't find the pitot cover. This immediately gave me suspicion as to what had caused the compressor stall. I carried out a foreign object damage (FOD) crawl and found the first three stages of the compressor were damaged and there were the telltale remnants

of orange "remove before flight" flags stuck in the stator guide veins prior to the compressor. I had indeed ingested the pitot cover. How could this have happened?

Well…it actually started approximately three years ago when I started my pilot training on the Tutor. There is a ledge just ahead of the intake that is formed by a v-shaped formation on the aircraft, which splits the airflow by the intake. This ledge served well as a resting-place for the pitot cover while I did up my parachute. The normal flow of events was that I placed the pitot cover on the ledge, did up my parachute, then took the cover and placed it in the appropriate stowage pouch. I did it in this order so as to save climbing up to stow the cover, then climbing down to do up my parachute. There were times in the past where I had forgotten the cover on the ledge but, either the ground crew or I, had noticed the error prior to engine start. This day was an exception. My bad habit, combined with some inattention due to excitement about the upcoming mission, had allowed me to miss the fact that I hadn't stowed the pitot cover, which resulted in the destruction of a 1/2 million-dollar engine.

But it could have been worse. Had the cover been ingested on departure instead of immediately on start, it would have led to an ejection and a crashed airplane.

It is important that in our line of work, we develop good practices right from the commencement of our training. We must continue to foster good habits and seek out bad ones so that we can put an end to them before they are allowed to cause damage to, or the loss of, valuable aviation resources. I have learned this lesson but, unfortunately, not without cost. ◆

Captain Damian Unrau serves with 410 Squadron at 4 Wing Cold Lake.

OPERATIONAL CAUSE FACTOR DISSCUSION

An Opportunity MISSED

There is a lot of unnecessary and distracting information being forced upon people these days and aircrew are probably subject to even more of it than most. I expect, therefore, that in self-defence most aircrew have adopted a fairly restrictive filtering system, so that dealing with the trivial does not interfere with getting at the important issues. Flight safety officers should remember this reality when writing up incident reports, because there will only be a slim window of opportunity to grab the reader's attention and, if it is missed, it is likely gone forever. When that happens, the most important reason for the existence of incident reporting is gone with it.

For instance, take the following Griffon incident (#111108) extracts, which concerns a rotor overspeed in Bosnia.

- **Description:** Suspected main rotor overspeed — crew was flying at 80–100 knots, approx 500 feet above ground (AGL.) The aircraft was crabbing at 45 degrees to the right in 65 knots of wind, with gust of 85 knots, (60G85knots) when severe turbulence occurred. The aircraft yawed to 90 degrees and lost and gained altitude at a rate of 1000 to 1500 feet per minute. The main rotor rpm (RRPM) was seen to reach approx 106 percent with the RRPM warning light and cyclic position centre light on. Severe turbulence continued for almost one minute before the crew was able to find smoother air and land safely at the nearest site, without further incident.
- **Investigation:** After landing, the crew downloaded the data from the aircraft Health & Usage Monitoring System. No conditions of overspeed were recorded. The crew carried out a detailed pre-flight inspection and return to base without any further incident.
- **Cause Factors:** Environment — weather — in that strong and gusty winds caused a rapid acceleration of the main rotor rpm.
- **Preventive Measures:** Brief all aircrew.

The current bee in my bonnet is the incorrect application of the environment cause factor. In another ***closed*** incident, a window broke when a gust of wind slammed the open and unattended pilot door shut and the only cause factor is environment/wind. I wondered, though, who left it open? In the above-mentioned case, I was quick to notice that the whole incident was also attributed to the strong gusty winds that did, in fact, exist. However, I think you have to dig a little deeper than that and rule out other possibilities before you can settle on "environment" as a cause factor. The A-GA-135 states that: "*Environmental causes apply* ***only*** *to those events where* ***adequate*** *and* ***reasonable*** *care and precautions were exercised. Reasonable precautions include, but are not limited to: full use of forecast information, …*".

Right away, I wondered about what forecast information was known by the crew. Nothing in the investigation answered that question but I thought that 65G85 knots does not just come out of nowhere, so there were several possibilities. At least three of these were: first: no area forecast available, second: crew was at a deployed location and could not get the forecast, or third: crew did not check the forecast. I came away from reading this with more ammunition for my crusade

but had an inadequate appreciation of what really happened. Routinely, I review all Griffon incidents and, every once in a while, review the "higher interest" ones at the morning 400 Squadron operations briefing. On the day I mentioned this one, I was just getting warmed up with my environment cause factor theme and got as far as "What did the crew know about the weather?" when one of the pilots at the briefing broke in and told us he was the aircraft commander (AC) in question. The tale he told was eye-watering. What follows is the narrative he later wrote up, a story he called "Bumpy Ride" but that hardly does the tale justice. Read on to see what the AC had to say…

"In February 2003, our squadron was deployed to Banja Luka, Bosnia in support of the Multi-National Division North West. Essentially, we were a taxi service for VIPs. The day started the same as others while in Banja Luka. We received our tasking the previous night. This time we were to fly our VIP to Sarajevo and two other persons to Bugojno, a Dutch base mid-way to Sarajevo, but off track and in the next valley over. A weather call had been requested at 0630 hrs, due to the long drive required if the weather was poor. As usual, the weather was less than ideal; the ceilings were right on the line with respect to making it over the mountains enroute to Sarajevo. The most noted item, however, was the forecast wind — severe turbulence in the mountains. This wasn't supposed to occur until we were nearing the end of our mission. Regardless, based on the relatively low ceilings, the severe turbulence, and the known dislike of flying by our passenger, I elected to cancel the mission. No problem. As expected, we were asked if we could at the least get the VIP to Bugojno, which was halfway. Since I was still trying to get there with my other two passengers, I said it shouldn't be a problem but told him to expect a very bumpy ride. This made him happy as it cut his drive in half." (Major Lee Editorial Note: So far, so good. The decision to go was based on a shorter mission and the ability to complete it before the onset of the forecast severe turbulence condition.)

"As luck would have it, about thirty minutes before our launch time, a Slovenian Bell 412, (a civilian Griffon) with weather radar onboard, had made it in from Sarajevo and the VIP caught wind of this fact. When we arrived to pick him and the two other passengers up, he said he wanted to try for Sarajevo as he had a very important meeting to attend. I told him about our chances due to the weather and advised him that I had another mission to Bugojno, for my other passengers. "Essentially, he said that he was the priority and all else would have to wait."

This is where I made my biggest mistake. I caved and agreed to try, warning him it was going to be a bumpy ride and I couldn't promise that we could make it. The two Dutch passengers weren't too happy, but came along in hopes of getting to Bugojno on the return leg.

After take-off, we noted the winds on the avionics management system to be 60G85 knots, and we were making a ground speed of approximately sixty knots. Right away, I advised the VIP that we would have to land at Bugojno for fuel, due to the winds. No complaints so far. In order to get to Bugojno from Banja Luka, we had to take a small cut through a line of mountains, which was approximately fifteen to twenty miles wide. As we turned the first corner into a valley, perpendicular to the winds, we really started to feel the turbulence. It was bad, but nothing too extreme at the time.

Our second mistake was that we continued. At that point, we hit severe turbulence, which sent us back and forth from 2000 feet per minute (fpm) up to 2000 fpm down. The aircraft was already crabbing 45° to the right and was being kicked 90° off of track. In order to control the rotor during the rapid changes on the Vertical Speed Indicator, I had to pull in the collective. Unfortunately, the ceilings were only a couple of hundred feet above us, and closing. We managed to arrest our rate of climb but at the cost of over speeding the rotor. After some colourful descriptions of our current situation from the entire crew, I managed to get us low enough and close enough to a mountain that some of the turbulence subsided and we made an emergency landing at Novi Travnik, a Dutch hospital camp. After a few hours on the ground to regain our composure and several phone calls and inspections later, we were able to get the aircraft back to Banja Luka, hugging the ground to avoid the worst of the winds. In comparison, it took us ninety minutes to get to Novi Travnik and less than twenty minutes to get back.

I learned a great deal that day. The first lesson was to never second-guess my decisions concerning weather. The second one was not to allow myself to be pressured into flying a mission, at least a non-critical one, in poor or unsafe conditions. On a side note, the VIP passenger admitted he learned a lesson that day as well. He'll never question an AC's decision when weather (more accurately turbulence) is concerned."

For this incident, the preventive measure assigned was "Brief all aircrew". This tale was related to the Bosnia pilots but that is as far as it went. That was a significant oversight for the rest of the Griffon pilot community, specifically, and for all pilots in general. Anything more that might be said would be anti-climactic. Suffice to say that the opportunity to use this incident to pass on an important message to all pilots was, for whatever reasons, missed. Make sure you don't miss your opportunities. ◆

Major Ted Lee serves as Base Flight Safety Officer at Base Borden.

Captain Carl Stenhouse serves as a pilot with 400 Squadron in Borden, 1 Wing Kingston.

Photo by Sergeant Gerry Pilote, Combat Camera, Bosnia-Herzegovina, 14 November 2001.

The Editor's Corner

E-mail from Sergent Jocelyn Chagnon, 12 May 2004

"Just a quick note with respect to the Spring issue of *Flight Comment*. Included in the magazine is a poster of the Flight Safety Team for 2004. It is a very nice poster but unfortunately not very accurate in my opinion. What I mean is that as a National Defence Quality Assurance Region (NDQAR) here at SPAR Aerospace, I have a full plate monitoring flight safety concerns on numerous Canadian Hercs we have in house at any time. Beside our own airplanes, we have other military Hercs belonging to the USCG, the USN, Mexico and Greece which can bring the total of aircraft in house to 11 planes, not counting any Tutor Snowbird's conversion we may have or our busy CC-130 component Repair and Overhaul line. I am also aware we have a multitude of NQARs across the country who performs the same duties for other DND aircraft type once inducted for 3rd line repairs. Does it mean that we are not part of the team? I hope not."

Sergent Jocelyn Chagnon, NDQAR SPAR Edmonton

Editor responds

Very good point, Sergeant. As you can appreciate, it is difficult to incorporate on one poster all organizations forming the Flight Safety (FS) team. When we will reproduce the next edition of the poster; we will look into the possibility of inserting the NDQARs and other members of the FS Team like the Regional Glider Cadet Offices. ◆

Jacques Michaud, Editor

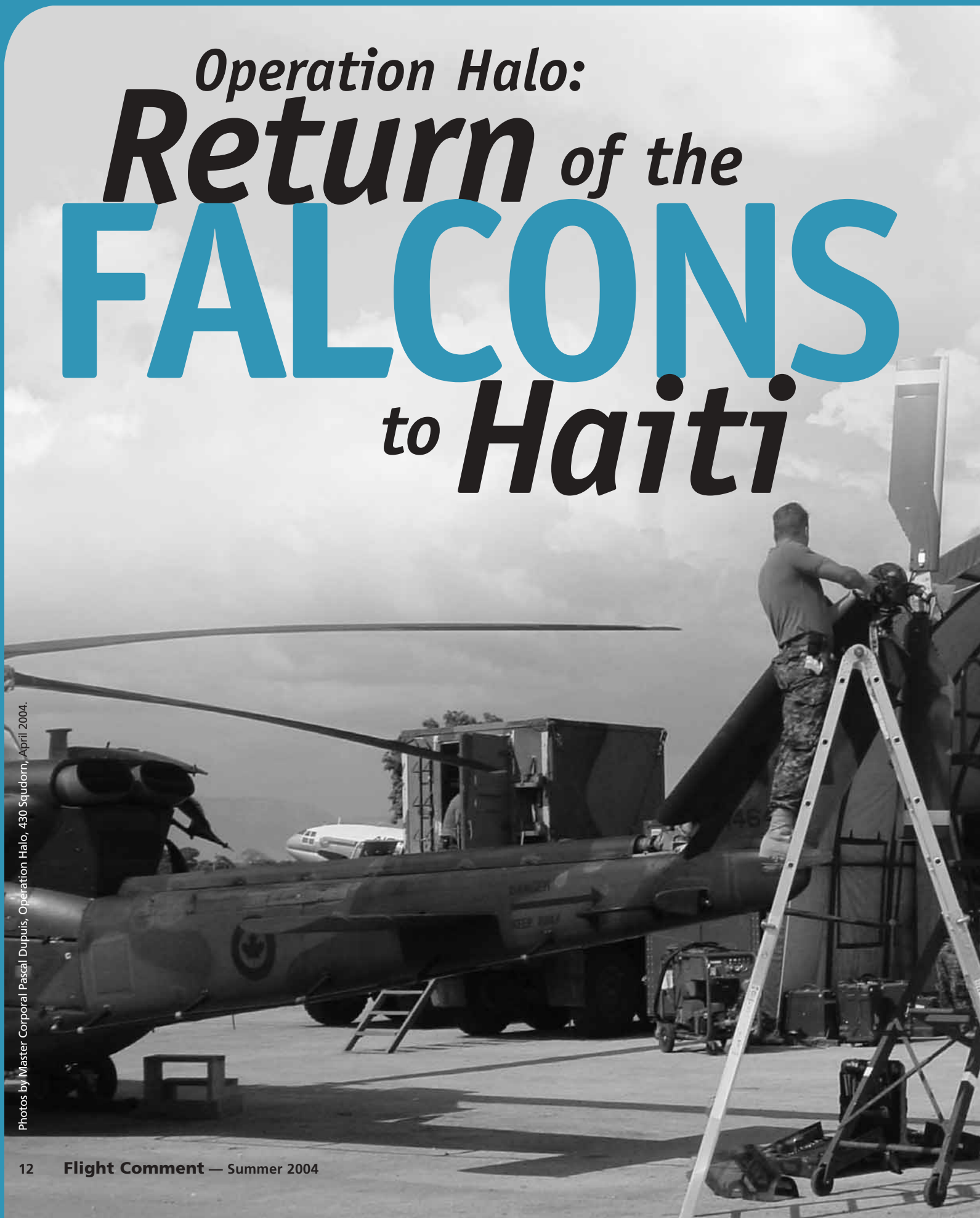
Kudos to LCol Hook for the CAS Commendation

"As the Divisional Flight Safety Officer (DFSO), Lieutenant-Colonel (LCol) Gary Hook has had a profound and lasting impact on the Flight Safety culture of the Air Force. Under his guidance, the Basic and Advanced Flight Safety (FS) courses have evolved to a highly sought after world class standard. The reputation of the course has spread, resulting in no less than fourteen different nations having sent individuals to these courses. He has reached out beyond the flight safety organization to spread his message. His superb briefing abilities have been described as outstanding and inspirational. LCol Hook's interest in the well being of the Air Force is manifested in his continued efforts to maintain focus on FS and the balance with operational requirements. His background in the study of Human Factors (HF) is extensive and in his capacity as DFSO he has raised the awareness of the human element in operations to the point where HF considerations have become institutionalized in the Air Force system. He has been instrumental in the development of the HF And Classification System (HFACS). Not only will this initiative contribute to a safer environment, it will also enable the identification of systemic issues that affect the operational capability of the Air Force, thus creating a more effective organization." ◆

Signed Lieutenant-General Ken Pennie, Chief of the Air Staff

The Assistant Chief of the Air Staff, Major-General Richard Bastien, presenting the Chief of the Air Staff Commendation to Lieutenant-Colonel Gary Hook at the opening of the FS Single Issue Seminar, Ottawa, 18 May 2004.

Operation Halo: Return of the FALCONS to Haiti

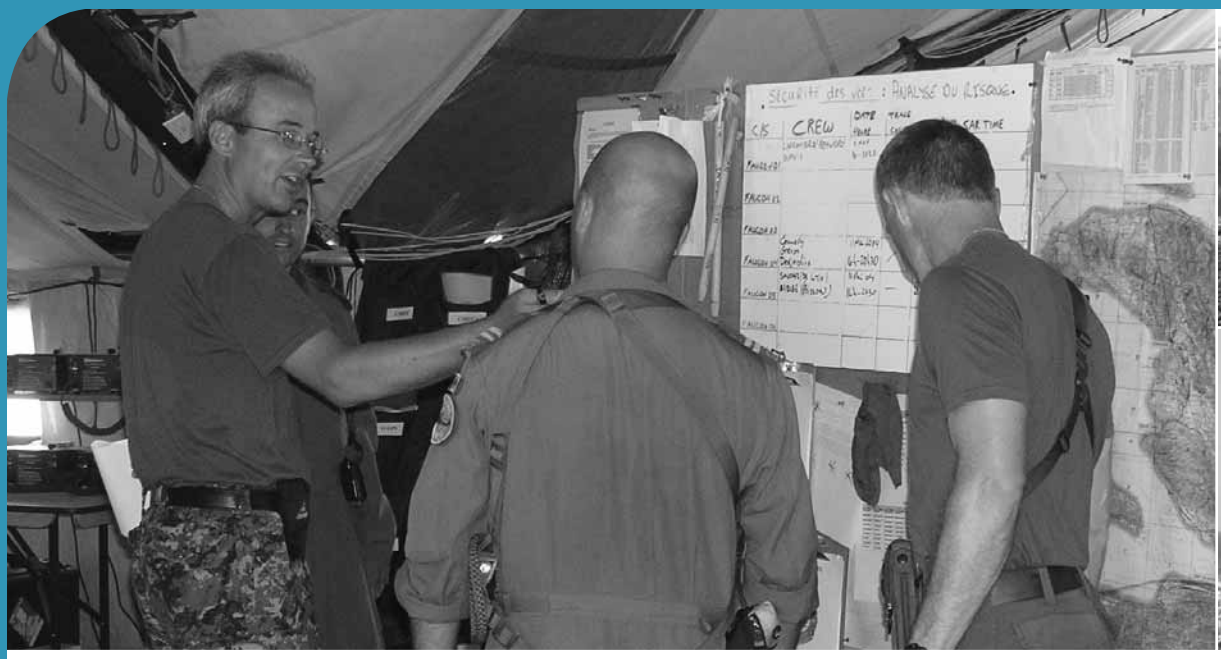


Photos by Master Corporal Pascal Dupuis, Operation Halo, 430 Squdorn, April 2004.

It was hard to imagine that one day we would be asked to return to Haiti to serve on another United Nations (UN) mission. Even though some of our members have never forgotten their experiences in 1997 on Operation (OP) Constable, it came as a bit of a surprise when we had to consider a possible return to this Caribbean country. The Canadian government's positive response to a request from the UN made it very clear: the squadron would be on its way. With unrivalled enthusiasm, the members of 430 Tactical Helicopter Squadron quickly answered the call. Barely two weeks after the order to deploy, 82 members of 430 Tactical Helicopter Squadron (THS) and nine others from 438 THS had completed their preparations and training for Operation Halo. On 17 March, the advance party of 26 members and two CH-146 Griffon helicopters arrived in Port-au-Prince to start the mission. On 28 March, the main body, consisting of 65 members and four Griffons, arrived in theatre. Although the personnel were transported in Hercules and Polaris aircraft, the six CH-146 helicopters, receiving the invaluable assistance of 438 THS, made the journey from Valcartier to Port-au-Prince in 4 days, accumulating more than 27 hours each.

Over the first few days, the reality of Haiti hit us right in the face. Not only did our crews have to cope with a hostile environment with difficult living conditions, they had to adapt to the unique flying conditions. These include the heat and the density altitude, the terrible air traffic control service, flying obstacles (ie, non-indexed wires), the huge amount of garbage at landing and take-off sites and at the Port-au-Prince airport, kites, and the weather conditions unique to the West Indies. Given the development and implementation of new operating procedures and our integration into multinational flight operations, we had to have an accurate assessment of these conditions to allow us to adapt and to clearly identify appropriate measures to mitigate the risks they represented.

We gradually adapted to this new environment. The personnel needed some time to acclimatize to a significant change in temperature (-20 to 40°C), to get used to life in a tent, and to appreciate the hard rations that would be the norm for the rest of our stay here. Another aspect that needed some adjustment was the nature of the mission, which is governed by Chapter VII of the United Nations (UN) Charter, requiring constant protection of the force. Consequently, the crews must constantly wear army fighting order and fly wearing bulletproof vests, which increases the risks of dehydration and the consequences of the greenhouse effect. Greater vigilance and mutual monitoring were the most effective measures. The personnel needed 24 to 48 hours to make the adjustment and be able to commence operations. And to deal with the extreme heat, we built an "igloo" tent with several air conditioners where night flight crews and night technicians could cool down during the day.



As for the equipment, the CH-146 displays good potential and performs well under these conditions. The experiences of OP Constable with the Griffon helped us prepare and train crews and technicians. Required to operate at the aircraft's weight limits (11,900 lbs) and at a density altitude of 2,500 feet above sea level at Port-au-Prince, the crews do not have a lot of room to manoeuvre and must be extremely careful when controlling the helicopter. One of the most obvious signs of poor technique or skills is the amount of torque overloads that occur under these conditions. Only one overload occurred in the 457 hours flown in theatre between 17 March 04 and the date this article was written (3 May 04).

Another distinctive detail of this theatre is the extremely limited air traffic control service. Air traffic control in the Port-au-Prince area consists of the controller on duty visually identifying the traffic. Although most approaching aircrafts identify themselves, some do not and land without the permission of air control. Thus, the actual control is exercised by all military aircraft that clearly announce their intentions for the benefit of everyone. The greatest danger, however, is not necessarily the lack of air traffic control but the closeness of the airport to several kites, some of which can attain heights of 700 feet. To face this challenge, the crews try not to fly over parks and large recreation areas used by kite-flying fans, and they join the circuit at higher altitudes than required in order to steer clear of any unannounced traffic approaching Port-au-Prince airport. According to the mission's operational requirements, a certain number of flights are to be conducted in the Port-au-Prince area with night vision goggles (NVG). Close co-ordination between us and the American forces (US Army and US Marines) thus ensures that the airspace is shared safely. We need to maintain constant vigilance because we are operating with civilian traffic that does not see us. A fourth member of the crew, actually the mission specialist, is essential on these missions to help with the visual detection of air traffic.

In addition to these unique conditions, there are challenges caused by the weather. Since we are in the rainy season and thunderstorms occur every day, we plan our flights in close collaboration with our weather section. The geography of the country means that the altitude can range from sea level to mountain chains reaching a height of 8,000 feet. This generates a variety of weather conditions and requires special attention. Since the weather section is under the same roof as flight operations, it can contact the crews in time in case of any changes that could influence their flight.

The technicians must also adapt to the heat and to sharing their facilities with civilian companies. The ramp used is shared with several air companies that have up to 40 flights a day. Boundaries and strict control of access to our facilities, including barriers and guard posts, ensure protection. In addition, two "Weather Heaven" hangars help us protect aircraft undergoing repair or maintenance. Even though aircraft in theatre should not require major inspections, we still need to pay special attention to it to maintain a good serviceability rate. For example, it must be washed every night to remove salt, and special attention must be paid to the aircraft batteries

on a daily basis. Batteries are less effective in such hot conditions.

Managing flight operations here is no different than managing operations in garrison. However, the risks and inherent dangers of this type of mission mean that our analysis of each situation must lead to the identification of all possible mitigation measures. In an environment as non-permissive as Haiti's, each element is studied by both the crew concerned and the flight supervisors. To facilitate the communication and integration of information required by all flight supervisors, a new Command Post concept is currently being tried out. It allows us to centralize and maintain all our information under one roof. This gives the crews access to all the detailed information they need to plan their missions and the supervisors with all the data required in risk analysis and decision-making. The effectiveness of this concept is exceeding expectations and represents an improvement in flight operations management.

Air operations can only be organized and conducted in such rough and non-permissive conditions with the help of a thorough and continual risk analysis. We quickly learned that we cannot do everything. Although the missions may present us with an unexpected and excessive workload or with requests different from those earlier agreed upon, we have to be very careful before accepting. In other words, we cannot maintain a "can-do" attitude at all costs. In such situations, control can be lost, emotions can triumph over reason, and security can easily be breached. Since our experiences tend to vary from one day to the next, it is important to absorb the lessons and information that will help us improve our skills and avoid specific situations. Consequently, we stage daily meetings with all flight personnel and some personnel from the maintenance and operations team to review events and share the lessons learned.

The members of 430 THS Falcons and the augmentees are proud of their ability to meet the challenges of OP Halo and to demonstrate that air operations can be carried out safely in difficult environments. ◆

Lieutenant-Colonel Pierre St-Cyr,
Commander Task Force Haiti
Tactical Helicopter Detachment

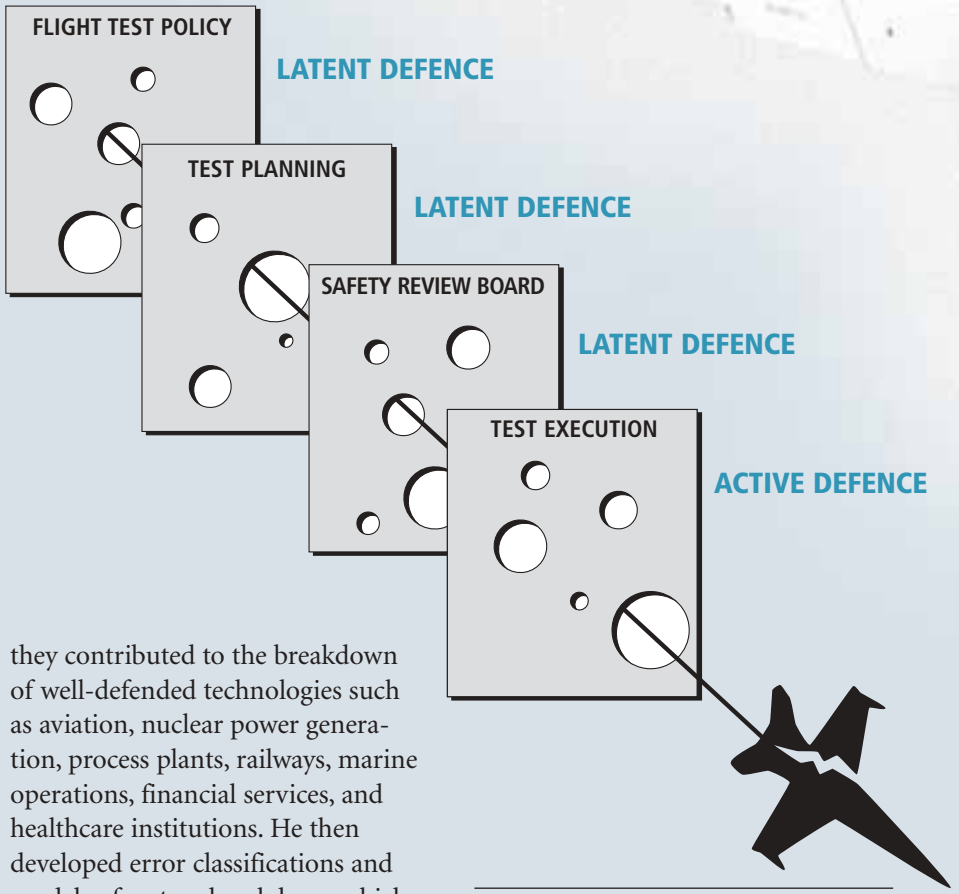
Captain Dave Devenney, the Task Force Haiti Public Affairs Officer, reported on the Department of National Defence Internet site that the Griffon helicopters from 430 THS played a pivotal role in relief efforts after torrential storms hit Haiti, causing mudslides and damaging towns along the border between Haiti and the Dominican Republic. "In the mountains, many roads were washed out, so some of the most badly damaged areas were accessible only by helicopter. Haiti's interior ministry was estimating that the storms had caused more than 400 deaths.

The six Griffon helicopters deployed to Haiti on *Operation HALO* are Canada's participation in the Multi-National Interim Force (MIF). 430 THS works with the American, Chilean and French contingents of the MIF as well as the Canadians, providing services ranging from aerial coverage for the soldiers of India Company, 2nd Battalion, The Royal Canadian Regiment, to ferrying French soldiers to the northern city of Cap Haitien." ◆

Safety at the Edge of the Envelope

Flight safety and risk management are key to operations at the Aerospace Engineering Test Establishment (AETE) in Cold Lake, Alberta. AETE is the Canadian Forces Engineering Test and Evaluation (ET&E) centre and often provides the first look at new aircraft systems, stores, and expanded aircraft envelopes. Colonel Bill Werny, the Commanding Officer of AETE, is the designated Canadian Forces (CF) Flight Test Authority and in this capacity must ensure that safety and risk management come first in all aspects of flight test programs.

Within the past two decades, several new approaches have been produced in both the civilian and military sectors to improve safety by applying methodical approaches to risk management. Most notable were the contributions of Professor James Reason of the University of Manchester. For the past 25 years, Professor Reason has researched human error and organizational processes and how they contributed to the breakdown of well-defended technologies such as aviation, nuclear power generation, process plants, railways, marine operations, financial services, and healthcare institutions. He then developed error classifications and models of system breakdown which are now used by many organizations



NOTE: Adapted from Professor James Reason's Swiss Cheese Model of Safety.

CC-130 Hercules AUP Glass Cockpit.

CH-149 Cormorant Icing Trials.

and is known as the Swiss Cheese Model of flight safety. Succinctly stated, each layer is a defence against or means of preventing an accident. However, each layer has holes and if all of the holes line up at a given time, an accident will occur.

The different layers are identified as either active or latent defences. The active layers are obvious — in aviation they might be environment (weather, obstacles, traffic, etc), aircraft flight condition, and pilot actions. The latent layers are less obvious. These could be maintenance policy, maintenance instructions, training, parts procurement policies and methods, or aircrew training and proficiency. The latent defence layers consist of policy, orders, instructions, and planning, to name a few. One of the methodical approaches to risk management was produced in Standard Practice for System Safety (MIL-STD-882) and has been used by AETE for flight test since the late 1980s. It has also found its way into Canadian Forces Technical Orders, namely Flight Safety for the Canadian Forces and the Technical Airworthiness Manual, as well as 1 Canadian Air Division (CAD) orders.

AETE has executed many interesting flight test programs in the past few years: CF-18 Hornet Precision Guided Munition (PGM) stores clearance, implementation of a CT-133 T-Bird ejection seat test bed aircraft,

CC-130 Hercules AC DC electrical systems upgrade and Ground Collision Avoidance System (GCAS), CP-140 Aurora electromagnetic interference (EMI) on the autopilot and electrical power control panels, CH-124 Sea King sudden loss of power investigation, and CH-149 Cormorant icing trials. Each test program provided unique risks and challenges that required careful thought and planning prior flight test execution.

Store clearance risks might entail exceeding an aircraft limit as the edges of the envelope are explored or worse, un-damped flutter could encountered which would quickly destroy the aircraft. Designing, building, then flying the prototype ejection seat CT-133 aircraft had risks of flight path stability, potential pitch excursions when firing the ejection seat, or smoke in the cockpit from the ejection of the rear seat. Modified complex CC-130 electrical systems face risks of fire or loss of electrical power due to unknown system switching response. Ice trials on a helicopter could cause a rotor imbalance from ice build-up or ice shedding. The challenge is identifying the hazards, all of them, and reducing the list to only those that could be reasonably expected to occur. Sound easy? Far from it.

The process used by AETE involves four distinct steps:

1. **Identify**:

   Hazard: What bad things await the unwary?

   Causes: What could cause these bad things to intrude on the test program?

   Effect: How bad could it get, injury, loss of aircraft?

   Unmitigated Effect Category

   Unmitigated Probability

   Unmitigated Risk Level

2. **Minimizing procedures** — What can be done to reduce the effect if the hazard occurs and to minimize the probability of it occurring?

3. **Corrective actions** — So it does occur, now what? You need to do something!

4. Once minimizing procedures are taken into account, **identify the projected**:

   effect category

   probability

   risk level

The potential Effect of an event is defined by four specific categories as follows:

1. **Category I — CATASTROPHIC**: May cause death, system loss, or severe environmental damage;

2. **Category II — CRITICAL**: May cause severe injury, severe occupational illness, or major system facility, or environmental damage;

3. **Category III — MARGINAL**: May cause minor injury, occupational illness, or minor system/facility/environmental damage; and

4. **Category IV — NEGLIGIBLE**: There are no significant effects

The Probability of an event occurring is broken into five distinct areas defined as follows:

1. **FREQUENT**: Likely to occur frequently during the test;

2. **PROBABLE**: Will occur several times during the test;

3. **OCCASIONAL**: Likely to occur some time during the test;

4. **REMOTE**: Unlikely, but possible to occur during the test; and

5. **IMPROBABLE**: So unlikely that it can be assumed that it may not occur during the test.

The combinations of effect categories and probabilities is further categorized into risk levels culminating in the following table which is used in MIL-STD-882 and most Canadian Forces risk management documents:

Much of the flight testing conducted by AETE is on aircraft systems that don't have an airworthiness clearance or are in flight regimes at the edge or even beyond the approved envelope. A flight test exclusion is required to allow the test to proceed. AETE, the Director of Technical Airworthiness (DTA), and the Aircraft Engineering Office (AEO) consult and determine what limits are required to accomplish the test. As well, a safety onion skin layer beyond those limits is determined to allow for small excursions as the target limits are approached. Simply stated, the experts look at a limit beyond the cleared envelope, apply a small margin for excursions, and determine if it can be approached during a methodical build-up and reached without causing damage or injury. This is then documented in the flight test exclusion which is, in fact, the first step of a risk analysis.

For a CF-18 stores clearance project, one hazard is un-damped flutter in certain flight regimes with the new store, or combinations of the new and existing stores, loaded onto the aircraft wing. Rapid onset of flutter could destroy the aircraft. The test team, consisting of qualified test pilots (QTP), flight test engineers (FTE), and subject matter experts (SME), analyze the hazard, and assign an effect level and probability to determine an unmitigated risk level. Minimizing procedures would

HAZARD SEVERITY CATEGORY				
CATEGORY / PROBABILITY	CATEGORY I CATASTROPHIC Death or system/ Facility loss, severe environmental damage	CATEGORY II CRITICAL Severe injury, occupational illness, or major system/ facility/environmental damage	CATEGORY III MARGINAL Minor injury, occupational illness, or minor system/ facility/environmental damage	CATEGORY IV NEGLIGIBLE No significant effects
FREQUENT Likely to occur frequently during test	EXTREMELY HIGH	EXTREMELY HIGH	HIGH	MEDIUM
PROBABLE Will occur several times during test	EXTREMELY HIGH	HIGH	MEDIUM	LOW
OCCASIONAL Likely to occur sometime during test	HIGH	HIGH	MEDIUM	LOW
REMOTE Unlikely, but possible to occur during test	MEDIUM	MEDIUM	MEDIUM	LOW
IMPROBABLE So unlikely, assume it may not occur durint test	LOW	LOW	LOW	LOW

SOURCES: MIL-STD-882D, Standard Practice for System Safety C-05-005-001/AG-001, Technical Airworthiness Manual.

AETE CF-18 flying with MK82 bombs.

AETE CF-18 dropping MK82 bombs.

include a methodical build-up in the test matrix from benign to more dynamic test points, use of an instrumented aircraft, and monitoring the flight, real time, in AETE's flight test control room.

The next critical step in the risk analysis is identifying corrective actions — that is, if things do go wrong, now what? We need to make sure that if the pilot and aircraft are having a bad day, things don't get worse. The test team identifies steps to ensure that safety infrastructure and support are in place in case, despite our best efforts, the hazard occurs. Finally, the team looks at the minimizing procedures, determines a projected effect and probability, and finally the projected, or residual, risk level. If the residual risk is too high, the team returns to square one and starts over. Once all risks are identified and addressed in the Risk Assessment, a Safety Review Board, chaired personally by the CO AETE, as the Flight Test Authority, is held with AETE's Senior Test Pilot, Senior Test Engineer, and the test team to review the hazards, minimizing procedures, and residual risk before the program can continue.

Regardless of the aircraft type or systems involved, AETE must ensure that the right people and skill sets are assigned to the test program to guarantee success. AETE's safety process is systematic but we must always bear in mind that process is no substitute for Test and Evaluation experience and sound judgment. Experienced QTPs, FTEs, and SMEs and our methodical approach ensure that we continue to test new systems and explore aircraft performance safely at the edge of the envelope. ◆

Larry Dublenko, P.Eng.
Aerospace Engineering
Testing Establishment
Officer in Charge Avionic Systems
Evaluation

Ready for Everything?

I was at home, on summer leave, when I received a phone call from work. They wanted my passport as, it seemed, I would be replacing a suddenly repatriated squadron member. Within four days, having said my goodbyes, I found myself on the way to the Persian Gulf. Once arrived, I made my way to my new home, the HMCS Regina, to join the already embarked helicopter air detachment.

The next day, the ship put out to sea and I was scheduled for my first flight in the Arabian Gulf. This flight was a "door gun shoot" and it was specifically scheduled to give me my last needed qualification before reaching the operating area. My immediate surroundings were not new; I had been at sea before and had done these flights before, although never in this neck of the woods; still, I considered it an easy trip. During our pre-flight brief, water was mentioned, but not stipulated. This detachment, already in theatre for a month, was relatively accustomed to flying in the harsh, hot environment. I was not, nor did I understand the effect it would have on me. "Besides," I thought, "this flight was short and only scheduled for ninety minutes."

I observed other aircrew filling their water bottles, however I had not had an opportunity yet to acquire a bottle of my own. I made a brief search yet was unable to come up with any suitable container. Flying stations had been piped and the last thing I wanted to do was to delay my first flight. I decided then, that I could survive a short flight without water and I would sort out the water bottle issue for the next flight.

Having spent the last fifteen hours sleeping and living in an air-conditioned space, the heat and humidity hit me like a hammer. The intensity of 40+ temperatures surprised me, but the hangar door was closing and I was already behind in my pre-flight checks. I carried on with my job and wondered if I had made a wise decision. I came to the same rationalization as earlier — it was only a short flight!

After adding a helmet, life vest, and the required dual layer clothing, I was sweating buckets inside the aircraft, even before take-off. As I was moving around the plane during the post take-off cabin check, I noticed sweat dripping from my helmet. When the range had been cleared, the Tactical Coordination Officer (TACCO) and I proceeded to the rear cabin to prepare for the machine gun shoot. By now, my flight suit was soaked; the TACCO noticed and kindly offered me some of his water. I declined his offer, too proud to admit that I was in any discomfort. When our task was completed, we cleaned up and were on our way back to the ship for a crew change. I was in some discomfort but I was relieved knowing that I would soon have some water to drink on an air-conditioned ship.

During our return flight to the ship, we were re-tasked as a medical evacuation (Medevac) flight. We had the only doctor afloat, so we were to land on an American ship and transport a possible heart patient to our ship, the HMCS Regina. Once we landed on the American ship, my activity level increased because of the refuelling, passenger brief, and the physical effort of carrying a litter to our helicopter. I was now concerned for my own health as it was unbearably hot. Still today, I don't understand why I did not request water from the Americans. I had stopped perspiring, yet I hardly noticed as I was so preoccupied with concern for our passenger's comfort.

As we were touching down on our deck for landing, I was nauseous and dizzy, and my peripheral vision was starting to grey. I felt that I was in grave physical condition, however there was no time to interrupt as we needed to set down, shut the rotor down, and disembark our passenger to the sick bay.

Fortunately, there was ample help and I was free to proceed inside. It was none too soon as I stumbled while crossing the deck and needed to be helped down the ladder, where I was physically sick.

The short, ninety-minute flight had turned into a three and a half hour flight, in 40-degree heat, without water. I was definitely unprepared. I spent the next hour re-hydrating and reflecting on how my pride, ignorance, and stupidity could have unnecessarily burdened the crew and the already busy medical staff. For the rest of that deployment I became inseparable from my shiny, new, and very large water bottle. ◆

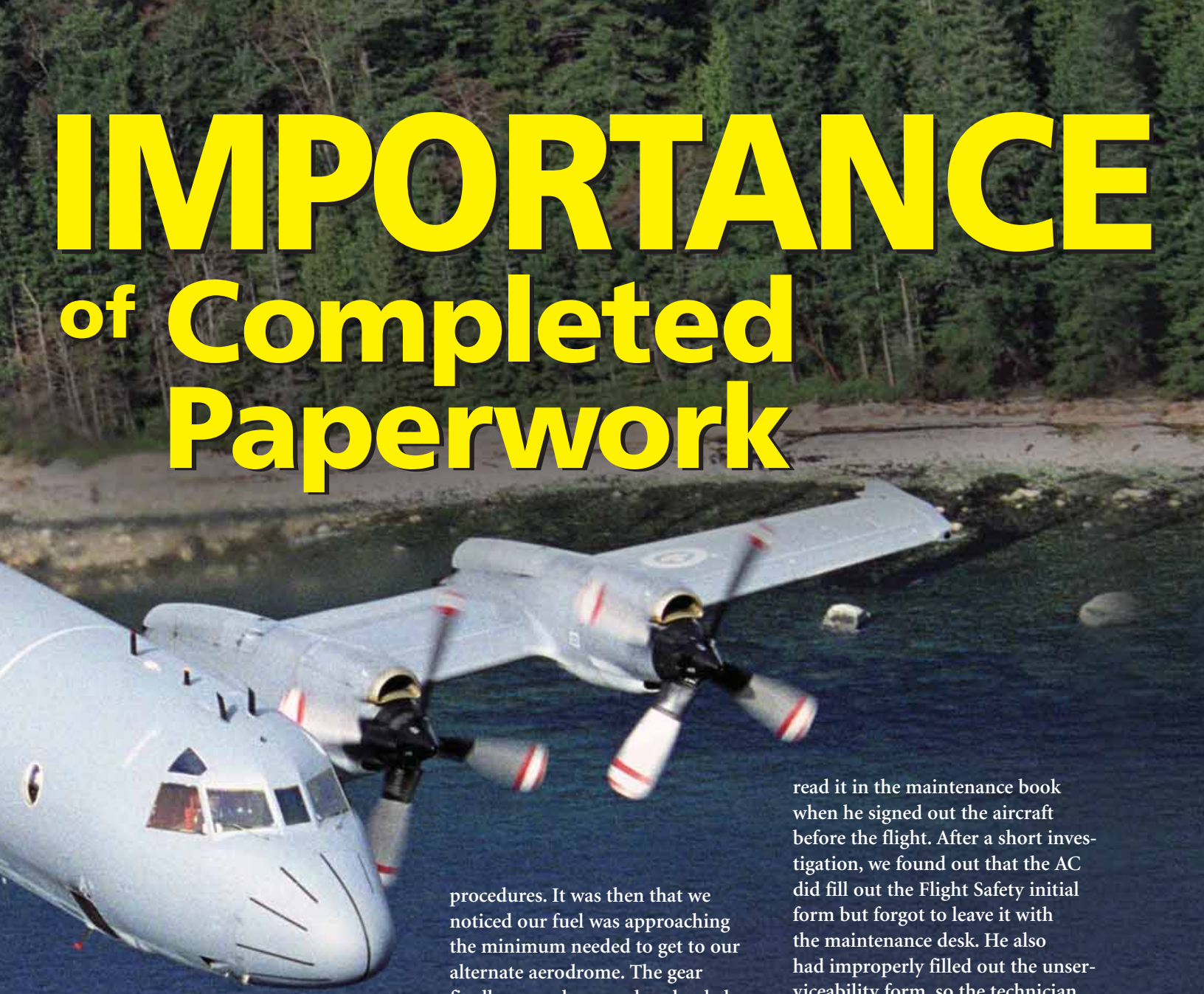
Warrant Officer Don Mackie serves with 407 Squadron, 19 Wing Comox.

It all started with a briefing two hours before our scheduled take-off time. The weather was forecast to be low ceilings and reduced visibility in light snow for the duration of our mission and for our landing time. New to the squadron, I had only a year of experience as a co-pilot on the Aurora. The mission today was open ocean surveillance. It was something we were supposed to do the day before but, because of fuel discrepancies from the fuel gauge, the mission was delayed one day.

The pre-flight and all-station checks were going well, so we were able to depart on time for what should have been a routine mission for the crew. As in any good organization, we tried to maximize every hour of flight. After changing from Air Traffic Control (ATC) to an operational frequency, my Aircraft Commander (AC) decided to show me an emergency high-speed descent to get into our surveillance area quickly. This procedure involved lowering the landing gear to increase drag, thus achieving a greater rate of descent. As we levelled off at our pre-briefed altitude, we started cleaning off the aircraft to proceed with the mission. The landing gear has a speed restriction during retraction of 190 knots. As part of the cleaning, the landing gear was retracted momentarily and re-extended above that speed for a second. After discussing with the Flight Engineer (FE) and the AC, we decided to bring the landing gear back up.

As we were getting closer to home, the weather seemed to be getting worse. When we listened to the automated terminal information system (ATIS), the weather was reported as a 200-foot ceiling and 1/2-mile visibility, with a snow-

IMPORTANCE of Completed Paperwork



covered runway. Talking with ATC, it appeared we had two choices: getting wide vectors for the runway or being put in a holding pattern to wait for the snow-ploughs to complete their work. We elected for the wide vector in the heavy snow. We used an extra thirty minutes of fuel but, finally, were vectored for final approach. As we brought the gear down for the pre-landing check, we noticed that we had an unsafe nose-gear indication. At this time, we requested a block of airspace between two radials to complete our emergency procedures. It was then that we noticed our fuel was approaching the minimum needed to get to our alternate aerodrome. The gear finally came down and we landed safely without further incident.

Now it was time for the paper work! The AC started to do a Flight Safety Initial Report, which was completed in several minutes. Everything seemed to be in order, so we went home for the weekend. When we came back on Monday morning, I heard another pilot talking about the landing gear problem he had during his flight the previous day. I was surprised that he had the same problem as we had three days ago, so I asked him which tail number he had. It was the same aircraft but, to my surprise, he was not aware of the problem we had. He should have read it in the maintenance book when he signed out the aircraft before the flight. After a short investigation, we found out that the AC did fill out the Flight Safety initial form but forgot to leave it with the maintenance desk. He also had improperly filled out the unserviceability form, so the technician had no way of knowing that they had to re-adjust the nose-gear landing switch.

The second incident would not have happened if the paper work had been done properly. In this case, no accident resulted from these errors, but we should remind ourselves that the extra fifteen minutes could mean a lot for the maintenance crew and the ensuing pilots that will try to see a trend of problems in the maintenance book. So remember, no job is complete until the paper work is done. ◆

Captain Sylvain Lavigne serves with 404 Squadron, 14 Wing Greenwood.

Photo by Corporal Joseph Morin, Base Imaging, CFB Esquimalt, 2002.

Lithuanian LANDING

Photo by Corporal Henry Wall, NSU photographer, Arabian Gulf Region, 06 June 2003.

Photo by Mater Corporal Brian Walsh, Combat Camera, Entebbe, Uganda, 10 June 2003.

It had already been a long day, and it was about to get longer. Our mission was to drop off charitable goods in Vilnius, Lithuania. Our departure point was Keflavik, Iceland, and our final destination for the night was Copenhagen, Denmark. The weather in Vilnius was down to a ceiling of 100 feet, with a visibility of only one quarter of a mile. The winds were quartering from the right, and seemed to veer toward a right crosswind on descent.

I was a level two first officer (FO) and I was flying a pilot-monitored approach (PMA) from the right seat. This was the standard instrument approach in Hercules operations, and the experienced aircraft commander (AC) and I had both flown many of them. The advantage of this approach lies in the left seat pilot's ability to scan for visual references while cross-checking the instruments, and thus make an easier transition to landing. Further, this approach afforded an opportunity for a "continue" call, and for flying the approach an additional 100 feet below minimums. In the case of the approach we were now on (the ILS 07 in Vilnius), this meant we could fly to 100 feet above ground (AGL). In the remarks portion of the approach brief, the requirement for a "continue" call was briefed as a likelihood, and the criteria for the "continue" call were reviewed. The approach had to be stabilized, and on the numbers. I thought to myself… "small corrections only, get my power setting early, keep my cross-check going, and hold that attitude."

Once established on the localizer, the approach was generally smooth, but drifting left of the on-course. With the initial drift left, a three-degree heading change to the right was initiated and the left-seat pilot prompted "drifting left." The rate of drift was slowed, but not arrested. We now approached "a dot left" on the horizontal situation indicator (HSI). Another prompt "turn right" came from the left-seat pilot as I rolled another three degrees to the right. We had just crossed the final approach fix (FAF) inbound and were steady on both airspeed and glide-slope. The drift was now arrested and further correction to the right was needed. Unsatisfied with my lack of aggressiveness, and having twice prompted me, the left-seat pilot took control of the aircraft as I rolled out on the next heading change. Stating, "I have control," he continued the corrective turn and brought us aggressively through the localizer.

At this point, the approach became non-standard, and crew resource management (CRM) broke down. Unclear on the AC's expectations and passing through 400 feet AGL, I began scanning outside the cockpit for the runway environment. Passing through 300 feet AGL, the left-seat pilot returned aircraft control to me, stating, "You have control." With my instrument cross-check broken and only seconds to go until decision height (DH), I held the attitude steady. I called "100 feet above" as we continued toward our DH, and I braced myself for the overshoot. To my astonishment, the left-seat pilot called "continue" as I called "Decision Height." We had not met the criteria for a stabilized approach, a parameter necessary for a continue call. Prior to 100 feet AGL, the approach lights came into view and the left-seat pilot again took control. Now right of centreline, he banked hard to the left, then to the right, and smoothly touched down for landing. We were safely on the runway and the blankets and school supplies had reached their destination, but …had we done our job correctly and in the spirit of flight safety?

Obviously the answer is NO! In challenging weather and well into our crew day, we had deviated from normal approach procedures and sacrificed flight deck coordination. I had allowed the aircraft to drift toward one dot left of the localizer, and lacked the necessary aggressiveness in correcting for drift. My predisposition for a stabilized approach through ***small corrections*** did not serve me well on this day. Deviations left of the localizer lead to two prompts from the AC, and that lead to three control transfers inside the FAF. In turn, the control transfers, and deviation from normal PMA procedures, lead to a breakdown in CRM with potentially dangerous results. As well as creating serious confusion with respect to pilot duties, we prosecuted a "continue" call without the necessary parameters to do so. That we landed safely is certainly indicative of pilot skill, but that a landing was attempted from such an approach is the principle issue. Aircrew coordination and CRM had broken down when they were needed most, and standard procedures during a critical phase of flight were sacrificed. This incident had potentially serious flight safety ramifications, and the lessons learned should not be lost in the aftermath of a successful landing. ◆

Captain Jack Simpson now serves with 440 Transport Squadron, Yellowknife, 17 Wing Winnipeg.

MAINTAINER'S CORNER

TOOL CONTROL — ARE YOU TAKING IT SERIOUSLY ENOUGH?

The Canadian Forces Tool Control System (CFTCS) is neither new nor revolutionary. The same system is in effect on each Wing and unit where Canadian Forces (CF) maintenance personnel maintain and service aircraft. Tool Control (TC) has to be learned only once, and is truly a universal system. Why then are there concerns within the Flight Safety organization that tool control, a very user-friendly system, is not being taken seriously by CF maintenance personnel?

A little bit of history will help with understanding why the CF adopted a Tool Control System. Not that long ago, technicians were issued with their own toolboxes. I remember, as a young private, being issued a toolbox when I was sent to a maintenance organization for on-job training (OJT). I also clearly remember turning in our toolboxes when TC was implemented, in the early 1980's. When I was first issued my tools, a list was made of all the items in the box. Strangely enough, though, when I returned the tools, some were missing and others I had never signed for in the first place had appeared. And the worst part is that no one seemed to care. The extra tools were put to other use, the missing ones were written off. I'm still wondering if any of these tools were left in an aircraft. The good news is that this fleet is no longer flying–not because of me; it has been taken out of service! As you can see, the 'one-technician-one-toolbox' system was not very safe.

The solution was the Canadian Forces Tool Control System, which was first introduced to the CF in 1974. The concept had been borrowed from the Royal Air Force. There were several reasons why such a system made sense for the CF. First, there were large numbers of tools left in aircraft undergoing maintenance or servicing. Second, these tools could not be traced back to their owners, whether military or civilian (contractors). And, last, it was a cost-saving measure. Even though the last two issues seem to have been solved, the first issue, however, still appears to be a problem, albeit on a smaller scale. More on that subject later.

CFTCS radically changed the way technicians had to work: Tools were now grouped around the job rather than around the worker, and records were kept as to which tool kits were used on which aircraft. Before CFTCS, a technician just grabbed his toolbox and went to work on the aircraft. Although it was possible to find out who worked on the aircraft (through 349's), it was impossible to find out who was the owner of a found tool. The new designs of the tool kits and cabinets made it easier for personnel to ensure each tool was returned to its respective container. That was nearly impossible with individual toolboxes. (If you have one at home or in the trunk of your car, you know what I mean.) CFTCS, although standardized across the CF, remains flexible enough so that it can be adapted to the various fleets and operations that make up the Canadian Air Force.

One of the main purposes of the implementation of CFTCS was to improve flight safety. By controlling the number of tools used on an aircraft, it stands to reason that fewer tools would be left behind once the job was completed. Unfortunately, we have no statistics to prove that. The only statistics available concerns lost tools reported through CFTCS and the Flight Safety Information System (FSIS).

As you can see in Table 1, there is a significant difference between what is being reported in CFTCS and FSIS. There could be several reasons for the discrepancy. One that comes to mind is that not every lost tool will result in a Flight Safety Incident. A tool lost in an aircraft in periodic maintenance, for example, would not require a FS incident report, **as long as the aircraft is still in maintenance when the tool was found missing.**

	Lost tools (aircraft involved) reported in CFTCS	Lost tools reported in FSIS
2001	148	11
2002	40	15
2003	47	7

Table 1: Lost Tools by Year.

The numbers in the table above do not seem very important when you consider there are approximately 2000 tool kits and 1500 tool pouches in the system. But remember this:

> ***"Only one tool, left in a critical area, is needed to bring down a state-of-the-art aircraft and its crew."***

This is the main reason why tool control is so important. This is also why you should take tool control seriously by:

- ensuring all tools you take to an aircraft are serviceable;
- ensuring all tools are put back in their respective tool kits; and
- reporting missing tools without delay so a Forgien Object Damage (FOD) check can be carried out before the aircraft goes flying.

Many of the lost tool incidents reported in FSIS concerns found tools rather than lost tools–at least those are being reported. As seen in Table 1, there were 47 lost tools involving aircraft in 2003. However, maybe 2 of these were reported in FSIS. Here is a list of the 7 FSIS reports:

- One report was the result of an audit (2 tools missing from tool crib).
- Another aircraft was gone on a cross-country flight before someone noticed a tool was missing from a tool kit.
- One aircraft went flying before it was discovered a tool had not been returned to tool crib.
- Three tools were found during maintenance (three separate reports).
- A tool from a tool pouch was found on the ground during an aircraft start.

I suspect in the first two incidents, where the tools were found missing following a tool kit or tool crib check, the tools were discovered missing when they were needed for another job and they were not in their place. Hence the questions: Are **you**, the technicians, taking tool control seriously enough? Do you **check** the tool pouches, kits or benches carefully (not a quick cursory look) after **each** job on an aircraft?

Are you confident that you did not *leave* any tools behind? Do you **officially** report a missing tool right away, even if it means grounding an aircraft to do a FOD check?

If the answer is 'no' to any of these questions, it is high time that you start taking tool control seriously before your carelessness results in the loss of life or aircraft.

Further information on the CFTCS can be found in the C-05-005-021/AM-000, *Maintenance Policy, Tool Control System*, 2001-01-31. ◆

Sergeant Anne Gale, DFS 2-5-2-2

Special thanks to Warrant Officer Nickerson from the Aerospace and Engineering Support Squadron for his help in researching data for this article.

CF-18 Electrical Toolkit.

ÉPILOGUE

TYPE: **Seaking CH12422**
LOCATION: **150 NM South of Honolulu, Hawaii**
DATE: **23 June 2000**

BISHOP 22
A Second Perspective

The Summer 2003 edition of *Flight Comment* included the Epilogue article to the Flight Safety Investigation of CH12422's ditching off the coast of Hawaii, 23 Jun 00. In response to this article, the Directorate of Flight Safety (DFS) received the following letter which indicated that some relevant factors may have been omitted in the original Epilogue article, possibly better explaining how the stage was set for CH12422's ditching. Major Brian Northrup's letter has been published here in its entirety.

"The loss of Sea King CH12422 (c/s Bishop 22) off Hawaii on 23 June 2000 proved to be a calamitous event which resulted in the loss of a valuable military helicopter; the impact of this accident was softened somewhat in that the aircrew were able to evacuate the aircraft prior to its sinking. As with so many aviation accidents, however, the true story often lies in a host of contributing factors that eventually distort the delicate balance encompassing man, machine, and the environment.

Surprisingly, the Canadian Forces (CF) Flight Safety program, through an Epilogue article published in the Summer 2003 edition of *Flight Comment*, chose to focus attention on an aircraft serviceability issue rather than highlight the succession of contributing factors that combined to influence the eventual ditching decision. Regrettably, not only does such hypothetical musing challenge past flight safety program precepts but, more importantly, it ignores the constructive lessons to be gleaned from such a classic aviation case study.

As often happens in aviation mishaps, the crew of Bishop 22 found themselves victims of a pre-accident sequence of events, of which each individual event was a contributory factor to the final ditching outcome. I this case, it was the cumulative effect of a recognized Sea King Main Gear Box (MGB) overtemp condition, a potentially catastrophic MGB emergency situation, and a relatively inexperienced Maritime Helicopter (MH) crew.

Throughout the 1990s, the Sea King fleet experienced an epidemic of overtemp conditions involving the antiquated 21000 series MGB. Anticipating that the cancelled Maritime Helicopter Project soon would resume, it was decided to delay implementation of a costly 24000 MGB upgrade project. Unfortunately, fiscal and political realities soon indicated that a new MH aircraft was not in the immediate offing, thus it was decided to implement the MGB upgrade project over a prolonged time span. Despite an increasing frequency of MGB overtemp situations, the risk mitigation factor was rationalized through the belief that by retarding the number one engine to ground idle, it was possible to resolve the overtemp condition. This mysterious procedural remedy had been discovered by accident and, even more incredibly, was a power train technique unable to be substantiated by either military or civilian Sikorsky aircraft engineers. In short, aircrew understood that an inherent MGB overtemp problem resided within the Sea King fleet, yet they were expected to believe that a somewhat mystifying engine handling procedure should alleviate the situation.

Operating from HMCS PROTECTEUR during Exercise (EX) RIMPAC, CH12422 had experienced continual MGB problems, as evidenced by a substantial MGB oil loss situation at Hickam Air Force Base a week earlier. While running at night prior to returning to PROTECTEUR at sea, the aircrew noted an MGB caution light that subsequently confirmed a substantial quantity of transmission oil lying on the airport tarmac. Luckily, a second Sea King maintenance detachment alongside in Hawaii was able to repair the major MGB unserviceability, eventually allowing the aircraft to rejoin the ship later the next day. Had the massive oil-loss occurred during the transit back to the ship the previous night, it is most probable that the crew would have been forced into an arduous night ditching situation under extremely difficult and dangerous circumstances. As could be expected, aircrew suspicions concerning the status of the Bishop 22 MGB became even more magnified with this latest development.

As the crew settled into the hover on that fateful June day, it is worthwhile to note their level of experience. Although the Aircraft Captain (AC) was an experienced multi-tour Sea King pilot and maintenance test pilot, the other three crewmembers were novice naval aviators experiencing their first sea cruise. Normally it would be customary to have a minimum of two experienced crewmembers on each crew, ideally with one located in the cockpit (pilot) and a second veteran aviator in the rear cabin area

(Navigator/AESOP). Although all of the aircrew performed admirably during the actual ditching emergency, it is conceivable that a second experienced aviator may have offered additional input that may have influenced the eventual decision-making chain of events. Unfortunately, post Force Reduction Plan (FRP) minimum air force personnel establishments and low experience levels had savaged Sea King HELAIRDET manning plots, causing considerable concern at all supervisory levels. Neither aircrew nor maintenance crews were immune to the challenge of conducting embarked naval aviation operations with below average at-sea operational expertise.

And so the stage was set for the Bishop 22 overtemp scenario. While in the hover, an MGB oil hot caution light confirmed an MGB oil temperature reading pegged at the maximum 150-degree gauge temperature limit. A cursory aircraft inspection while raising the SONAR dome eliminated any other abnormalities or evidence of MGB fluid leakage. Faced with a 20-minute transit to PROTECTEUR and a transmission temperature indicating well beyond limits, the AC elected to depart the hover and attempt a low level transit back to the ship. The nagging problem for the pilot, however, was just how hot was the transmission fluid, based on the knowledge that the oil temperature light illuminates when the oil cooler is no longer able to maintain MGB oil temperature below a safe 120 degrees? As the pilot was well aware, extreme oil temperatures could dramatically reduce oil viscosity properties and begin to destroy system seals and other vulnerable parts of the transmission system.

Shortly after leaving the hover, the crew observed fluctuating and slowly decreasing oil pressure gauge indications that forced the AC back into the hover for a situational reassessment. While in the hover, a distinct welding odour, coupled with abnormally hot air emanating from the MGB area behind the pilot's head, precipitated the decision to ditch the aircraft prior to an expected catastrophic failure.

Once settled on the ocean surface, the aircraft had to be shut down based on danger of the rotor blades striking the water due to ambient sea conditions.

Could Bishop 22 have made it back to PROTECTEUR safely? — Possibly and possibly not. From a Flight Safety perspective, it is suggested that the true value in relating the Bishop 22 story lies in identifying the classic pre-accident factors that combined to influence the ultimate ditching decision. Rather than surmising that the aircraft still may have been serviceable and capable of recovering onboard ship, a review of the pre-accident sequence of events would highlight how aviation disasters often are preordained through earlier decisions and events that occur far distant from the actual accident site."

Major Brian Northrup, 443 Maritime Helicopter Squadron, Patricia Bay, 12 Wing Shearwater.

DFS Comments:

On occasions, the message is not made as clear as it was intended to be, as was indicated to me in this case. My thanks to Major Brian Northrup, 443 (MH) Sqn, for pointing that out.

The major lesson here is that the MH community was not given comprehensive, unambiguous direction with respect to dealing with MGB overtemp conditions. Although documented evidence supporting the use of the #1SSL procedure was compelling, the CF did not make it mandatory. As a result, pilots were given the latitude to decide for themselves whether or not to use the #1 SSL procedure even though its success, when it was used, was 100%. As is evident in Maj Northrup's letter, the CF also failed to advise all crews of the success of this procedure. This lead the investigators to conclude that, had the #1 SSL procedure been made mandatory, the crew would have employed this procedure. Given the success rate of this procedure, it was further concluded that it was highly likely that the aircrew would not have been forced into a ditching situation. In short, the system did not give this crew all of the tools necessary to operate the aircraft at an acceptable level of risk.

Please refer to this or any other FSIR on the DFS website for complete analysis, conclusions, and recommendations. You may access the DFS website via the Defence Wide Area Network Intranet (airforce.dwan.dnd.ca/dfs) or the Internet (www.airforce.forces.gc.ca/dfs/). ◆

Colonel Al Hunter, Director of Flight Safety

ÉPILOGUE

TYPE: **Griffon CH146408**
LOCATION: **Cold Lake, Alberta**
DATE: **06 November 2003**

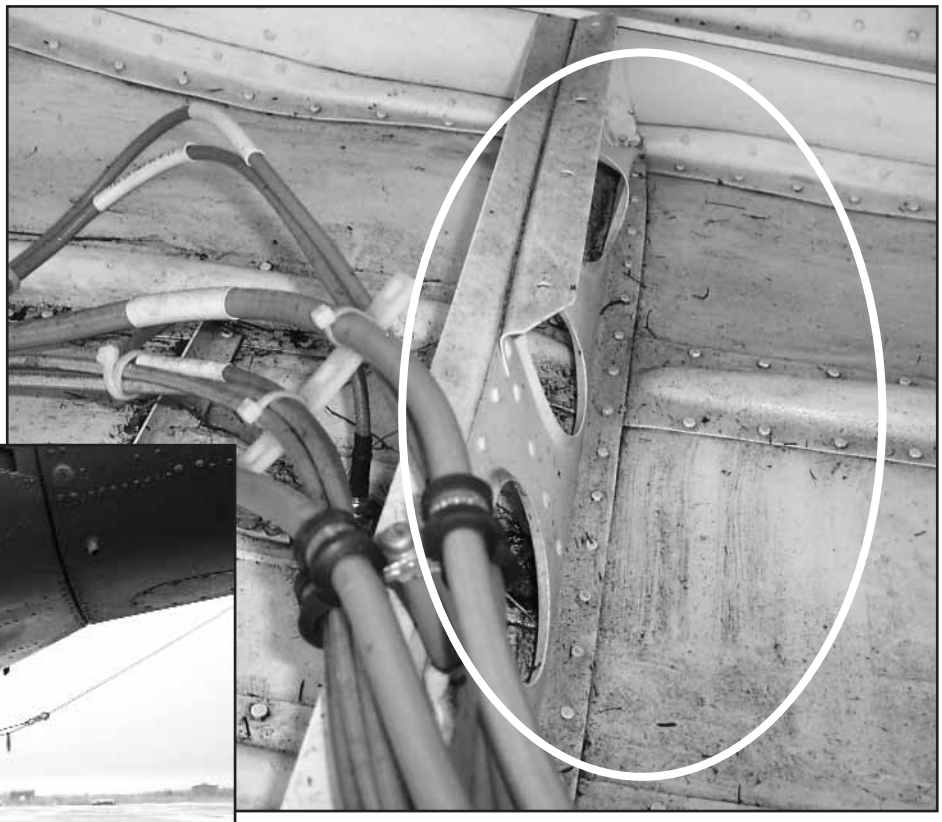
The 408 Tactical Helicopter Squadron crew was conducting an advanced Night Vision Goggles (NVG) training mission in the Cold Lake Air Weapons Range (CLAWR). At the end of the 50 feet Above Ground Level (AGL) navigation leg, the aircraft commander (AC) gave a simulated no. 2 Engine Fire. The First Officer (FO) selected a landing area which appeared to be approprite but was frozen muskeg. A seating check was performed in accordance with CH-146 Standard Manoeuvre Manual but after a few seconds the aircraft settled about 12 inches with a 5 degree left roll. The FO immediately increased power and the AC took control. Not realizing that the left skid shoe was caught under the ice surface, the AC increased the power further, applied full aft and right cyclic before the aircraft broke free and stabilized in a 4 foot hover. The crew recovered the aircraft in a prepared landing area and found damage on the underside of the Griffon. The damage was initially assessed as B Cat but was later downgraded to D Cat.

The crew was experienced and conducted the selection of the emergency landing area in accodance with established procedures. The investigation confirmed that the aircraft was fully serviceable and it was not equipped with skis.

417 Combat Support (CS) Sqn, a unit of 4 Wing, operates the CH-146 Griffon in the CLAWR on a daily basis. They operate the CH-146 with skis installed all year round. In addition, landings are restricted to hard ground surfaces such as gravel, rock formations or helicopter landing pads due to problems with muskeg and other wet landing areas. The frozen muskeg area where the incident crew landed was identified by 417 (CS) Sqn as an unsuitable landing site.

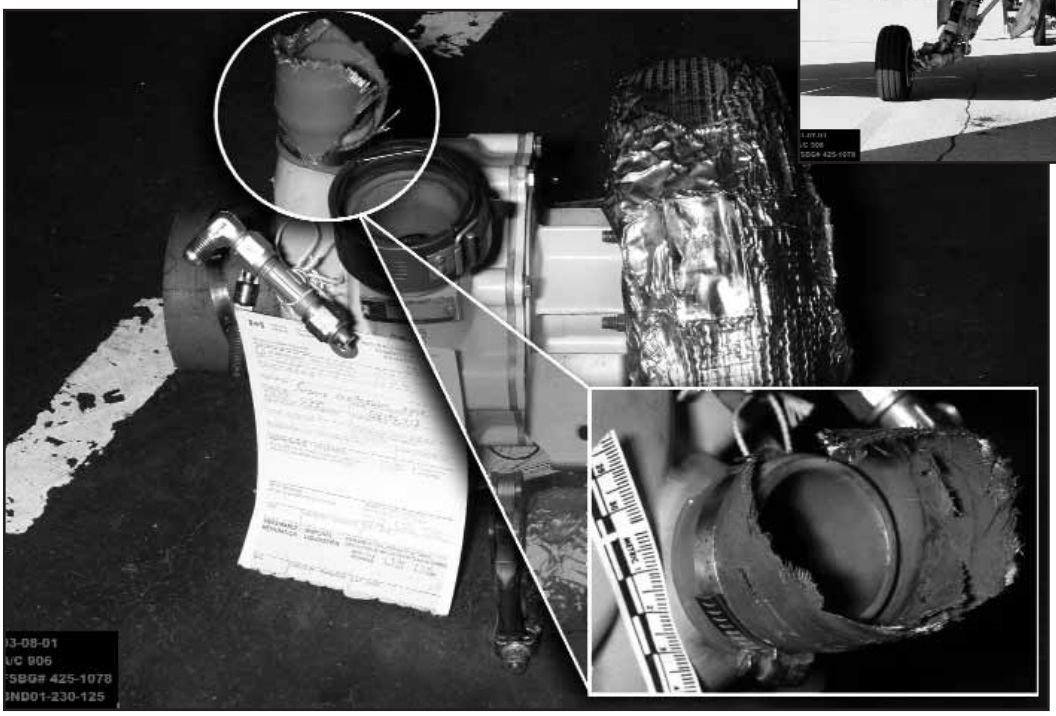
This occurrence illustrates the risks involved in operating in unfamiliar terrain. The unsuitability of the landing area for the simulated emergency could not be detected visually prior to landing. Because the Detachment Operations brief did not include information on terrain conditions in the CLAWR area, the unit had not implemented measures to compensate for the wet terrain to prevent this occurrence.

As it is often the case, this was not a new occurrence. A very similar event occurred in the CLAWR a few years ago which prompted the implementation of the preventive measures mentioned above. It is believe that these measures would have been effective in preventive the damage sustained by CH146408. ◆



ÉPILOGUE

TYPE: **Hornet CF188906**
LOCATION: **Bagotville, Quebec**
DATE: **31 July 2001**



The mission for the pilot of the accident aircraft was to conduct an Instrument Flight Rules (IFR) cross-country to Toronto. Shortly after the aircraft lifted off runway 29 (R29) at Bagotville, yellow, acrid smoke began to fill the cockpit. The landing gear and flaps were selected up and although the gear indicators showed three wheels "up and locked", the light remained on in the gear selection handle indicating the gear doors were not completely closed. The pilot selected the gear down while carrying out the emergency procedures for smoke in the cockpit. While informing Air Traffic Control (ATC) and Squadron operations of the situation, several system advisories were noted. During the approach end engagement on R36, the arrestor gear failed damaging the aircraft's right side but a successful overshoot was conducted. The aircraft was successfully landed on R29 (without the arrestor gear up) and was taxied off the active runway without further incident. There were no injuries in this accident but the aircraft sustained C category damage.

The investigation revealed that the aircraft experienced multiple failures after take-off because the Flow Temperature Limiting Anti Ice Modulating Valve did not function correctly; this caused the Environmental Control System (ECS) system to overheat which in turn caused the damage and the smoke in the cockpit. The ECS Flow Temperature Limiting Modulating Valve did not function properly because an unserviceable one had been re-installed during maintenance.

The Pilot distracted by multiple emergencies and stepped on radio transmissions, forgot his landing flap and flew the approach at a speed in excess of the arrester cable limits. ◆

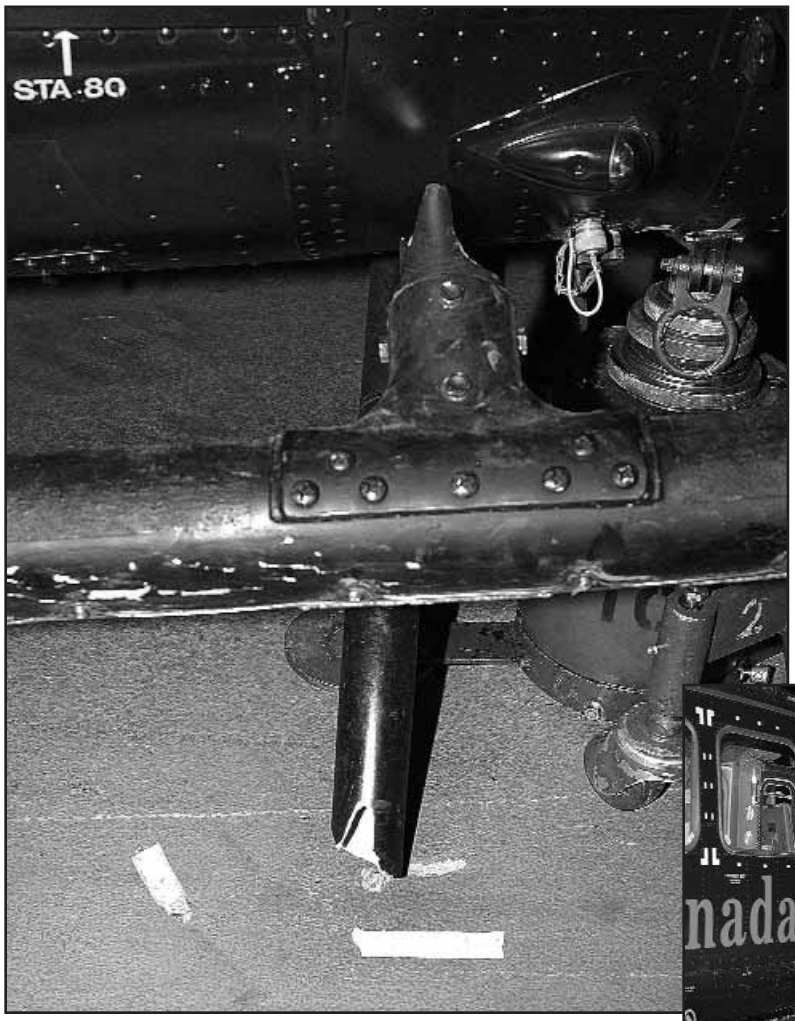
ÉPILOGUE

TYPE: **Griffon CH146400**
LOCATION: **Petawawa, Ontario**
DATE: **25 August 2003**

The aircraft was being towed from parking spot no. 07 to inside the hangar. Shortly after the aircraft had crossed the hangar threshold the front right hand cross tube broke at the top of the saddle assembly. As the aircraft fell, the tow bar struck and damaged the aircraft just below the right pilot door. The skin and web were punctured 1.5 inch vertically by 4 inches horizontally at station 37 and waterline 18.5. The damage to the aircraft belly was initially assessed as C Category, but was later downgraded to D Category ground incident following further examination and evaluation.

The entire skid gear assembly has been sent to the Quality Engineering Testing Establishment (QETE) Hull for testing. The mechanism for the cross tube failure was assessed as fatigue cracking followed by overload. The relative small size of the fatigue crack with respect to the overall fracture area suggest that overloading on the cross tube at final failure was high. Fatigue crack growth was attributed to a combination of high and normal loads. No material contributing factors were identified.

The overload was most likely caused by the towing of the aircraft. The investigation also revealed that there were no diversion from normal towing procedures and, other than crossing of the threshold of the hangar, the towing operation was smooth and unobstructed. The entrance of the hangar does not have any significant obstruction that would induced abnormal loading on the skid gear.



QETE also recommended that a periodic inspection of the cross tube be included in the maintenance cycle.

An Unsatisfactory Condition Report has been raised by the unit of occurrence to address the deficiency of the towing system. The Land Aviation and Testing Establishment has recently been tasked to evaluate an improved CH-146 Griffon towing system. The results should be available this fall.

This incident is a further illustration of the inadequacy of the Griffon towing system. It has caused personnel injuries in the past as well as other material damage. It is also a reminder that until a new towing system is adopted, all personnel must exercice vigilance and care when towing the Griffon helicopter. ◆

FROM THE INVESTIGATOR

TYPE: **Griffon CH146493**
LOCATION: **In the vicinity of Goose Bay, Labrador**
DATE: **29 March 2004**

CH146493 was conducting a scheduled training mission for the co-pilot who needed simulated emergency practice. The emergency selected for the training was: "Governor Failure High Side". The co-pilot, flying in the left seat, was at the controls, with the pilot performing "non-flying pilot" duties. The emergency was briefed among the crew, followed by a simulation.

The emergency simulation was correctly initiated by the co-pilot raising the collective. The non-flying pilot then lowered the collective to regain single engine parameters in anticipation of switching the governor to manual. After identifying the governor switch and hearing "Confirmed" from the Flight Engineer (FE), the non-flying pilot selected the governor switch to manual.

Shortly thereafter, the "Engine 2 Out" and the "Fire 2 Pull" lights came on and the aircraft experienced a power loss of the no. 2 engine. The pilot took the controls and the crew executed a "No. 2 Engine Fire" emergency procedure successfully landing on a snowmobile trail just outside the Base. Following shut down, the crew noticed extensive damage inside the no. 2 engine compartment consisting of burnt paint chips and metal discoloration caused by excessive heat.

The investigation later revealed extensive heat damage to the no. 02 stage of the Free Wheeling Turbine (as shown in the photo). Nearly all the turbine blades were missing 20 to 50 % of their tips. Also, damage was observed on the inside of the exhaust duct, the air by-pass duct and both tail rotor blades had dents, nicks and scratch damage. The damage is consistent with Category C.

The likely cause of the occurrence is the failure to roll the no. 2 throttle to idle prior to moving the governor switch to manual. The investigation is on-going and will focus on crew procedures, crew communications and Crew Resources Management. ◆

FROM THE INVESTIGATOR

TYPE: **Hawk CT155202**
LOCATION: **1 Mile North of 15 Wing, Moose Jaw, Saskatchewan**
DATE: **14 May 2004**

The mission was a navigation trip and part of a conversion syllabus designed to familiarize the Royal Air Force (RAF) student with the NATO Flying Training in Canada (NFTC) Hawk's variant. With the area portion completed, the crew was conducting some proficiency flying at 15 Wing. The Instructor Pilot (IP) had just taken control and as the aircraft approached the departure end of Runway 29R, a bird was observed just left of the nose. Both crewmembers heard a "thump", felt vibrations and noted a change in engine pitch. This was followed immediately by audio and caption engine warnings (T6NL&ECA) and high engine temperature indication (660 C).

The IP traded altitude for airspeed, confirmed that engine temperatures remained high, reduced throttle to idle and told the student to "prepare to abandon the aircraft". The aircraft reached a maximum altitude of approximately 3700 Mean Sea Level (1700 AGL). When the aircraft descended through 3000 MSL the IP transmitted his intention to eject to Moose Jaw tower. After confirming the student was ready, the IP ordered and initiated ejection.

Both occupants cleared the aircraft and descended under parachutes but for less than 30 seconds prior to landing. One crewmember was seriously injured in the sequence and the other received minor injuries. The aircraft was completely destroyed when it crashed about seven seconds later in a farmer's field.

The investigation is on going and focusing on a wide range of issues including the aspects of low and slow speed (below 300 Knots Indicated Air Speed) engine failure in the CT-155 and ejection criteria. Also, the investigation will examine engine performance after bird ingestion and aircrew life support equipment. ◆

For Professionalism

PRIVATE ROBERT WEST

Private West was conducting a quarterly inspection of a torque wrench from the 19 Air Maintenance Shop component shop when he discovered the torque wrench was reading a significantly lower value than what he had set. He rechecked the discrepancy, then requested a senior technician to confirm his finding. Upon checking the torque wrench, the senior technician determined it to be within specification. Private West noticed that the senior technician had read the torque wrench incorrectly. On this particular torque wrench, the numerical value is physically offset from the actual torque indication line. If a technician incorrectly uses the numerical value adjacent to the indication line as the torque value, the wrench will read a lower torque value from what is actually being applied. Private West immediately explained the problem to the senior technician and pointed out that, as a result, there was a good possibility that aircraft components had been repaired with incorrect (low) torque values.

Private West immediately notified the Unit Flight Safety Officer, quarantined the torque wrench and informed the Component Shop of the problem. All aircraft components, which had been repaired with that torque wrench, were located and re-torqued with a serviceable wrench. Considering the possibility that the torque wrench may have been improperly calibrated during its last annual calibration, Private West contacted the Wing Calibration Coordinator for follow up. The Wing Calibration Coordinator contacted the Calibration Centre in Esquimalt and upon investigation, discovered that an improper method was used to calibrate the torque wrench during annual calibration. The other torque wrenches on the Wing, which potentially could also have been incorrectly calibrated, were inspected locally and all were found serviceable.

Private West's strong technical knowledge and outstanding persistence prevented the potential for a very serious accident by having incorrectly torqued components installed on aircraft. His excellent knowledge of reporting procedures allowed the appropriate authorities to be informed, thereby preventing any further occurrences. Private West should be highly commended for his vigilance and perseverance in pursuing a seemingly small discrepancy, which could have had very serious ramifications. ◆

Private Robert West has been promoted to Corporal and still serves with 19 Air Maintenance Squadron, 19 Wing Comox.

CORPORAL MIKE GALLANT

On 16 July 2002, Corporal Gallant was tasked to carry out an Avionics (AVN) Before Flight Inspection ("B" Check) on Sea King CH12428. During his inspection of the Flight Control rods, located in the electronics bay (E Bay), he noticed a cotter pin missing from the collective pitch control rod. He immediately notified his supervisor and initiated a flight safety investigation. Corporal Gallant was not required to inspect the E Bay as part of the AVN check but did so under his own initiative. The same area was inspected by others during the previous "A" check but did not reveal any unserviceability.

If left undetected, the missing cotter pin could have allowed the castellated nut to loosen and fall off, disconnecting the collective pitch rod. This chain of events presented high potential for a catastrophic flight occurrence.

Although the E Bay is a difficult area to inspect, his initiative and keen eye for detail while inspecting the component is commendable. Corporal Gallant's professionalism averted a potentially dangerous situation that could have seriously endangered both aircrew and the aircraft. ◆

Corporal Mike Gallant has been promoted to Master Corporal and still serves with 12 Air Maintenance Squadron, 12 Wing Shearwater.

For Professionalism

CORPORAL MIKE SNELGROVE

On the 13th of November 2003, Corporal Snelgrove was tasked with carrying out his first training high power Class II Engine Run Up, on aircraft 188918. Following the run, while carrying out the post run inspection, Corporal Snelgrove noticed smoke emanating from the front inboard area of the engine and a predominant fuel smell from the engine compartment. Concerned, Corporal Snelgrove attempted to isolate the source in the bay, to no avail. He then proceeded to the top of the aircraft, where Corporal Snelgrove noted smoke wafting up from around the front of the speed brake area. Taking initiative, he alerted 'Man' 1 to stand by with a fire extinguisher and conducted a thorough inspection under and around the speed brake, discovering the aft-most dorsal panel exceedingly hot.

Corporal Snelgrove immediately opened the dorsal panel, attempting to further identify the heat source. No leak or damage could be readily located. Corporal Snelgrove raised a CF-349 and passed the aircraft on to Snags. During the subsequent investigation, the cause was identified as an improperly installed environmental control system (ECS) clamp which unseated a fuel vent line, dumping raw fuel on the ECS duct which ducted hot engine bleed air to the ECS system. Due to the inaccessibility of the duct and line, it was impossible to discover the fault without the use of the boroscope equipment.

Thanks to Corporal Snelgrove's outstanding dedication, professionalism, and extraordinary vigilance above and beyond, a possible catastrophic failure was avoided. ◆

Corporal Mike Snelgrove serves with 410 Tactical Fighter Operational Training Squadron, 4 Wing Cold Lake.

CORPORAL AUSTIN COLE

On 3rd October 2003, Corporal Cole, a 514 Aviation Technician, was tasked to assist with the before flight check on Seaking CH12441 (B). During the check of the port side airframe, Corporal Cole noticed the landing gear drag link assembly bolt appeared different than the starboard side drag link bolt. After consulting the applicable Canadian Forces Technical Order, Corporal Cole determined that an incorrect bolt was installed in the drag link assembly. He then made a major entry in the aircraft servicing set and initiated a Flight Safety Incident Report on this observation.

Failure of this drag link assembly bolt has the potential to render the Main Landing Gear system completely inoperable, possibly leading to a serious incident or accident

Corporal Cole's initiative and outstanding attention to detail, while assisting with carrying out the before flight check, is considered exceptional for someone with limited experience and exposure to the Sea King fleet. Corporal Cole is to be commended for his timely actions in eliminating this potential flight safety hazard. ◆

Corporal Austin Cole is still serving with 12 Air Maintenance Squadron, 12 Wing Shearwater.

CORPORAL DALE WARREN

On 17 April 2003, Corporal Warren was conducting a pre-flight inspection of Griffon CH146460 in preparation for a mission during Exercise Resolute Warrior in Wainwright, Alberta. During the conduct of pre-flight he noticed that a screw appeared to be contacting one of the oil cooler lines. Closer inspection revealed that it was indeed contacting the line and that the line was significantly worn past allowable tolerances. Had the damage not been detected the line would have worn through causing loss of lubricating oil from the Cbox. After notifying maintenance section of this unserviceability a fleet wide Special Inspection was initiated. As a result, a significant number of Griffon helicopters were found with the same damage.

Corporal Warren is to be commended for his exemplary level of diligence and professionalism exhibited during a field deployment. His proficient attention to detail while performing his duties undoubtedly prevented what certainly could have resulted in an extremely serious in-flight emergency. ◆

Corporal Dale Warren serves with 408 Tactical Helicopter Squadron, Edmonton, 1 Wing Kingston.

CORPORAL HARRIS GOODYEAR

In the course of his duties Corporal Goodyear was requested to carry out non-destructive testing inspections on a phase aircraft. Looking through the various special inspections required, he noticed that the CF-349 calling up NS-459 had been signed off as not applicable. Usually when this occurs a technician will proceed with his other work, but Corporal Goodyear made inquiries as to why this inspection had been called up, and then signed off as not applicable. The phase supervisor had noted in the special inspection description that if modification CD-140 had been carried out on an aircraft, then the special inspection would not be required. Using Data Management System/Maintenance Records Set to query the aircraft records for outstanding mods, CD-140 did not appear, so the phase supervisor reached the conclusion that it had been done and therefore the special inspection was not required.

Corporal Goodyear was not convinced that the information was interpreted correctly, and dug deeper. Through further research, he discovered that modification CF-140 was not applicable to this aircraft, and therefore wouldn't have appeared on the list of outstanding modifications. Corporal Goodyear explained the situation to the Squadron Aircraft Maintenance Control and Records Officer and Phase Supervisor, and as a result the CF349 for NS-459 was re-opened and the special inspection was carried out.

Corporal Goodyear applied excellent work ethic and his knowledge of the critical nature of non-destructive testing inspections in this situation. He took the time to research and rectify the misunderstanding that could have resulted in extensive fatigue damage to an aircraft. Not only that, but by bringing this to the attention of his supervisor, a fleet-wide record check was instituted that discovered two more aircraft that had been interpreted in the same manner. This situation and the interrelation of the special inspection and modifications have now been highlighted on the CF-18 fleet, and future occurrences should be eliminated.

Not performing this particular special inspection in a timely manner would not likely have resulted in an accident. However, there was potential for serious and costly preventable damage to the aircraft. Corporal Goodyear's thoroughness and adherence to non-destructive testing principles has potentially saved aviation resources. ◆

Corporal Harris Goodyear serves with 1 Air Maintenance Squadron, 4 Wing Cold Lake.

For Professionalism

PRIVATE JEAN-PIERRE BOIVIN

On the 16th of May 2003, Private Boivin enthusiastically volunteered to partake in the de-snagging and ground maintenance run of a CF-18 Hornet. During the engine run up Private Boivin noticed that the tail hook flag had separated from its braided attachment and was being blown forward towards the right engine intake. Since the ground crew had not seen this, he immediately notified the run up supervisor, who instructed the run up technician to shut down the right engine. Private Boivin's quick and decisive action was instrumental in preventing foreign object damage from being ingested into the right engine.

Despite his lack of experience, Private Boivin exhibited professionalism and dedication to safe operations beyond his years. His immediate actions averted a serious flight safety incident. In recognition he is awarded this flight safety *For Professionalism* award. ◆

Private Jean-Pierre Boivin serves with 416 Tactical Fighter Squadron, 4 Wing Cold Lake.

CAPTAIN GLEN ENGEBRETSON

On 01 November 2003, Crew 3 of 407 Maritime Patrol Squadron was preparing to start engines to embark on a seven hour maritime patrol. Just before the Pre-Start Check, Captain Engebretson, the Crew Tactical Navigator, queried the flight deck as to what system they had just turned on. He further clarified by stating that whatever switch had just been selected had created an abnormal vibration in the tactical compartment. With all of the noise and vibration associated with the Aurora, he was adamant that this particular vibration was abnormal. Upon further investigation it was determined that the vibration could only be felt when the #3 Tank Fuel Boost pump was selected on, and that the vibration was predominantly localized at his flight station. A technician was called on board the aircraft and in the course of investigation it was determined that the #3 Fuel Boost pump impellor had come loose which would have inevitably led to a failure of the Fuel Boost Pump and compromised engine performance.

Captain Engebretson is a Navigator who is not familiar with the Aurora aircraft main system maintenance requirements. However, his attention to detail coupled with his decisive actions and persistence, demonstrated his outstanding professionalism. His exemplary vigilance was instrumental in preventing a potentially hazardous in-flight emergency that could have developed into a disastrous situation. ◆

Captain Glen Engebretson serves with 407 Maritime Patrol Squadron, 19 Wing Comox.

MASTER CORPORAL DOUGLAS FITZ-GERALD

On 7 May 2003 Master Corporal Fitz-Gerald, an Aviation Technician employed in the Aircraft Maintenance Control and Records Officer section at 427 Squadron was verifying the maintenance records for a recently installed fire-extinguishing bottle on a Griffon helicopter. While doing so, Master Corporal Fitz-Gerald identified a discrepancy regarding the expiration dates for the right hand fire bottle's explosive cartridges

While confirming the expiration date on the installed cartridges, Master Corporal Fitz-Gerald discovered that the other bottle's cartridges on the left hand side were actually expired, contrary to maintenance records. Confirmation was made by verifying the installed component's serial numbers. Upon discovery of this discrepancy, Master Corporal Fitz-Gerald informed maintenance personnel of the necessity to replace the expired left hand cartridges.

The flight safety investigation revealed that the left hand bottle and expired cartridges were reportedly replaced eleven months earlier on 31 May 2002. This paperwork was entered in error, when in fact it was the right hand fire bottle, which had come due and for which the work had been completed. As a result, the left hand cartridges had been in service approximately one and one-half months beyond their expiry date. Additionally, the right hand fire bottle and cartridges were replaced approximately four years earlier than necessary.

Master Corporal Fitz-Gerald is awarded the *For Professionalism* award. He identified, through diligence and attention to detail a critical error with aircraft servicing records. This error could have gone completely undetected and resulted in danger to crews and aircraft. ◆

Master Corporal Douglas Fitz-Gerald serves with 427 Tactical Helicopter Squadron, Petawawa, 1 Wing Kingston.

PRIVATE GRANT POUPORE

During a deployment with 427 Squadron on 20 November 2002, Private Poupore discovered a potentially dangerous fault on a Griffon helicopter. As an apprentice Aviation Technician, Private Poupore was tasked to assist his crew with a 25-hour inspection. Upon removal of the #1 and #2 engine intakes, he proceeded with an inspection of the engine wiring. It was then that Private Poupore noticed an improperly positioned engine-wiring clamp on the #2 engine.

Having discovered this poorly positioned wiring clamp, Private Poupore immediately summoned his supervisor and continued with a detailed inspection of the engine. He then discovered that this wiring clamp had worn a hole approximately 0.75 inches deep through the underside of the #2 engine fuel line outer protective sheath. The clamp had been rubbing on the fuel line tubing above the Automatic Fuel Control Unit, apparently for some time. Had this fault gone undetected much longer it may have resulted in fuel spilling over a hot running engine. For such an incident to occur in flight, the results would have been catastrophic.

Private Poupore demonstrated an ability to work with minor supervision, even as an apprentice. He quickly discovered the fault with the poorly

positioned engine-wiring clamp and on his own initiative, investigated further. This attention to detail enabled him to discover the damage to the fuel line even though it was in a in such an obscure location. Private Poupore's keen eye and completeness of work likely prevented a potentially catastrophic in-flight emergency. ◆

Private Grant Poupore serves with 427 Tactical Helicopter Squadron, Petawawa,1 Wing Kingston.

For Professionalism

MASTER CORPORAL ARON LEHTINEN
MASTER CORPORAL CHUCK MATHEWS

On Wednesday, 4 June 2003, Master Corporal's Lehtinen and Mathews were standing outside the Quick Reaction Alert (QRA) facility in Comox. There was a fully loaded Operation Noble Eagle Hornet in each of the four hangar bays. An air sovereignty alert practice scramble start involving two aircraft was in progress when Master Corporal Lehtinen heard the auxiliary power unit (APU) on one jet cut out shortly after the #1 engine began to turn over. He proceeded into the hangar and saw the technician in the 'man one' position signalling the pilot that there was a fire. Initially he suspected that the APU was 'torching', as is often the case in situations of early APU shutdown followed by a quick restart attempt, however he soon noticed that the entire underside of the tail section was in flames. At this point, the pilot abandoned the aircraft and moved a safe distance outside of the hangar. Master Corporal Lehtinen and Master Corporal Mathews immediately rolled a portable fire extinguisher to the rear of the involved aircraft. Master Corporal Mathews energized the extinguisher and remained in position to ensure Master Corporal Lehtinen's safety. Master Corporal Lehtinen aggressively fought the fire, which was burning just behind two AIM-7 missiles, until it was extinguished. He then ran to and climbed the boarding ladder to the cockpit. Quickly he shut down the restarted APU and turned off the master power switch to ensure that there would be no re-ignition of the fire. By this time, base fire fighting units arrived and inspected the aircraft to ensure there were no internal fires and no chance of a flare-up.

In disregard of their own safety, Master Corporal's Lehtinen and Mathews' instinctive response in a critical situation prevented the possible destruction of one or more CF-18 Hornet as well as the potential loss of life or serious injury of the fifteen other personnel manning the QRA. These two individuals are commended for their outstanding display of bravery, quick thinking and decisive action. ◆

Master Corporal Aron Lehtinen and Master Corporal Chuck Mathews serve with 441 Tactical Fighter Squadron, 4 Wing Cold Lake.

CAPTAIN LYNE BRAGAGNOLO
MISTER MICK LEBOLDUS

On 8 August 2003, Mister Leboldus was conducting an NATO Flying Training in Canada test flight, and Captain Bragaganolo was acting as the inner runway tower controller.

A Hawk IP had returned from a low-level navigation mission and requested a practice forced landing (PFL) to the inner runway. Captain Bragagnolo sequenced the aircraft and when required requested the pilot confirm the gear down as per the standard operating procedures (SOPs). The pilot responded that the gear was down. As the Hawk neared the final stage of the PFL Captain Bragagnolo conducted a visual confirmation of the gear even though not required by regulation. Additionally, the Hawk PFL pattern is very dynamic, with a steep final approach, making it difficult to confirm the gear from tower. However, Captain Bragagnolo did not see any gear and requested the pilot reconfirm that the gear was down to which the pilot again responded that the gear was down

At this time, Mister Mick Leboldus was holding short of the runway, awaiting take-off clearance, and heard tower ask the Hawk pilot, a second time, to confirm the gear was down. Mister Leboldus then heard the pilot reply that the gear was down, however, when he looked at the aircraft on short final he clearly saw that the gear was in fact not down. Captain Bragagnolo simultaneously confirmed that the gear was not down and both Mister Leboldus and Captain Bragagnolo directed the Hawk pilot to overshoot. The pilot overshot and eventually landed without further incident.

Mister Leboldus and Captain Bragagnolo's exceptional situational awareness and quick decision making prevented a Hawk gear up landing and potential accident with possible injuries to personnel and loss of materiel resources. Mister Leboldus and Captain Bragagnolo are deserving of the flight safety *For Professionalism* award. ◆

Captain Lyne Bragagnolo and Mr Mick Leboldus serve with the NATO Flight Training in Canada, 15 Wing Moose Jaw.

For Professionalism

MAJOR JOHN ARGUE
CAPTAIN NICHOLAS GRISWOLD

Aircraft 912 was number 2 in a 4 plane CF-18 Hornet formation that was on route from Thunder Bay, Ontario (CYQT) to Buffalo Niagara International, New York (KBUF) on Saturday 04 October 2003. At the time of arrival at KBUF the runway in use was runway 23 with a 15–20 knot crosswind from the right. The formation lead requested and was vectored to initial for the overhead pattern. Upon touchdown, the number 2 aircraft experienced a pull to the right and received indications that they had a planing link failure on the right hand main landing gear. Captain Griswold, the front seat pilot, initiated a go around at the same time that Major Argue, the backseat pilot, was calling for a go around. The number 3 aircraft landed without incident and the number 4 aircraft, upon the request of Major Argue, carried out a low approach and formed up with the incident aircraft to conduct a visual inspection of the right hand main landing gear. Upon inspection it was evident that the connecting rod on the right hand main landing gear was bent and that the tire was not aligned appropriately for a normal landing. At the time of the incident KBUF had only one runway available for operations and there was no cable available to conduct an arrested landing.

At the request of Captain Griswold, Air Traffic Control informed aircraft 912 that the closest airfield with a cable was the Air National Guard Base at Syracuse, New York. A quick calculation by the flight crew confirmed that they had just enough fuel to make the transit to Syracuse with the gear down, providing they could climb to 20,000 feet. Despite repeated requests from Air Traffic Control to accept a lower altitude, the flight crew insisted that they needed to climb to 20,000 feet. Upon arrival at Syracuse, Captain Griswold conducted a minimum fuel penetration to a five-mile Instrument Landing System approach and successfully conducted an arrested landing. Both Captain Griswold and Major Argue should be commended for their quick decision-making and crew coordination. Their timely decision to go around at KBUF prevented the loss of control of aircraft 912 and the possible closure of the only available runway at an international airport. Their excellent coordination with different Air Traffic Control agencies allowed them to successfully recover aircraft 912 and prevented this incident from becoming an accident. ◆

Major John Argue and Captain Nicholas Griswold serve with 416 Tactical Fighter Squadron, 4 Wing Cold Lake.