National Defence | Défense nationale

Flight Comment

ISSUE 1, 2011

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SÉCURITÉ DES VOLS FLIGHT SAFETY

Canada

Views on
Flight Safety

By Mr Bill Kelly, Director General Aerospace Equipment Program Management (DGAEPM), Ottawa

Anyone who has suffered through the agonizing seconds after a "one bell," willing that the bells would continue to ring, understands first hand how flight safety can touch their lives and how important it is. When there is only one bell, the entire mood of the flight line changes. It's like someone punched you in the stomach. Your thoughts immediately turn to the pilot. Did he or she get out OK? If you've ever lost a close friend to an aircraft accident, I don't need to describe how difficult the ensuing weeks and months are when they don't "get out OK". Despite our grieving, people tend to step it up several notches, jumping into action to play their role in the aftermath. On the technical side, an entire machine kicks into gear to secure the accident site, ensure the remainder of the fleet is not at risk, and begin the arduous task of determining the causes and remedies.

My exposure to the Flight Safety Program began some thirty plus years ago, starting on a CF104 Squadron in Germany. I did lose some very good friends and that experience more than anything has shaped my approach to flight safety, making it very real and very personal. Hopefully, you will never have to live through that gut wrenching experience, and understand that, as good as we are at dealing with accidents and incidents, the real strength of the program is in **all the things we do up front to avoid them**. As your career progresses, you will also understand that the success of the program depends on you maintaining that awareness of flight safety - especially as you move away from the flight line and are no longer exposed to the jet noise and smell of JP 8 that are the daily reminders of its import.

As DGAEPM, I am very proud of the many personnel (military, public servants and contractors) who work every day to ensure that the fleets we operate are safe to fly. These personnel are often under considerable pressure to deliver capabilities in support of operations and the temptation to cut corners is palpable. Fortunately, we have a strong flight safety culture, underpinned by a solid Quality Management System and a robust Airworthiness Program, to guide us. Our processes are flexible enough to allow us to expeditiously field and support new (and existing) capabilities in a manner that recognizes operational urgency, yet ensures safety by first assessing and then mitigating the associated risk. Nevertheless, we must never become complacent. These programs are only as good as our willingness to continuously improve them through an active lessons learned process.

For those that have not been exposed to these programs, let me highlight two key elements to give you a sense of what I am talking about: (1) the Record of Airworthiness Risk Management (RARM) process and (2) the As Safe as Reasonably Practicable (ASARP) principal. The RARM is a world-class process that is routinely employed by Engineering and Operations staff to determine the level of airworthiness risk associated with certain situations affecting a fleet. Hazards are identified and risks are carefully assessed, including severity and probability of occurrence. The RARM then presents different risk control options to the Commander of 1 Cdn Air Div, enabling the achievement of a level of safety as high as reasonably practical. The ASARP principle is an important feature

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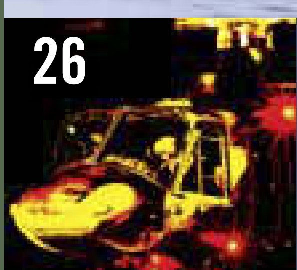
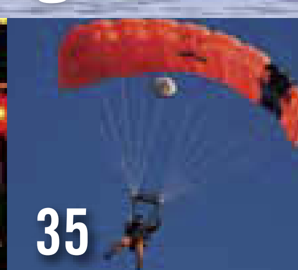
Corporal Danny Ford, an Avionics Technician for 14 Air Maintenance Squadron replacing a panel on the tail of *Aurora* aircraft CP140108.

Photo: Pte Jessica Reynolds





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For *Professionalism*

For commendable performance in flight safety

Corporal John Saunders

In May 2010, Cpl Saunders was tasked to conduct an inspection of the main rotor assembly as part of a 25hr/30Day inspection on the CH146 *Griffon*. While inspecting the mast cap, Pte Saunders noticed a small gap in the PRC bead which wraps around the locking nut, located under the mast cap, behind the mount bolts. Going beyond the criteria listed in the inspection package, he found that the rivets for the locking tab for the rotor retaining nut had sheared off the mast cap and the locking tab was missing. Investigating further, he then found the second locking tab rivets, 180 degrees away from the missing one had also sheared, but the tab was jammed in place against the retaining nut which had backed off slightly. Cpl Saunders immediately informed his supervisor and alerted Flight Safety.

Cpl Saunders' outstanding attention to detail and professional approach while performing his duties were well beyond expectations considering his experience level. Taking into account this specific component is not in plain view, coupled with the fact that the defect had not been detected previously by more experienced ground crew and aircrew conducting inspections makes his actions even more commendable. His professionalism and conduct prevented possible injury to personnel and/or loss of material resources makes him very deserving of this For Professionalism award. ◆

Corporal Saunders is currently serving with 444 Combat Support Squadron, 5 Wing Goose Bay.

Corporal Brandon Paton

On the 17th of March 2010, *Griffon* aircraft 146466 encountered excessive vibrations in the tail rotor. The aircraft was placed unserviceable, corrective adjustments attempted and the external structure visually inspected for damage. There was little success in eliminating the vibrations and data fluctuated erratically. On the 21st of March, while attempting another track and balance, Cpl Paton observed unusual radial vibrations of the tail even though the Data Recording Unit (DRU) read serviceable.

Cpl Paton's concerns about the vibrations and visual observations were discussed during the crew changeover and a subsequent in-depth inspection revealed a crack in the skin and internal structure. The crack appeared to have started at the spar and expanded rapidly, eventually becoming visible on the aircraft skin. After the crack was repaired, a ground run was done resulting in axial data that was high but stable. The radial data, however, indicated extremely low in spite of contradicting visual oscillations. Cpl Paton opted to investigate further. Conferring with AMCRO (aircraft maintenance control and repair office) regarding historical data, it was determined that the radial accelerometer had been failing intermittently for approximately 15 flight hours. After inspecting the existing radial accelerometer and its connector, he replaced it and another ground run was carried out; resulting in similar data. An inspection of the radial accelerometer cabling was then carried out during which the wires broke off at the connector. Following wiring repairs, the next ground run correctly showed high Radial and Axial vibrations, which were adjusted enabling the aircraft to return to service.

Cpl Paton's outstanding attention to detail and professionalism in tracking down a difficult problem prevented possible injury to personnel and/or loss of material resources makes him very deserving of this For Professionalism award. ◆

Corporal Paton is currently serving with 408 Tactical Helicpter Squadron, Edmonton.

Master Corporal Gordon Carey

During a shut-down sequence, when the #1 engine slowed to ground idle in preparation for a water wash, CH124434 *Sea King* unexpectedly lost all electrical power. Initial analysis by MCpl Carey, an AVS technician with 443 Maritime Helicopter Squadron, revealed that the aircraft wouldn't accept power from a ground power unit. Suspecting a battery problem, he removed the battery and forwarded it for overhaul. The subsequent maintenance shift replaced the battery and completed the snag rectification.

The next day, unrelated to the previous occurrence, the malfunction reoccurred while MCpl Carey was participating in a training exercise. Not yet qualified on CH124 electrical systems he commenced a meticulous inspection using admirable deductive reasoning skills and discovered a terminal, within the battery's quick-disconnect that had not been crimped onto the corresponding power-cable. His initiative and thoroughness revealed a serious wiring deficiency, which prompted him to share his discovery and the correct crimping procedure with Squadron personnel.

Flight Safety staff later discovered a long history of elusive and intermittent electrical problems with CH124434's battery power. It was learned that a Special Inspection (SI) on its battery quick-disconnect was issued in 2000 as a corrective action for a total loss of electrical power. The SI called for disassembling the battery quick connector and inspection of its internal lugs. Maintenance records indicate that the lug in 2000 was unserviceable and replaced.

MCpl Carey's professional work-ethic and diligence led him to uncover and correct an error to a chronic deficiency, which undermined the reliability of the emergency back-up power ordinarily assured by the battery. Total loss of AC/DC power during instrument flight conditions, whether flying in clouds or at night "in the dip" could have catastrophic consequences.

MCpl Carey is commended for his intuition, diligence and keen troubleshooting prowess in resolving this malfunction and his forthrightness in passing his experiences on to his colleagues. He is most deserving of this For Professionalism award. ◆

Master Corporal Carey currently is currently serving with 443 Maritime Helicopter Squadron, Pat Bay, BC.

Master Corporal Stephane Hachey and Master Corporal Jeff Knight

On 11 January 2010, MCpl Hachey, an aviation technician with the Aviation Battalion in Afghanistan was completing the installation and adjustment of the reduction gear box (RGB) on a CH146 *Griffon* helicopter. He observed an anomaly with the numbers on the RGB data plate. These numbers are used to adjust the aircraft's torque transmitter and normally range in the mid-80s; MCpl Hachey noted that they were reported in the mid-30s. Not content to simply accept these suspect numbers, MCpl Hachey discussed his concern with a co-worker MCpl Knight. MCpl Knight noted that the numbers matched a related set of values and suspected a transposition error. Together, they contacted the original equipment manufacturer, Bell Helicopter Textron Canada (BHTC), to challenge the suspected discrepancy. The reply from BHTC stated the numbers had been checked with the sub-contractor involved in overhauling the RGB and confirmed that the values printed on the data plate were correct. Still not confident they continued to seek confirmation of this discrepancy raising the issue again with their supervisors. They documented their concerns and collected supporting information to validate their theory. This information was forwarded to the Aircraft Engineering Office. A week later, the unit received confirmation that the numbers were in fact in error and the correct values were provided.

If these conscientious technicians had not been so alert to the suspicious RGB numbers, and diligent in their unfailing follow-up, the helicopter would have been rigged incorrectly. The potential safety, operational and fiscal consequences are impossible to determine, however they demonstrated an awareness of their surroundings and persistence in seeking a complete and technically airworthy solution. This demonstrates the kind of professionalism upon which a sound Flight Safety program is built and makes them fully deserving of this For Professionalism award. ◆

Master Corporal Hachey is currently serving with 417 Combat Support Squadron, 4 Wing Cold Lake and Master Corporal Knight is currently serving with 408 Tactical Helicopter Squadron, Edmonton.

Views on Flight Safety

(continued from page 2)

of our Airworthiness Programme that cannot be overstated. "Personnel responsible for the design, procurement, operation and support of DND aircraft are further bound, whenever possible and reasonable, to achieve a level of safety as high as reasonably practical." (AG-005, Part 2, Sect 1, para 12). The achievement of ASARP requires an evaluation of the risk reduction that can be achieved against the associated financial and operational impact, and the RARM process helps facilitate this evaluation. The RARM process and the ASARP principle are therefore two crucial elements in the continued safe operations of our fleets.

So what's the bottom line? Well, for all of us who are working away in some capacity within the CF aerospace domain, you need to know that what you do, or don't do, really does have an impact. You should always ensure that when you are at work on a "mod leaflet", or a special inspection, or a risk assessment, or a non-standard repair, or a maintenance deferral, or a requisition for some piece of kit, or a flight test plan, or any number of the myriad of other activities that go on in the daily generation of air power - flight safety and achievement of a level of safety as high as reasonably possible are uppermost in your mind. Follow our "Plan-Do-Check-Act" quality principle in everything you do, and you shouldn't go wrong. Good luck – Per Nos Ad Astra. ◆

The Editor's Corner

You Want Me to Fix What?

There is a segment within aviation that, without its presence, its high level of professionalism and its prevailing attention to detail, we would have no serviceable aircraft with which to fly. The work in this field requires education, skill, knowledge and plain old hard work - day after day, often unheralded. I am, of course, referring to those men and women who work in aircraft maintenance related trades and classifications, and their importance is the major theme of this issue. In keeping with this theme, I am very pleased to have Mr Kelly's (DGPAEM) "Views on Flight Safety" which effectively covers some of the issues associated with maintainers and how these issues are integral to the Flight Safety Program. There is also a great article from Mr Greg Poulin (Directorate of Technical Airworthiness and Engineering Support) on lessons learned from the Royal Air Force Nimrod airworthiness issues.

We also have our very own Major Alain Giguére back with his "Maintenance in Focus" column on the importance of aircraft washing. This seemingly simple operation has huge benefits for the long term serviceability and reliability of our fleets and, unsurprisingly, is not like washing your car!

HPMA and You

What do you know about HPMA? We have the inaugural submission from Major Dennis Scharf that clarifies this sometimes misunderstood topic into simple terms – well, relatively simple terms. Expect a return article from the ICP School in our next issue.

Energy Drinks

How many of you regularly consume the increasingly popular energy drinks? Maybe you are trying to stay awake on a long mission, or perhaps you believe them to be performance enhancing. Have a look at Major Helen Wright's column "From the Flight Surgeon" and separate fact from fiction.

IMP Aerospace

It was pointed out to me that for two recipients of the "For Pro" awards published in our last issue, we neglected to mention the contracting company they work for. Both Mr Barrow and Mr Penton are employed by IMP Aerospace to provide maintenance on the CH 149 *Cormorant* helicopter in support of 103 and 442 Squadrons. Thank you both, once again, for your continuing contribution to flight safety.

Letters

I would like to thank those of you who sent along emails and pictures on flight safety related issues and want to encourage you to continue to provide feedback and perhaps comment on what you like, what you don't like and what you would prefer to see in future issues. For submissions that promote our Flight Safety Program, I may even be able to pass a little 'swag' your way. Work Safe. ◆

Captain John W. Dixon
Editor, *Flight Comment*

Sir,

When I got the air force tattoo I had 18 years in and knew I would always be proud I'd been in the air force…plus it's a conversation piece while shaking someone's hand. The flight safety tattoo came last Dec after being in 423 Sqn Flight Safety long enough to feel like I'd begun to make a difference: one of the most important positions I've ever held.

Master Corporal Jon Gibson

423 Squadron Flight Safety, 12 Wing Shearwater, Nova Scotia

Response

Master Corporal Gibson:

Thank you so much for passing along your comment and the accompanying photo. Although I may not run out to get a matching tattoo, your enthusiasm is admirable and I would agree with your statement on the importance of those in flight safety positions.

Editor

Good day sirs,

I would like to comment on the opening article by Colonel Chicoyne on "speaking up". It reminds me of an incident from my younger days.

In 1996 I was a Cpl posted from 4 Wing Cold Lake to 14 Wing Greenwood and was returning from my house hunting trip on a civilian Boeing 737. I was at a window seat in the rear of the aircraft and about 1/2 hour from Edmonton I noticed fluid streaming down the side of the #2 engine cowling. I quickly realized it was oil and summoned a flight attendant, asking her to inform the pilots. She turned white! After a few minutes she returned and told me they were monitoring it and that it was nothing to worry about, but when we landed there were 3 fire trucks waiting!

Had I not spoken up and had the engine suddenly failed on short final, I'd hate to think of what might have happened. I don't hesitate to speak up, and whenever I trained new techs on the CP140, I always stressed to point out anything that didn't seem right.

Safety first!

Corporal Dwayne Harvie

12 AMS Master Tech Library, 12 Wing Shearwater, Nova Scotia

Good afternoon,

After acquiring the latest issue of Flight Comment (Issue 3, 2010), I eagerly perused through the pages to see if I knew any of the folks depicted in the editorials. Upon reading the "Shortcuts" narrative on page 31, the lesson learned is a valuable one; unfortunately the 2 AVN technicians replacing the flap on a CF18 are wearing watches while performing maintenance on the A/C. As a 6 year CFSATE AVN instructor, we always preached no rings or watches on the hangar floor. It is commendable to relay lessons learned from mistakes made, but it seems ironic that a publication referencing Flight Safety could miss something so basic.

Keep up the great work. I look forward to reading more current issues and using lessons learned through your publication as examples for new apprentices coming through my classes.

Cheers.

Sergeant Dave Barsi, TTF Coordinator

404 Squadron, 14 Wing Greenwood, Nova Scotia

Response

Sergeant Barsi:

Thank you for bringing this to our attention. Our DFS maintenance section has confirmed that you are indeed correct as the General Aircraft Maintenance Safety C-05-005-P10/AM-001 (ref B) states that "personnel employed on aircraft, vehicles, and electrical or mechanical equipment shall remove rings, watches, identification bracelets, etc. Such items constitute a serious injury hazard." The policy is coherent and directions are clear: watches shall not be worn by maintenance personnel working on aircraft.

Interestingly, this particular image has been published more than once and you are the only individual who has brought this to our attention. Thank you for helping to educate this still rather "green" editor and more importantly, for contributing to the Flight Safety Program.

Editor

From the

Flight Surgeon

Performance Drinks and Flight Safety

By Major Helen Wright, Directorate of Flight Safety, Ottawa

Energy drinks claim to make you more alert and give you more energy. These beverages contain a variety of so-called "energy boosters," such as caffeine, tyrosine, phenylalanine, taurine, and other chemicals. Many boast that they contain antioxidants and large doses of B vitamins, as well as ginseng and other herbs.

Energy drinks are aggressively marketed as a method to provide mental and physical stimulation for a short period of time. These drinks can be found anywhere you buy beverages and have grown into a multi-billion dollar industry. Examples include Red Bull Energy Drink®, Rockstar®, Monster®, AMP® and Full Throttle®[1].

Beware: the chief ingredient in these drinks that will make you feel energetic is the large dose of caffeine.

What do they contain?

Caffeine: Caffeine is a stimulant (note that caffeine may be listed under alternate names such as Guarana or yerba mate). Most drinks available in Canada have 80 mg of caffeine per serving/can which is double the amount found in most soft drinks. Some have much larger doses of caffeine. For instance, a 250-ml bottle of Coca-Cola contains 26 milligrams of caffeine, but a 75-ml bottle of Rockstar "energy shot" contains 200 mg of caffeine. A 355-ml can of Red Bull contains 113.6 mg of caffeine[2].

Health Canada says that most healthy adults can safely consume up to 400 mg of caffeine in a day from all sources. (It is not recommended that children and young teenagers use energy drinks – and yet these products are heavily marketed towards this age group). Caffeine can cause nervousness, anxiety, jitteriness, tremor, decreased mental focus, increased blood pressure, irritability, stomach/intestinal upset, rapid heart rate and trouble sleeping in some individuals and withdrawal symptoms such as headache, fatigue, irritability and poor concentration among those who consume it regularly.

Sugar: Sugar provides you with energy in the form of calories. A small can (250 ml) is likely to have at least 100-130 calories. However, many energy drinks are sold in much larger can sizes, which would contribute many more undesirable empty calories to your diet.

Taurine: Taurine is an organic acid that is found in meat and dairy products. It is not an essential nutrient and is not part of body proteins like most amino acids. It has been claimed that adding taurine to energy drinks will make you more alert, but there is no scientific evidence to support this. The long term health effects of consuming taurine in energy drinks is unknown[3].

Medicinal herbs: Many energy drinks contain herbs like Ginseng and Gingko Biloba. The manufacturers want you to believe that these herbs improve performance; however, there is no scientific evidence to support this. Additionally, some herbs can interact with medications and supplements. Be sure to talk to your flight surgeon or MO about using these products if you are taking medications or supplements.

Energy drink makers may also add other ingredients that they say provide extra energy, such as B vitamins and glucuronolactone (a type of carbohydrate). However, there is also no scientific evidence to support these claims.

Photo: MCpl Danielle Bernier

Is Your Performance Enhanced?

The feeling of increased energy from an energy drink is due to the caffeine, other stimulants and sugar[4]. Caffeine is a central nervous system stimulant that enhances athletic performance in some circumstances[5]. There is no evidence that caffeine is of benefit in sports events that last less than 90 seconds. The ideal performance enhancing dosage of caffeine appears to be from 3-6mg/kg body mass (about 2 cups of coffee for a 70kg person) - taking higher doses than this does not appear to provide any greater performance benefit and may actually decrease performance. Caffeine should be taken approximately one hour prior to exercise and ingesting it during exercise and especially late in exercise has also been shown to improve performance[6].

One study looked at the ability of a commercial energy drink to enhance acceleration tolerance, strength under G-load, and cognitive performance. Relaxed G-tolerance was significantly higher during the caffeine session, but importantly the **simulated air combat tolerance did not change**[7].

Another study found that energy drink decreased reaction times on a behavioural control task, increased subjective ratings of stimulation and decreased ratings of mental fatigue[8]. It is very important to note that the greatest improvement in reaction times and subjective measures were for the lowest dose and improvements diminished as the dose of energy drink increased. A study on caffeine (not energy drink) during US Navy SEAL training found that in circumstances of lack of sleep and stress moderate doses of caffeine improved cognitive function, including vigilance, learning, memory, and mood state[9]. A dose of 200 mg appears to be optimal under such conditions.

The amounts of guarana, taurine, and ginseng found in popular energy drinks are far below the amounts expected to deliver either therapeutic benefits or adverse events. However, caffeine and sugar are present in amounts known to cause a variety of adverse health effects[10].

Side effects from drinking energy drinks are possible. While moderate use by adults is generally safe, side effects can happen if energy drinks are abused, such as when they are mixed with alcohol, when they are taken while you are on medications, or when too many are consumed at one time. Side effects that have been reported include nausea, vomiting, high blood pressure, tremor, agitation and irregular heartbeats. Life threatening consequences such as seizure, stroke and cardiac arrest have also been reported.

Dehydration is a major factor in physical performance and a sweat loss of 2% of your bodyweight will result in a performance drop of 20%. Energy drinks are not sports drinks and as such are not a good choice when you are trying to stay properly hydrated. Their high sugar content will reduce fluid absorption from your stomach and can cause stomach upset and diarrhea. In addition, the caffeine in these products can also cause stomach upset, increase sweat loss and urine production. It should also be noted that these products do not contain the electrolytes that are lost when you exercise for prolonged periods[11].

If you drink energy drinks, be aware of the following:

- Energy drinks should be consumed in moderation. Energy drinks should not be taken on an empty stomach and should not be used as a meal replacement. The drink labels do warn that there is a limit to the amount of energy drink should be consumed per day.
- Do not mix energy drinks with alcohol or other drugs.
- If you engage in intense physical activity or exercise, drink water to help re-hydrate your system. If you are exerting yourself for greater than 60 minutes you would benefit from rehydrating with a sports drink such as Gatorade, Powerade or E-Load[12].
- Unlike most food and drinks in Canada, energy drinks are regulated as natural health products under the Natural Health Product (NHP) Regulations because they contain higher levels of ingredients such as caffeine and vitamins than are usually allowed in foods. Like all natural health products, energy drinks are reviewed by Health Canada for their quality and safety; but, the government has allowed many to go on sale while waiting for approval due to a backlog of products to be reviewed. This means that some energy drinks and other natural health products on the market have never been reviewed for efficacy or safety[13]. Carefully read the labels of all health products you consume, including energy drinks, and follow label instructions. Health Canada authorized energy drinks will have an eight-digit Natural Product Number (NPN) on the label. ◆

Endnotes

1. Energy drinks should not be confused with sports drinks such as Gatorade® or Powerade®. Sports drinks are designed to re-hydrate the body and provide sugars, which the body burns to create energy and replenish electrolytes (note that water is your best fluid replacement for workouts less than an hour). Energy drinks should not be used as a fluid replacement.
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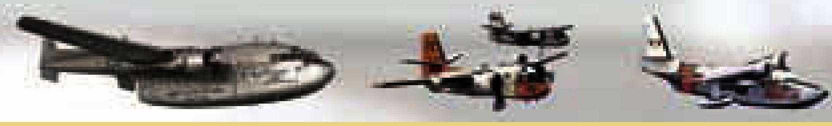


THE CANADIAN FORCES INVESTIGATE

Propeller Low Oil Level Lights

By Major Bob Maier and Captain Dave Nowosad, Air Command Headquarters, Canadian Forces Westwin, Manitoba

This article was originally printed in the January – March 1994 Issue of Service News. It is reproduced here with the kind permission of the authors and Lockheed Aeronautical Systems Company. The Editor would also like to thank Mr Robert Audet (CC130 and CP140 Propeller Systems Analyst) and Captain Kristen Bishop (CC130 and CP140 Propulsion Systems Technical Authority) for their contributions.

Propeller low oil light indications have plagued the Canadian Forces (CF) for a number of years. These incidents were of grave concern because in some circumstances, the required procedure for such indications is to shut the engine down in flight. In August of 1991, a decision was made to form a working group to investigate the high rate of propeller low oil light occurrences and make recommendations on how to solve the problem. The purpose of this article is to share our experiences and findings with other *Hercules* users so that they too may benefit from them.

Working Group

The working group reviewed flight safety data in order to determine if any trends existed. Propeller serial numbers were checked to determine if the problems could be attributed to specific propellers. The resulting analysis showed that this was not the case, and that the majority of problems were due to improper procedures or techniques, with no one predominant cause attributing to the high incident rate. The working group then identified all the factors that appeared to contribute to this problem and made recommendations to rectify them. Each of these factors and suggested solutions will now be discussed in turn.

Flight Incident Reporting

The reporting of propeller low oil level lights through the flight safety net at each user unit was found to be somewhat inconsistent. Steps were immediately taken to standardize flight incident reporting at each user unit in order to ensure that valid history data would be provided.

Standardization of Technical Publications

The technical publications used by the flight engineers and technicians were reviewed for inconsistencies in the procedures. Steps were then taken to standardize all CF publications to the correct procedures laid down by the propeller manufacturer, Hamilton-Standard.

Atmospheric Sump Dipstick

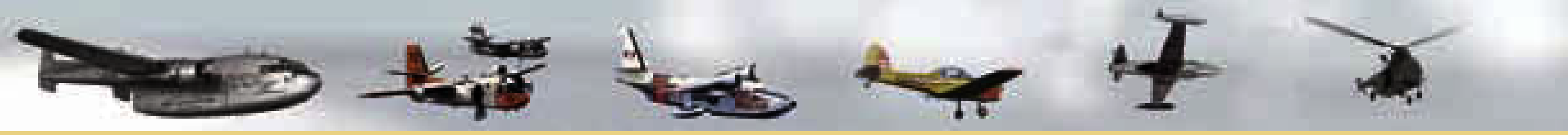
The current design of the dipstick and tube assembly is such that it is possible to get an incorrect fluid level reading if a small amount of residual fluid is retained in the hollow bolt which supports the dipstick tube (Figure 1). We found that this can lead to underservicing of the propeller which may result in a low oil level light indication in flight.

An optimum fluid level for the propeller was determined through practical experimentation. For our tests, we made use of a special plexiglass cover for the Hamilton-Standard NSN 16 I0-21 -843-4664 pump housing assembly that had been developed to assist maintenance technicians during de-snagging activities and as a training aid. After completion of these tests, authorization was obtained to modify all dipsticks to raise the full mark and indicate an operating level.

Difficulty in reading the dipstick under poor light conditions had also been reported by both technicians and flight engineers. To help remedy this situation, cross-hatch pattern was etched in all dipsticks to make them easier to read. Figure 2 shows the new design.

Other operators who may be interested in these modifications are cautioned to seek appropriate authorization before making any changes to existing equipment.

Photo: WO Robert Granger



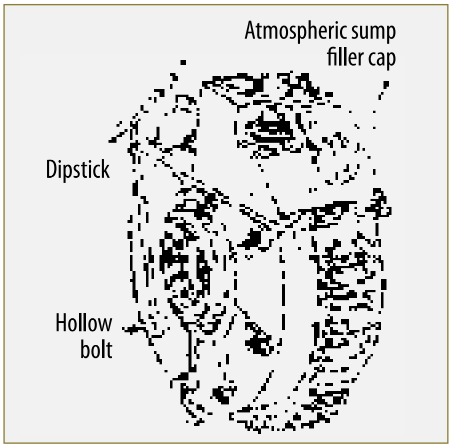


Figure 1 – 54H60 propeller control assembly

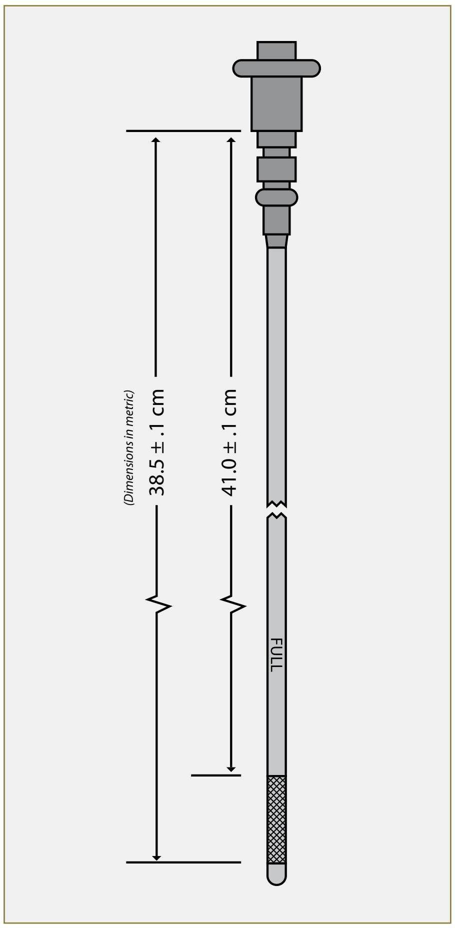


Figure 2 – Dipstick rework

NOTES

1. Remove old markings using emery cloth
2. Apply markings by electrolytic etch, characters shall be approximately 1.0 mm wide

Propeller Oil Level Check

The published procedures for our aircraft state that the propeller oil level check must be carried out within a 30 minutes of engine shutdown or overfilling may result. Tests that we performed on the propeller firmly underscored the importance of this point. Even on a warm day, the oil level dropped 1/2 inch on the dipstick after only 45 minutes had elapsed. Therefore, if a technician starts his fluid-level checks 20 minutes after shutdown, and it requires 40 minutes to service all four propellers, the last two propellers could easily end up being over serviced.

In order to ensure that the propeller oil level readings are taken within 30 minutes of engine shutdown, three servicing technicians must be utilized, one located in the flight station while the other two service two props each. An alternate method would be to have one technician take the readings of all four propellers before adding fluid as required. The actual dipstick check itself must also be carried out exactly according to the procedure described for your aircraft. A summary of the method used by the CF is as follows:

- Shut down the engine and connect external electrical power to the aircraft. Position the No.1 blade at the 12 o'clock position to ensure that the propeller hydraulic system is purged of air and to help prevent static leakage. Use the propeller auxiliary (feather) pump to cycle the propeller blades through the full range of positions from ground idle, to feather, to reverse, and back to ground idle *twice*. Be sure to observe the pump's duty cycle restrictions when carrying out this procedure.
- While the pump is still running, remove the atmospheric sump dipstick and wipe it with a lint-free cloth. Insert and lock the dipstick in the tube. Remove it again and check the oil level. Shut off the propeller auxiliary pump after the reading has been obtained.

Leaking Propellers

It was determined that 30% of propellers routed to the shop for maintenance work to repair leaks could have been fixed on the wing. In a number of cases, no fault at all with the propellers could be found.

In reviewing the maintenance records, we discovered that the record sheet then in use did not contain a sufficient amount of information about the propeller to serve as a truly useful de-snagging tool. A new record sheet was introduced that included such missing items as fluid amounts added and removed, information on when the propeller is changed, purged, or replenished, and the serial number of the propeller to ensure that the sheet will be used for one specific propeller and that propeller only. Figure 3 shows the newly designed record form.

PROPELLER FLUID LEVEL RECORD – PROPELLER SER. #: ______

*NOTE : ALL FLUID ADDED TO RECTIFY AN UNSERVICEABILITY OR PROP LOW OIL LIGHT MUST BE RECORDED.

PERIODICITY EVERY 50 HRS +/-5

ENTER OIL ADDED OR REMOVED IN QUARTS OR PART QUARTS (IE. I/2 QUART. 1/4 QUART. ETC)

Tail Number	Position	Airframe Hours Due	Airframe Hours Done	Amount Added (+) or Removed (-)	Amount Added After First Flight or Mainten-ance	Unservice-ability	Prop Low Oil Light ON At Airframe Hours	Name/ Signature Please print	Location and Time of Servicing

Figure 3 – Propeller servicing record form

Cold Weather Operations

The procedure used for starting engines during cold weather operations was reviewed and the following procedure for starting engines cold-soaked at temperatures below 0°C (32°F) was implemented:

Run the engine in low-speed ground idle until the engine oil temperature rises to 10°C. When this temperature has been reached, the engine may be up-shifted to normal ground idle. Then run the engine in normal ground idle until the engine oil temperature reaches 60'C, or has been 50°C or above for five minutes. At no time during this procedure is the blade angle to be changed by throttle movement until all the conditions noted above have been met.

Propeller Static Position

The technical orders used by the CF direct that the number one blade of the propellers on static aircraft is to be placed above the horizontal split line or roughly at the 12 o'clock position. It was emphasized to all technicians and flight engineers during training sessions that positioning the propeller as per regulations is essential to prevent oil from draining from the propeller hub through the beta feedback shaft and filling the atmospheric sump, causing static oil leaks.

Editor Comment: The guidance provided in this section (Propeller Static Position) has evolved since this article was first published. The technical publications now recommend to positioning the no. 1 blade at 45 degrees when the aircraft is parked for an extended period of time, such as overnight. It is stated that this procedure can reduce static hydraulic fluid leaks from the pump housing lip seal by preventing hydraulic fluid in the hub from leaking through the beta feedback shaft into the atmospheric sump.

Clogged Breather

On at least one occasion, an unnoticed clogged propeller oil system breather caused the atmospheric sump to become pressurized and resulted in a propeller leak. The propeller servicing procedures were therefore changed to direct the technicians to place a finger over the dipstick tube briefly during feather pump operation to establish that no back pressure exists. This practice will ensure that the breather is not clogged.

Propeller Servicing Training

It is essential that senior supervisors fully appreciate the time required to properly de-snag and service a leaking propeller, and not place undue pressure on the technicians. It is also important that the technician be thoroughly trained with regard to the correct procedures for propeller servicing. An extensive training package was prepared for all technicians, senior supervisors, and flight engineers. The training was introduced into several basic training courses, and also taught by a special team that went to the major user units in order to get to as many personnel as quickly as possible. The half-day course focused on the proper procedures for the servicing of propellers and was comprised of the following topics.

Theory

- Basic propeller construction
- Hydraulic system operation
- Servicing techniques, including:
- Initial installations
- Post-runup servicing
- Post-flight servicing
- Ongoing servicing
- All notes and cautions listed in the technical pubs.
- Fluid-level servicing sheets

Practical

- Filling procedures
- Cycling of the propeller
- Reading of the dipstick
- Procedure on removal of fluid in event of overservicing.

Conclusions

Since the completion of the working group report and the implementation of their recommendations, there has been a significant reduction in the number of propeller low oil level light illuminations. The incident rate has dropped from a high of 2.93 per 1000 flying hours to a low of 0.94 per 1000 flying hours.

The most meaningful point to remember is that there was no single "magic fix" that led to a solution of our propeller low oil light problem. Rather, it was a combination of improved techniques, tightened procedures, and enhanced training that brought the problem under control. ◆

Photo : Adjc Keith Edgett

Flight Safety
A TEAM CONCEPT

By LCol Paul Dittmann

At the time of writing, LCol Dittmann was the Commandant, 3 CFFTS. He is currently the Contracted Flying Training and Support Program Manager in the Directorate of Air Contracted Force Generation, NDHQ, Ottawa.

3 CFFTS, Allied Wings (AW) and its sub-contractors such as Kelowna Flightcraft and Canadian Helicopters, to name a few, comprise the Canada Wings Aviation Training Centre, near Portage la Prairie, MB. 250 CWATC personnel and a fleet of 40 aircraft are responsible to train over 300 students and for the pinning of wings on roughly 80% of the Air Force's pilots each year. CWATC is no different from any other CF flying unit in that we are busy and getting busier. The key to succeeding at our tasks, therefore, lies in how we manage the risks inherent within them. Consequently, CWATC's Flight Safety organization is a robust one that provides both me - the Commandant - and the Site Manager with excellent advice on how to manage those risks. Flight Safety is the glue that keeps the CWATC fabric together.

Still a young entity, CWATC continues to experience significant change as it develops the capacity to meet the Air Force's demand for more pilot graduates; witness the growth from 12000 to 22000 YFR in the past four years! Sure challenges remain, but the efforts placed on nurturing our safety culture in the early days have paid off as both the 3 CFFTS UFSO and the AW FSO now form a united team that embraces four important concepts to tackle emerging issues.

CWATC's Flight Safety Team is dynamic. Faced with cultures and experiences from both military and civilian backgrounds, our team was instrumental in removing communication barriers that hindered the understanding of our different cultures within CWATC. Rather than staying static, our Flight Safety team remained flexible to deal with issues that a mature Air Force unit takes for granted. For example, the integration of a simple FSOMS-based reporting process to replace

Photo: Mr Derek Scharf

"Through a continual presence on the hangar floor as well as in the aircrew lounges, Flight Safety concepts and practices have been embraced by all..."

the Transport Canada, Canadian Helicopters and Kelowna Flightcraft reporting systems was essential to improving our reporting culture.

CWATC's Flight Safety Team is inclusive, not exclusive. Our team broke down the independent contractor and CF elements to forge a unified team. Through a continual presence on the hangar floor as well as in the aircrew lounges, Flight Safety concepts and practices have been embraced by all, as witnessed by a newly minted CWATC FS award that has been earned by both maintenance and aircrew personnel. Additionally, our team routinely engages a supportive 17 Wing FSO staff with significant effect.

CWATC's Flight Safety Team is proactive, not reactive. With such unprecedented growth, both FSOs continue to find innovative ways to get the Flight Safety message across. With a shared office environment, they demonstrate that a collaborative approach to designing posters, introducing new awards, and giving frequent presentations not only generates positive results, but also provides a common ground to engage in discussion.

Lastly, CWATC's Flight Safety Team is a learning organization. As a centre of learning excellence, CWATC embraces a unified approach to Flight Safety right from the top, recognizing the important point that the graduating students are the Air Force's future leaders. The Commandant, Site Manager, and the 3 CFFTS and AW OpsOs frequently engage in morning briefings to punctuate the FSOs' messaging. The point that safety of flight is paramount does not become clearer than when, for example, the Site Manager, who operates for profit, enforces a pause in flying to resolve emerging issues. This notion of the primacy of flight safety is something that should remain at the forefront of every student's mind throughout his career.

At CWATC, Flight Safety facilitates a strong bond between the Air Force and contractor teams. Our attitude is that Flight Safety is a force multiplier. If we introduce and foster this belief correctly, our students will embrace a solid safety culture that is able to guide them well during training and on operations. As all of us in the CF belong to a team somewhere, we need to always positively influence our younger generation. . . .

. . .after all, Flight Safety is everybody's business! ◆

A Dirty Secret

By Major Sylvain Giguère, Directorate of Flight Safety, Ottawa

All you ever wanted to know about… aircraft washing. Disappointed? Washing aircraft is far from what you and I would call a rewarding job. It's more like a chore. For some, like *Sea King* techs, aircraft washing is done on a weekly basis. You can just imagine that for them, washing aircraft is almost like being in a scene from "Groundhog Day": wake up, eat breakfast, go to work, fix snags, eat lunch, wash an aircraft, etc. Considering that the *Sea King* will be turning 50 in two years, there are a few lessons to be learned from this feat of longevity. One of them is why we need to wash and clean an aircraft.

For a fast jet jockey, washing the aircraft may be perceived as the means to improve the aircraft performance through an increased aerodynamic efficiency. This is far from being a consideration in the case of a *Sea King* helicopter! The main purpose of washing an aircraft is to slow down or reduce the amount of corrosion occurring on the airframe. The question of how frequently to wash an aircraft is a management decision based on minimizing the total cost of maintenance. Keeping an aircraft clean, however, also makes it easier to inspect for faults or trouble areas, some of which, if left undetected, could have disastrous results.

Metal corrosion is the greatest threat to the structural integrity of an aircraft. The reason is simple: the impact of corrosion to the fatigue of components is not really considered in aircraft design. As a result, unless corrosion is detected and treated, it can become a serious problem that can endanger flight safety by causing components or systems to fail unexpectedly. The first layer of defence remains the prevention of corrosion.

Corrosion 101

Corrosion is essentially an electric circuit: part of the circuit is the base metal itself; the rest of the circuit exists in an external conductive solution (i.e. an electrolyte) that must be in contact with the metal. The electrolyte in our corrosion circuit is nothing more than water and salt/pollutants. Washing reduces the surface concentration of the salt/pollutants which diminishes the concentration of the electrolyte leading to a reduced corrosion rate.

If the previous description is not sufficient to justify the assignment of aircraft washing to the avionics type, I do not know what is… Seriously, aircraft washing is an effective way to reduce corrosion. An added bonus to aircraft washing and cleaning is that it helps ensure the reliability of certain systems. By removing dirt and grime, we prevent the premature wear of coatings and aircraft components such as actuators, seals, discs, and bearings. These components often have oils and grease on them and it's no secret that grease attracts dirt. If they are not kept clean, the dirt particles can invade and act like an abrasive compound which can lead to premature failure.

Basics of Aircraft Washing/Cleaning

Technical publications for each fleet provide specific details on applicable aircraft exterior cleaning procedures. In general, exterior cleaning is done via either dry or wet washing. For the dry wash, the exterior is wiped with an applicator soaked in the wet cleaning compound, then left to dry or glaze over. Once dry, the aircraft is rubbed with clean towels or pads. Conversely, the wet wash consists of spraying on water and cleaning agent (soap), scrubbing the surface and rinsing. Power washing equipment should not be used for cleaning aircraft as the high pressure can force water into skin joints, lift paint, and damage skin panels. Even when authorized equipment is used for spraying water on the aircraft,

Photo: MCpl Robin Mugridge

Photo: Sgt Frank Hudec

it is important to pay attention to what is being sprayed and how it is done to alleviate problems. A few years ago, while conducting a technical investigation into the failure of a screwjack during CP140 maintenance, it was found that the screwjack gearbox was filled with water. That was unexpected. It was determined that the water had penetrated the gearbox as a result of water being sprayed on the component during aircraft washing. Just in case you wondered, the presence of water had no part in the occurrence, but it can serve as a reminder that water under pressure can readily get inside components. After the wash, it is very important to follow the instructions for lubrication and servicing to prevent water ingress and resultant corrosion.

Only products that have been designed and approved are to be used when washing aircraft. These products, listed in the technical publications for your fleet, have been thoroughly tested on aircraft materials to demonstrate that they will not damage or degrade any part of the aircraft. This is not the case for commercial and household cleaners which may contain chemicals that could irreversibly damage composites, acrylics, rubber, and seals.

Are We Complacent?

Despite years of experience at the squadrons, washing of aircraft is not always as effective as it should be. The job is certainly tedious and not very rewarding. That said, it should be realized that aircraft washing directly impacts aircraft availability. It is possible that the impact may only be seen when the aircraft goes to the contractor facilities for repair and overhaul (R&O) where months may be added to the schedule for corrosion repairs.

The value of aircraft washing is best illustrated by a project conducted on the CP140 fleet to assess the frequency of aircraft wash. During this project, tests were conducted to determine the presence of salt (or more specifically chlorides) at several locations on the airframe before and after the aircraft wash. For most locations, aircraft washing removed chlorides from the aircraft surface; however, the project revealed that the horizontal stabilizer was the exception. The reason was that the horizontal stabilizer was not "scrubbed" as in the case of the other locations. This finding was very interesting as it could partly explain why high levels of corrosion were found on that component during Third Level Inspection and Repair.

Keeping an aircraft clean and free of corrosion is a tough job that requires hard work and dedication to properly complete. There are no easy solutions when the time comes for aircraft washing. Only good old-fashioned elbow grease and attention to detail will limit the detrimental effects of corrosion and play a part in getting our older aircraft to safely reach vintage status. ◆

Photo: MCpl Robin Mugridge

Flight Safety
On Lessons Learned

By Mr Greg Poulin, Directorate of Technical Airworthiness and Engineering Support, Ottawa

The Flight Safety Program's investigation and reporting mechanisms are an effective means of communicating issues and precipitating change to achieve the aim of preventing accidental loss of aviation resources. This is intuitive in the context of exploiting the lessons learned from incidents involving Canadian Forces aircraft or civil aircraft conducting CF military missions. That said, what lessons can be learned from the experiences of other military air forces or civil operators? The following is one example.

On the 2nd of September 1995 British *Nimrod* XV239 crashed while performing display manoeuvres during the Toronto International Airshow. Tragically all seven crewmembers onboard were killed and for a brief time the Canadian public became familiar with the Nimrod aircraft as a result of the extensive media coverage and the dramatic footage of the aircraft plunging into Lake Ontario. Aircraft enthusiasts and members of the Canada's Air Force, having a greater investment, were aware of the reported cause of pilot error but would have to wait more than a year before learning the official Board of Inquiry (BOI) findings. In the end it was determined that the aircraft captain made an error in judgement in deviating from an established display manoeuvre to the extent that the aircraft stalled at a height and altitude from which recovery was impossible. There were other contributory factors associated with training, supervision and cockpit resource management; however, by this time the accident had faded from the Canadian collective memory and not surprisingly the results of the investigation were of limited benefit to the Canadian Air Force in terms of lessons learned.

Ironically it would be the fatal crash of *Nimrod* XV230, exactly 11 years later and half a world away, that would have a much greater impact on the Canadian Forces. On September 2nd 2006 *Nimrod* XV230 crashed 20 km west of Kandahar in Afghanistan, killing all 14 personnel onboard. The aircraft was on a reconnaissance mission and within minutes of taking on 22000 lbs of fuel in a routine air-to-air refuelling rendezvous, the crew were alerted to a fire warning indication as well as smoke entering the cabin. One minute later the aircraft depressurised, presumably due to fire penetrating the pressure hull. Almost immediately after this, crewmembers reported fire emanating from the starboard engine and from within the aileron bay. The aircraft captain declared an emergency and commenced a descent towards Kandahar airfield. Unfortunately, the fire continued to rage uncontrollably and within seven minutes of the original warnings, XV230 exploded and broke apart at an altitude between 750 and 1000 feet.

Despite challenges presented by the theatre of operations which did not allow for recovery of the wreckage, the BOI was able to determine the most likely cause of the crash to be mechanical failures and design issues which allowed escaped fuel to ignite near the starboard wing-fuselage attachment. The ensuing report offered valuable lessons in regard to the manufacture and procurement of aircraft parts as well as the safety risks associated with compounding design changes on long serving aircraft. Had the BOI report been limited to these findings it would likely have gone unnoticed by all outside the Royal Air Force; however, there was an additional finding that precipitated a series of events that led to many allied nations sitting up and taking notice. This finding stated that the 'Safety Case[1]' prepared in respect of the *Nimrod* aircraft between 2002 and 2005, contained a number of significant errors associated with the safety assessment for the zone of the aircraft where XV230's fire started. The Safety Case is the fundamental risk management tool used to ensure airworthiness and safety of flight for RAF fleets; why had the *Nimrod* Safety Case failed to identify the risk of fire and subsequent effects? To answer this question the UK Secretary of Defence appointed Charles Haddon-Cave, Queens Council, to conduct a follow-on BOI now known as The Review. Its' mandate was a broader investigation into the historic and extant procedures for assuring the airworthiness and safe operation of the *Nimrod* fleet. The Review was also mandated to: assess where responsibilities lie for any failures, what lessons were to be learned and make all appropriate recommendations.

The Review conducted a wide-ranging inquiry over some 20 months in the course of which the BOI team studied many thousands of documents (spanning the 1930s to the present day), interviewed hundreds of witnesses of all ranks and in all relevant organisations and visited numerous organizations in the UK and abroad to gain an understanding of Accident Theory.

1 A Safety Case is "a structured argument, supported by a body of evidence that provides a compelling, comprehensible and valid case that a system is safe for a given application in a given environment". There is a Safety Case developed for each Ministry of Defence (MoD) aircraft; their ultimate purpose is to identify and manage risks that could impact upon safety of flight. Safety Cases are a fundamental element of the MoD Airworthiness Program

The Review was delivered to the UK Government on 28 October 2009. It affirmed the findings of the original Board of Inquiry as to the causes of the accident. In accordance with its mandate, it made over 80 individual findings which it grouped into eight broad categories of shortcomings as follows:

1. The MoD failed to adhere to basic [airworthiness] principles;
2. The MoD military airworthiness system was not fit for purpose;
3. The Safety Case regime was ineffective and wasteful;
4. There was an inadequate appreciation of the needs of aged aircraft;
5. The MoD suffered from a series of weaknesses in the area of Personnel;
6. There was an unsatisfactory relationship between the MoD and Industry;
7. The MoD procurement process was unacceptable and lead to serial delays and cost over-runs with a baleful effect on in-service support; and
8. The MoD Safety Culture had allowed "business" to eclipse airworthiness.

As a result of these findings The Review issued more than 80 recommendations for change to the MoD Airworthiness Program as well as to departmental organization and policies. Remarkably, The Review even went so far as to name individuals within the Royal Air Force and Industry as bearing responsibility for the accident.

The breadth and depth of The Review's findings were an awakening for the MoD and Haddon-Cave's recommendations precipitated dramatic change to the UK's military airworthiness programme. Given the military cultural similarities and likeminded approach to airworthiness principles, standards, and processes The Review resonated strongly within the Department of National Defence (DND) as it did with many other allied nations. Its strategic analysis of fundamental principles and far reaching recommendations were recognized for their universality and clearly demanded a thorough review to determine whether similar vulnerabilities existed or whether similar lessons could be applied within the CF context. In early 2010 the Assistant Deputy Minister (Materiel) directed the Director General Aerospace Equipment Program Management/Directorate Technical Airworthiness and Engineering Support (DGAEPM/DTAES) and Director General Materiel Systems and Supply Chain/ Director Materiel Policy and Procedures (DGMSSC/ DMPP) to review the findings of the Haddon-Cave report and determine whether any were lessons applicable to the Canadian Forces and Air Force and make recommendations where appropriate.

When assessed against the more than 80 findings of The Review, the DND achieved an overall passing grade. From the airworthiness perspective, structural differences between the two country's programmes allowed DND to avoid many of the systemic issues affecting the MoD, and it was found that some initiatives and improvements, ongoing as part of the evolution of DND's airworthiness program, echoed many of The Review's recommendations. From the Materiel Acquisition & Support (MA&S) perspective DGMSSC found striking parallels in The Review's findings associated with personnel, relationship with Industry, and the equipment procurement process. Many of these were either informative or cautionary and served to reinforce ongoing initiatives or spoke to the requirement for broader awareness through effective communication. Some warranted deeper consideration and further analysis and at the time of writing of this article, work continues on the development of recommendations and action plans. These will be presented to ADM(Mat) later this year.

In the end, the crash of *Nimrod* XV230, the subsequent crash investigation and the follow-on review by Haddon-Cave have driven significant and positive change within the UK RAF, particularly in the realms of safety of flight and airworthiness. Perhaps it is a fitting tribute to those crewmen who lost their lives that the MoD's response has reached beyond the UK RAF and served as a measure for other countries to assess their own safety and airworthiness programmes. As espoused by the Canadian Forces Directorate of Flight Safety: "... understanding why safety occurrences happen is the key to an effective Accident Prevention Program." This should not be limited to learning lessons exclusively within our own operations. The Review provides a strategic accounting of WHY *Nimrod* XV230 crashed, and even though Canada does not fly this type of aircraft, the report's broad mandate, exhaustive analysis, and principle-based recommendations provided an effective looking glass through which the CF has been able to critically review its airworthiness and MA&S programmes. Clearly we have learned from the UK lessons. ◆

What is HPMA?

By Major Dennis Scharf, HPMA Flight Commander, Air Force Standards Advanced Performance Centre, 1 Canadian Air Division, Winnipeg

How does the Air Force really conduct business? A collective effort of teamwork, structure and purpose? A volunteer force dedicated to the preservation of life and perhaps protection of our quality of life? Or closer to home, safety and security for all those we hold dear? Each of us will have our own reasons to serve this fine country but to complete our task we need to work efficiently and effectively. In years past, mistakes were made and lessons learned, passed to the next generation as "good gen" or "recipes for success". This had a varied effect and in most instances a very limited amount of individuals could benefit from this experience and wisdom. Initiatives were slowly developed in the form of human factors training in an effort to get the word out to all individuals that could benefit. Not until the turn of the century was there a very complete and specific training package developed for all levels of the Air Force appropriately called HPMA (Human Performance in Military Aviation).

Central Flying School was given the task to develop an Air Force specific human factors program so the question was asked "How could we provide the necessary ingredients to ensure everyone, directly involved with aircraft operations, works from the same sheet of paper?" A formidable task for an ever-changing military! A plan was developed to tap into all the available resources of human factors technology, present the material through discussion (vice briefings), create awareness, and develop our personnel by using operationally relevant material. Analysis of a real world case study would provide the means to further discuss threat and error management and enhancing the decision making process during the conduct of everyday operations. These could not be "fire and forget" briefings but requires an open forum which are adaptable to the audience and give meaning to the subject. Group size is key (around 25 persons) to promote a level of comfort and promote discussion in an open forum. Through the use of facilitation, logical conclusions can be extracted from the group to create a medium to transfer the much needed corporate knowledge from the experienced personnel to the developing members.

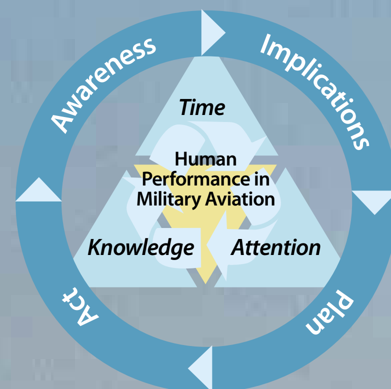
The HPMA recurrency training affords the unit/squadron the ability to increase operational effectiveness by promoting effective communications and endorsing a better understanding of how the unit and the Air Force, conducts business. During the first five years of the HPMA Program many beneficial offshoots have been realized. The essential feedback loop to the senior leadership has provided an avenue for all personnel to address issues in a relaxed atmosphere resulting in the timely improvements within the unit/squadron. Teamwork is solidified through enhanced understanding of all leadership levels and reconfirmation of operational purpose. The active push to ensure all our personnel properly receive HPMA Recurrency training will ensure a heightened level of awareness which will ultimately result in an infusion in the Air Force culture. . . as an additional layer in our error defences.

Are we there yet? The simple answer is no, not quite. The philosophy and policy is in place but the procedures and practice have yet to be finalized. The Air Standards Training, Readiness and Automation (ASTRA) Project depends heavily on the groundwork being provided by the HPMA Program. The addition of the new highly automated and complex aircraft being dovetailed into the Air Force, demands the inclusion and assessment of human factors and automation behavioural markers in the operation of these assets. New technical and non-technical skills create high demands on the personnel directly involved, and must be developed and perfected. Soon we can identify what the term "airmanship" really means!

If the HPMA Recurrency training is not being provided, does this open up holes in the proverbial "Swiss cheese"? Working in parallel, flight safety and HPMA share the same goal; prevention of the accidental loss of aviation resources. Flight Safety Occurrence Analysis includes the use of HFACS (Human Factors Analysis and Calssification System) to determine the breakdown in active and latent factors that contributed to an undesirable outcome. Armed with the HPMA background and knowledge, the flight safety Officer/Member can rationalize the breakdown in performance whether in the threat and error management or decision making process. Determination of the causes will obviously lead to preventive measures so that we can learn "the right lessons" from the occurrence. HPMA recurrency training is intended to maintain a constant level of awareness which minimizes the holes in the familiar Swiss cheese model.

The Air Force relies and benefits from many dedicated flight safety officers/members and HPMA coordinators. A collective effort to reduce the loss of our valuable assets, or life, is accomplished by employment of effective individual and teamwork skills. Even proactive accident prevention cannot nullify all occurrences. This is where HPMA Recurrency training steps in, by providing relevant discussion and promoting a heightened level of awareness. This collective effort will certainly advance the Air Force toward the desired result. Not convinced? Research has determined that 80% of aircraft accidents are directly related to human performance issues. These studies look at the active failure that directly contributed to the incident/accident. If we look at every activity for which we are involved, there is 100% human involvement in one form or another. Every action or decision is prone to human error so it seems apparent that we need to develop our teamwork skills and operate at this heightened level of awareness, monitor each other with no reservations, and speak-up if required.

The benefits of HPMA can only be realized if considered a 2-way street. There has to be a level of responsibility to provide the recurrency training as a method of communication within the unit/squadron but also a level of accountability for all those involved. Simply giving the program lip service negates all the effort put into place and impairs the Air Force's ability to progress forward. Human factors technology is a vast and complex subject but the key to success is simply, prevention. The human factor is still the largest single impairment for success, sometimes unknowingly sabotaging our goals or missions.
To keep up with the advancing technology and operations within today's highly automated, high data environment, we need to be able to recognize our own limitations, and constantly develop personal technical and non-technical skills. It takes but a moment of inattention or neglect for an occurrence. The overall success of any mission in the highly dynamic operations at home or abroad is highly dependent on the progress we make in the self development of these skills. There are no repercussions for not receiving the HPMA Recurrency Training but the question begs to be asked, are we willing to live with the consequences? ◆



Assumption

(and how it can make a four-legged long eared mammal of the horse genus of both you and me)

By Sergeant Don Cox, Deputy Unit Flight Safety Officer, 423 Maritime Helicopter Squadron, 12 Wing Shearwater

According to the Canadian Oxford Dictionary, one definition of the word assume reads as: "to take or accept as being true without proof, for the purpose of argument or action." Unfortunately, the word is often relevant when it comes to describing many a flight safety incident.

Within my world of the CH124 *Sea King* maintenance community, I can recall one particular occurrence where no less than 5 levels of assumption were involved in a flight safety incident.

My story begins with our Air Detachment deployed with a Canadian warship. Aircrew returning from a day of flying reported that their Gyroscopic Heading and Reference System (GHARS) Gyro had toppled. Technically speaking, the GHARS system is used to provide an accurate, reliable, internally stabilized heading and vertical reference for true and grid navigation. With our unserviceable gyro the "stabilized" portion of our system was no longer functional.


Photo: MCpl Danny Shouinard

The usual procedure with a toppled gyro is to replace both the unit itself and its' accompanying electronic unit (EU). What makes the EU replacement different from the standard "black box swap" is the necessity to remove the magnetic slave circuit card from the u/s unit and place it in the installed serviceable unit. As experienced techs, we knew this was the "by the book" procedure. Therefore, it was done automatically each and every time. Of course, it came as a surprise that our removed unit contained no magnetic slave card at all. In fact the aircraft had flown over 163 hours without one!

Now for the history: the component was originally installed by an apprentice who assumed (assumption 1) that because it was only a box change, he would not have to refer to a CFTO for the details. The attending Performance of Maintenance (POM) level technician was familiar with the proper procedure but was temporarily taken away from the job and assumed (assumption 2) that the card was changed when he/she returned and saw the box installed. The level "A" requested a 349B entry for the functional check to be carried out at a later time and then signed the "inspected and passed by" because he/she assumed (assumption 3) that the job done by the POM was completed properly. The final functional check was carried out by a 4th technician who never completed the magnetic slave card section because he/she had never seen it fail and assumed (assumption 4) that it would have passed again.

Eliminating even one of these assumptions would have prevented this flight safety. But where is the 5th assumption? As I had mentioned earlier, as two experienced techs on the detachment, we knew immediately that the magnetic slave card had to be replaced. We decided to do an ADAM (Automated Data for Aerospace Maintenance) search to see who could have missed something so obvious. Finally, there on the computer screen was his/her signature as the POM and mine as the level "C" releaser. Suddenly there were two sets of mammal ears that started to look a lot longer. ◆

Photo: MCpl Robin Mugridge

Photo: Cpl Peter Reed

"Someone should have said SOMETHING!"

By Captain Joe Palfy, Wing Flight Safety Officer, 5 Wing Goose Bay

I was stretched out on a perfect white sand beach soaking it all up, the roar of the ocean in the background, an onshore breeze barely easing the intensity of the sun and girls everywhere. Even with my sunglasses on and my eyes closed the sun was burning holes in my retinas and had probably started to melt my brain. Man, it was hot!

But the 3rd degree sunburn wasn't my biggest concern…

This is a little embarrassing to admit (actually "little" is the wrong word… replace "little" with "big" or "grande"). "How embarrassing" you ask? Well, it's the "I'm wearing a Speedo" kind of embarrassing! Now don't get me wrong, I looked good and all that…but a Speedo? If you think I'm over reacting, you try wearing a piece of green shrink-wrap to the beach.

Now I've had my share of fun and crazy vacations, but this was beyond that. How did my life get so far off track? I did a quick rewind of how I got into this tight situation. Now I'm old school, so for me to rewind my memory is similar to rewinding an 8 Track…you don't get what you want right away, but eventually you find what you're looking for (if you don't know what an 8 Track is, just roll with it, after all this is my story).

"Let's see… I was a SAR helicopter pilot… stationed on the east coast… I had been on standby… got tasked just before midnight… sailboat in distress… found it and rescued them (ok, they saved themselves but that's just detail)… we landed, refueled and got breakfast… departed… morning sun was in our eyes… and…??? what else???… I remember… flying!!!"

To say my heart skipped a beat would be an understatement! My heart skipped more beats than trying to learn drums by listening to a Rush album! The point is, my heart skipped a lot of beats! My eyes? Well they opened faster then 3 kegs at an "I'm not getting married" party … extremely fast! I tried to comprehend everything I was seeing … horizon was level with dirt side down … trees were small and staying the same size. I quickly scanned inside and everything was green and stable.

As I was about to tell the AC (Aircraft Commander) I had nodded off and needed him to take control, I looked over and he was hunched over sound asleep! I quickly looked back at the FE and SAR Techs… out cold!

"I was stretched out on a perfect white sand beach soaking it all up, the roar of the ocean in the background, an onshore breeze barely easing the intensity of the sun and girls everywhere."

I had realized the severity of the situation but with everyone asleep it was far worse and if you guessed that I woke up the other pilot using loud expletives then you guessed correctly! We discussed the situation and decided to continue home since it was the closest airport. When we landed we debriefed, but not before I changed my flight suit.

So, how did this happen? Before we departed we confirmed we were within the regulations and our personal limits. En route I began to feel tired but I wanted to fly as much as possible. The morning sun streaming through the windows not only turned the cockpit into a greenhouse but it also nearly blinded us despite our dark visors. I had opened my window to get some fresh air and cool off but all it really did was make noise (like an ocean). With all of those factors including the lack of sleep, a full stomach and a quiet crew, at some point I shut my eyes for a split second. Eventually it was harder to keep my eyes open and then once they were closed, it was harder to open them. It was self-generating in a way, as the more I closed my eyes, the easier it was to do it the next time.

I can't tell you exactly how long I nodded off for, but what I can tell you is the very first time I closed my eyes, for that split second, was too long and I had crossed into a very dangerous situation because I did this without saying anything. Not one crewmember said that they were tired or going to take a nap. We got very lucky!

Things to remember...

Communicate! Communication is vital and it saves lives. Just because you are within regulations, doesn't mean you are safe. Know your limits and those of your crew. Whether you're flying, monitoring, or just riding in the back, if you're feeling tired speak up and tell your crew. Tell someone. Tell anyone. We all have limits and we're faced with different and challenging situations each and every day. These challenges can be evident or inconspicuous and both can catch you if you're not prepared and they'll prevent you and your crew from returning home alive! Learn to recognize your limits. Stay vigilant! Speak up! Stay alive!

Oh yeah, I'd like to give a shout out to Mr. Speedo. While I still don't wear your swimsuits, I must admit that I'm glad you designed them. Their sheer ability to invoke the "that ain't right!" feeling in me, not only saved the lives of the crew that day, but also the lives of countless other crews I was part of, as I never forgot the lessons learned that day! So, thank you Mr. Speedo. Thank you! ◆

Save the DINO

Captain André Bordeaux (a relatively young OTD), Glider Flight Instructor and Tow Pilot, Bagotville and St-Jean d'Iberville

We have among us a peculiar species of flying fauna: the *old-timus dinosaurus*, or OTD for short. We often see them at annual reunions, all huddled around the same round table, each year sporting a few more wrinkles and a little less greying hair. They exhibit the herding instinct, since they sometimes feel different from younger aviators, which is only natural. OTDs like to swap war stories or discuss movies from the 1960s, and other people just don't get it. What sets them apart is the fact that we don't know them, these old fossils. ("Who are those guys, anyway!?")

We often learn about their extensive experience by listening to their many tales of adventure in the wide world of aviation, and also by a quick glance at the impressive number of badges on their shoulders. The younger and more timid members of the great flying fraternity often seem shy in the company of these "elders". It's a pity, because younger pilots could lend them a hand sometimes, even if it's only by holding their cane as they climb into the cockpit!

As I see it, there are two sub-species of OTD: *evolutus dinosaurus* and *granite-head dinosaurus*. *Evolutus dinosaurus* generally accepts the fact that the system, flight operations, and the whole world change and evolve, for better or worse. He knows he needs to make an honest effort to maintain his skills and expand his knowledge and experience. He is inquisitive, always exploring the field of aviation to improve himself. He is a credible reference and will remain so as long as he stays current. Conscious of the fact that every flight is a new mission, he remains as vigilant as he was on his first solo. He knows that complacency is his mortal enemy. Observing his positive and constructive attitude, we feel he is not really an endangered species.

Granite-head dinosaurus is quite different. Physically, he looks like other OTDs, but his skull is thicker and as hard as rock. Locked up inside are his old ideas, prejudices, inflexible thoughts and entrenched opinions. The differences between *evolutus* and *granite-head* are between the ears. Basically, the "old" granite-head firmly believes that his knowledge is the best knowledge, and that's all he really needs. His whole philosophy can be summed up as: "If it works, why change it?" Psychotherapists might describe this syndrome as resistance to change, or a visceral dislike of the notion of adapting to the new ideas of the modern world. This attitude is of course detrimental to the survival of this sub-species, but worse than that, it can also be hazardous to others.

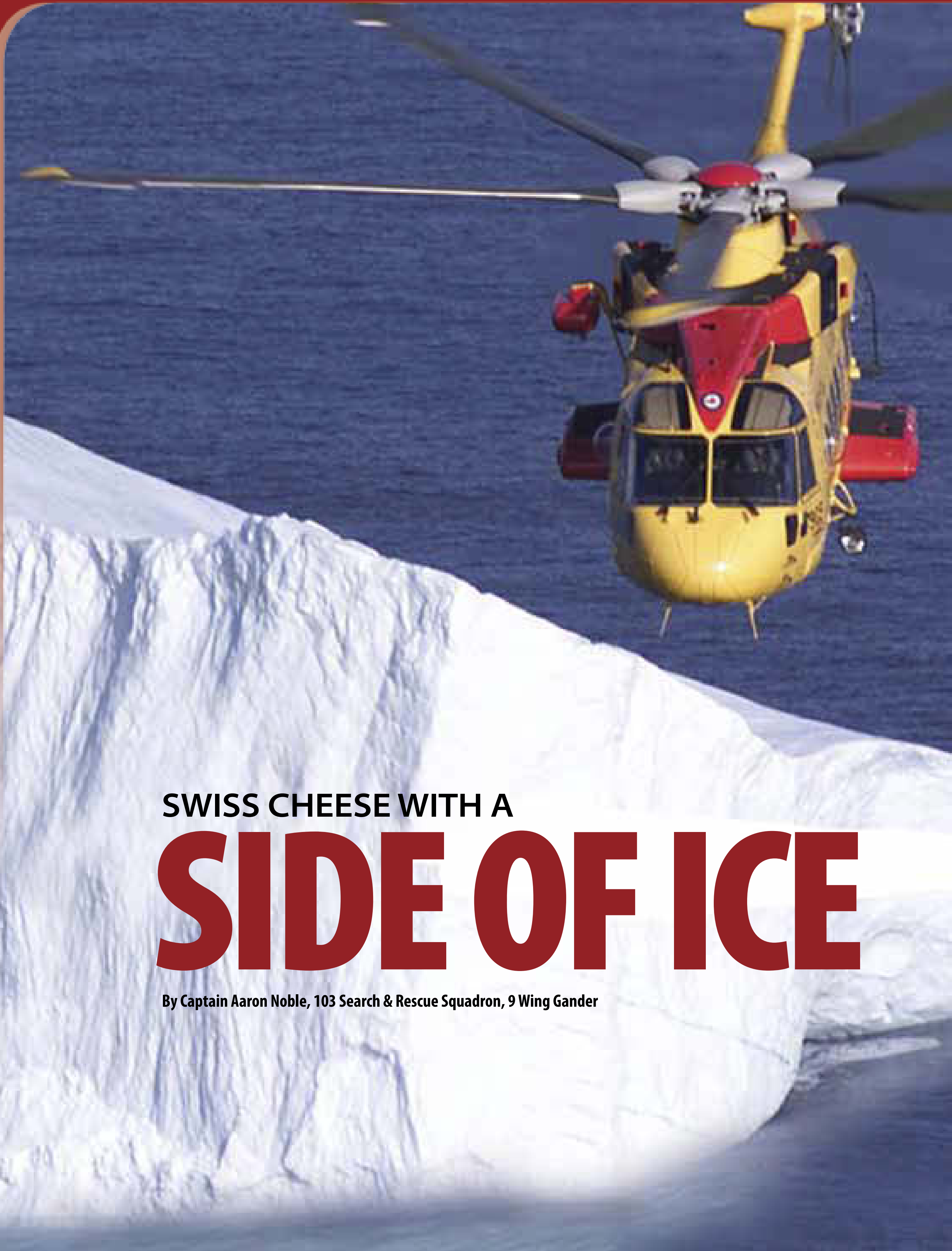
In our day-to-day lives, we encounter OTDs fairly often. But surprisingly, some of them are relatively young! It's a fact: not all OTDs are senior citizens. Sometimes all they need is several years of experience in the system, let's say at least 10 years, based on an unofficial survey, to qualify as an

SAURS

OTD. It's a matter of attitude and mentality. An experienced *evolutus dinosaurus* is a valuable specimen, a reference in a given field of aviation, but a *granite-head dinosaurus* is an albatross that can sap a lot of energy. If you know a member of this sub-species, it would be a good idea to tactfully vector him onto the right route: the route to progress and evolution. Even if you are younger or somewhat timid, don't be shy. It might be one of the last chances to ensure his survival. And if he doesn't change, someday his total career take-offs might outnumber his safe landings by one.

Despite his hard skull, I believe old *granite-head* can still change, perhaps with a little help. All you need to do is gently shine or soften his bald head to make him see the light. He really is worth saving. Everyone will benefit, because we can all profit from his extensive experience. More *granite-heads* are morphing into *evolutus* as time goes on.

So keep an eye out for these specimens from the Jurassic era and help them evolve. Learn from them, go and talk to them at their round tables. You will see that, as long as they don't have tissues jammed up their sleeves, they have their wits about them, and they can teach you a great deal. ◆



SWISS CHEESE WITH A

SIDE OF ICE

By Captain Aaron Noble, 103 Search & Rescue Squadron, 9 Wing Gander

"At those heights it would have been possible, had we arrived on scene at night and in cloud, to run directly into one as we approached the vessel."

I travelled to 103 Sqn in Gander, Newfoundland to augment as Aircraft Captain in the role of Search and Rescue on the CH149 *Cormorant* helicopter. Upon arrival I toured 103 Squadron and studied the local area (fuel caches, airports, ILS (instrument landing system) approaches, etc) in the event I was called out on a mission. The following evening I received a phone call from the Joint Rescue Coordination Centre Halifax (JRCC) for a medical evacuation of a patient suffering from a heart attack. The patient was on board a 60 metre fishing vessel approximately 100 NM (nautical miles) northeast of Naine, Labrador or approximately 600 NM northwest of Gander. The vessel was reporting a visibility of 1 mile and a ceiling of 200 feet and was steaming southwest towards Naine. After the appropriate gathering of information pertinent to the flight we proceeded IFR (instrument flight rules) to Goose Bay, Labrador for fuel.

Once on scene, my intention was to perform an overwater transition down (OWTD) to the vessel using our radar to identify it. The OWTD is an approved IFR procedure for the CH149, bringing us to our minimums of 100 feet ceiling and ¼ mile visibility. We would then pick up the patient via hoist, proceed IFR to Naine for fuel then proceed back to Goose Bay where the patient could be delivered to the hospital. Immediately prior to departure I contacted the vessel directly. They were now reporting zero visibility with the latest weather reports indicating deteriorating weather in Naine. After much consultation with all parties involved I decided that there were too many unknowns and we would wait to see what the weather was like at first light.

We regrouped at first light but the vessel was still reporting zero visibility in fog and the forecast for Naine (which was still a required fuel stop) was still reporting low ceiling/visibility in fog. After a few hours I received a call directly from the vessel indicating that they had finally left the fog bank and were reporting excellent visibility. We then proceeded VFR to their location and transitioned from an over land transit to an over water transit. This is where I realised the possibility for calamity. Icebergs were everywhere. On closer observation some were up to 300 feet high. At those heights it would have been possible, had we arrived on scene at night and in cloud, to run directly into one as we approached the vessel. I realized that in all my calculations and precautions I had not even considered the possibility of icebergs being in the area.

I don't think I truly grasped the possible danger at that time as we still had to complete our mission. We located the vessel and quickly hoisted the patient into the helicopter. We returned to an awaiting ambulance in Goose Bay and transferred our patient. After refuelling we arrived in Gander early evening.

In a mission oriented environment, I have learned that it is incredibly important to be able to recognize the many individual factors that can culminate in an accident. The only way to prevent accidents is by understanding the path they take. With pressure to extract the heart attack patient, poor weather and limited fuel, the holes in the "swiss cheese model" were lining up. Had we not noticed this prior to our departure, the final hole just might have been the iceberg. ◆

The Exhilaration of PERFORMANCE

By Captain André Gagné, Regional Cadets Support Unit Eastern – Air Operations, Valcartier

We've all witnessed or experienced a situation that gives us a feeling of success and a job well done. There are many examples: making a spectacular diving catch in the outfield, beating a personal race record, or setting a fuel-exhausted plane down on an island in the middle of the ocean. It's a great feeling, one that we constantly and sometimes subconsciously seek. This article is a reflection on the risks of the culture of performance and our desire to achieve lofty goals. I will briefly describe our operations, highlight a few behaviours arising from the quest for performance and propose solutions for avoiding becoming a slave to success.

I work on glider flight operations with air cadets. We operate with one plane and two gliders. Our mission is to train cadet pilots and familiarize young cadets with aviation. We instinctively measure the success of our operations in terms of the number of flights: number of flights per hour, number of flights per day, number of training or familiarization flights, etc. There is no pressure from the organization to put up big numbers, but the siren call of performance is hard to resist. We like to do over 100 flights per day. We like to maintain an average of 12 flights per hour. We like to compare ourselves favourably with other glider flying sites. We like to be able to offer a flight to every cadet who comes to our site. In short, we like to perform well and be successful.

The lure of performance sometimes leads us to push ourselves further. The behaviours prompted by our desire to reach our objectives generally fall within the limits imposed by our flying orders, but they do not always obey the spirit of flight safety. Refuelling

Photo: Cpl Gayle Wilson

the plane like a Formula 1 pit crew, skipping meal breaks, hooking up the cable to the glider as fast as possible — these are just a few examples. As well, everyone feels responsible for reaching the team's desired performance level and modifies his or her behaviour accordingly. For example, people might make two or three more flights even when they're tired, might use fuel normally reserved for the margin of safety, or might cut short a cadet briefing because everything is ready for takeoff. The culture of performance also makes it more difficult to integrate new pilots into operations because they are not able to perform as quickly due to their lack of experience. The new pilots are therefore more stressed, which affects their judgment and increases the risk of incidents.

I believe it is important to not get carried away with the quest for success at all costs. To do this, you must convince yourself that statistics are not the only indicators of success. Other factors need to be emphasized, such as the quality of instruction, the quality of flights offered to young cadets, and sharing of experience between young pilots and more experienced ones. You also need to know how to take a step back when making decisions and weigh the risks posed by placing too much importance on undertaking a large number of flights.

The fast lane may be exhilarating, but the middle of the road will get you there safer—safety trumps speed every time. ◆

When COOL HEADS Prevailed

By Sergeant Shawn Harrison, 103 Search and Rescue Squadron, 9 Wing Gander, Newfoundland

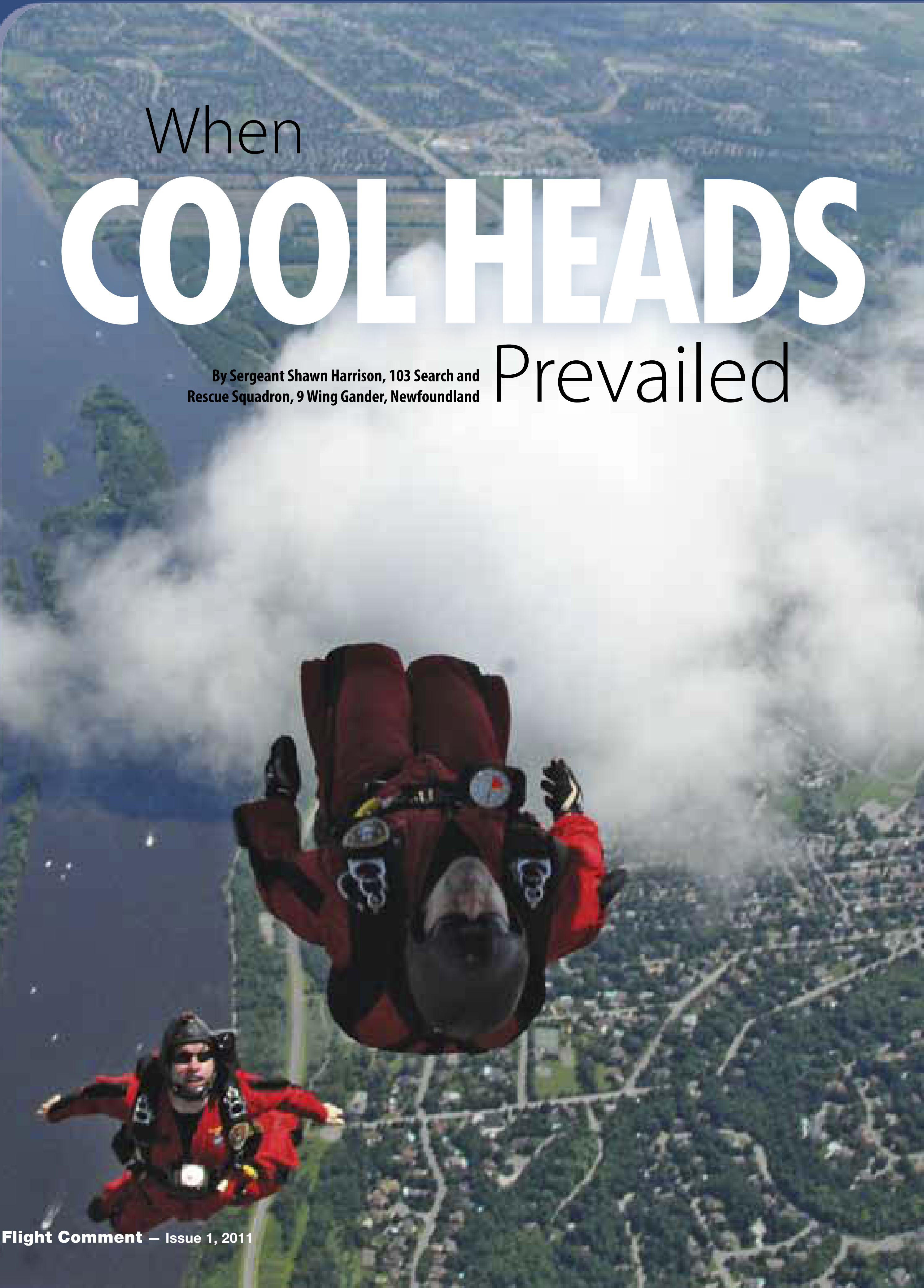


Photo: W.O. Randolph Rice

The more a task is practised the more it becomes automatic. Even though repetitive drills may seem boring or excessive, they hone our skills, which in turn contributes to confidence in our ability to perform. With intensive training, emergencies can be encountered with a calm and timely response with little or no panic or indecision.

While on my Basic SAR (Search and Rescue) Technician course, I found myself in a situation where the repeated drills saved my life and the life of a course mate. It was during the tree landing phase of our jump training. This phase comes near the end of course, and by this time we had performed a few dozen jumps to various types of drop zones and with varying types of equipment. The dress for full equipment tree landings is the most cumbersome that we SAR Techs encounter and consists of a ballistic nylon jacket and protective pants. This equipment is meant to shield us from injury as we encounter trees and perhaps a subsequent fall from an unstable branch.

I was the first of two jumpers on this stick, exiting from 3000 feet above ground. My canopy had opened normally and I was performing my post deployment drills. I noticed my partner was encountering a dual deployment, which is when both the main and reserve canopies open together. This dramatically changed the flight characteristics of his chute. This development, combined with my cumbersome equipment and inexperience, enabled us to collide and become entangled in all three canopies.

Now, we had spent multiple hours in the "racks" practising emergencies, which included colliding with another jumper. The time spent in the racks was usually uncomfortable and sometimes painful, but we were all acutely aware of the importance of getting the drills right and as near to a reflex as we could. At the time, little was mentioned about entanglements, as they are exceedingly rare in military parachuting. The obvious decision in this case, would be to perform a cutaway and land under a reserve chute.

However, at this point, we were entangled and falling toward the ground at an increased rate of descent, because all three canopies were wrapped around each other, resulting in minimal aerodynamic support. What compounded the situation was the fact that I had become entangled in the suspension lines, and could not perform an immediate cutaway. As we were falling, we were in constant communication with each other. My partner, now with both canopies deployed and no back up plan, remained very calm and assisted me in getting my feet and head cleared of the suspension lines. When I was cleared, I cutaway my main and then deployed my reserve, landing safely shortly thereafter. My partner, realizing that he had very little support from the tangled chutes (which appeared to be as effective as a large garbage bag) and still plummeting toward the ground . . . relaxed . . . prepared for a Parachute Landing Fall (PLF) and subsequently hit the ground. Miraculously, he suffered only minor injuries. His first words after the ground personnel reached him were "how is Shawn?"

The moral of the story, is twofold.
First, no matter how unpleasant and repetitive your training appears to be, it will aid you at the worst of times, when your brain is overwhelmed and conscious thought is difficult. When you encounter an emergency remain calm, rely on your training and trust what you've been taught. Second, effective communication can be instrumental to surviving a difficult situation. ◆

From the Investigator

TYPE: CH147 *Chinook* (147202)
LOCATION: Near Armarah, Afghanistan
DATE: 5 August 2010

Chinook CH147202 was conducting a sustainment mission that involved carrying coalition troops and supplies to military installations outside Kandahar Airfield (KAF). While flying at low altitude from the forward operating base (FOB) Masum Ghar to the Panjwaii District Centre in Kandahar Province Afghanistan, the aircraft was forced down due to an in-flight fire. The source of ignition is linked to insurgent fire directed towards the aircraft.

Immediately following the sound of a detonation, flames and black smoke entered the cabin from the left side of the open rear ramp. Inside the cockpit, the smoke began to hamper the pilots' visibility. Approximately 30 seconds after the detonation, the aircraft touched down smoothly with 15 to 20 knots of forward speed and came to a stop within 300 ft. By now, the rear of the aircraft was engulfed in a massive fire so all the passengers had moved to the forward part of the cabin. Aircrew members and passengers exited the aircraft from emergency exits located at the front of the aircraft. The door gun mount could not be removed from the main cabin door and the obstruction slightly impeded the egress of personnel exiting via that door. Some personnel sustained minor injuries from the fire and/or during the egress via the emergency exits.

An examination of the wreckage did not provide any direct evidence of the type of weapon(s) used by the insurgents.

The scope of the Flight Safety investigation will be limited to the survival aspects of this occurrence. The investigation will be focusing on the effectiveness of aviation life support equipment (ALSE) and on egress procedures, as well as passenger safety.

Since the occurrence, all CH147 *Chinooks* in theatre have been modified with a new gun mount which incorporates a quick release function that allows it to swivel and be pushed out of the way during egress. ◆

Epilogue

TYPE: **CH146 *Griffon* (146425)**

LOCATION: **Forward Operating Base (FOB), Afghanistan**

DATE: **22 September 2009**

The occurrence aircraft and crew were delivering equipment to a Forward Operating Base. The crew had to abort their first approach due to the intensity of the dust cloud on short final. The occurrence took place on the approach and landing from the second approach, which was flown at a slightly higher speed than the Standard Manoeuvre Manual (SMM) directed slow walking pace. This was done to keep the dust cloud behind the helicopter and allow the crew to maintain visual references for a longer time.

Very late on the approach the crew lost visual references but deemed the conditions to be within the criteria of the SMM to continue the approach to the ground. The higher approach speed required a greater than normal flare (9 degrees nose-up vice 5 degrees) to slow the helicopter prior to touch down. The aircraft touched down on the aft portion of the skids and the flying pilot reduced collective rapidly to make sure the aircraft would not become airborne again. When the collective was reduced the aircraft rotated forward to almost 8 degrees nose down and the Wire Strike Protection System (WSPS) heavily impacted the ground, after which the helicopter rocked fore and aft a few times. The WSPS dug into the ground and in doing so damaged the supporting bulkhead inside the fuselage. Following a preliminary damage assessment (the crew was not aware of the bulkhead damage), the crew continued the mission and returned to the main operating base, where more extensive damage was discovered.

The investigation also found that the aircraft did not have sufficient power available to conduct the mission under the given environmental conditions and aircraft weight. Both Inter-Turbine Temperature and Gas Producer RPM limits were exceeded on the overshoot from the first approach and on the departure from the FOB after the occurrence.

This occurrence was caused primarily due to the flying pilot's technique of reducing the collective rapidly when the aircraft was in a high pitch attitude on touchdown in brown-out conditions.

Following the occurrence the Canadian Helicopter Force (Afghanistan) reviewed the Desert Operations procedures. Change 5 of the SMM has been published to provide better directions on how to calculate aircraft performance and a software suite was developed to help crews calculate power requirements and availability more accurately.

The investigation also recommended a thorough review of the obscuring phenomena and the Desert Operations procedure and an amendment of the SMM to prohibit the continuation of an approach when there is insufficient power available to ensure a safe overshoot. ◆

Epilogue

TYPE: **CH149 *Cormorant* (149902)**

LOCATION: **Prince George, British Columbia**

DATE: **29 April 2007**

On 27 Apr 07 aircraft CH149902 landed in Prince George, BC, with a malfunction which required a maintenance repair party (MRP) to be dispatched. During the ground run required for the original malfunction, the No. 3 engine drive failed to go into "MAIN". The No. 3 Transmission Drive switch was confirmed to be in the "MAIN" position but both the Secondary Power System Display and the No. 3 Transmission Drive Magnetic Indicator (MI) indicated that the drive were in "NEUTRAL". The aircraft was shut down and it was determined through electrical testing that the No. 3 Electro-Mechanical Linear Actuator was unserviceable.

After some discussion, the flight crew decided to manually put the actuator to the "MAIN" position and then start with No. 3 Engine in "MAIN". To override the drive actuator motor, the system circuit breaker (CB) was pulled and secured. The No. 3 Drive was driven to what was considered to be the "MAIN" position by manually turning in the actuator drive until resistance was felt.

The engines were then started and the post-start checks completed. A take-off check was completed and as additional power was applied, the No. 3 engine torque fell to zero, with a corresponding slight engine over-speed. With no drive from the No. 3 engine indicated, the No. 3 engine was brought to idle and the aircraft returned to the ramp and shut-down.

The investigation revealed that the issue of actuator engagement problems was relatively common and well known by the CH149 community. It was also found that there were numerous different ways to start the CH149. Over time, the crews developed an undocumented alternative start procedure to circumvent the actuator engagement failure problem, so that they could carry on with their mission. The procedure involved engaging the actuator drive manually by turning in the actuator drive until resistance was felt. The investigation found that this unofficial start procedure was based on maintenance instructions for the servicing of the freewheel assembly, which indicated that 22 turns are required to achieve an engaged position. However, there is no guidance for either maintenance personnel and/or aircrew to attempt this procedure in support of a start. This alternate start procedure was passed by word of mouth.

This occurrence was caused primarily due to inadequate information, where a maintenance procedure was applied as an alternative start procedure. This occurrence highlights the potential risk involved with employing "work-arounds" in aviation. Good people with the best intentions, facing a novel situation.

Following the occurrence the procedure to manually engage the actuator drive was stopped. TRSET (Transport and Rescue Standardization and Evaluation Team) has also reviewed the start procedures and documented the approved ways in the Flight Reference Cards (FRC).

The investigation recommended that the technical staff continue their ongoing efforts to develop a more robust Electro-Mechanical Linear Actuator assembly to solve the actuator engagement problems. ◆

Epilogue

TYPE: CT114 *Tutor* (114145)
LOCATION: Bagotville, Quebec
DATE: 12 June 2009

During the strap-in for a practice flight, the passenger carried out the normal strap-in procedure, supervised by a certified technician. Upon completion of the strap-in, the passenger readjusted his position in the seat. At this time he noted the lap belt had become disconnected. Upon further investigation, it was noted that the tongue from the left side of the lap belt was still in the right side, along with the arming key. The lap belt had come apart at the point where the left end of the metal tongue connects to the left side the lap belt (the ballistic disconnect link assembly).

The investigation quickly determined that the ballistic assembly portion of the lap belt had been mis-assembled such that the internal assembly was not locked properly. A special Inspection (X-Ray) allowed the fleet to return to operations quickly.

It was also determined that one of two functional tests called for in the technical orders were not being performed at the second line maintenance facility. This highlighted a practice where on-the-job training (OJT) was diluted to the point where technicians stopped using CFTOs in their day-to-day work.

The incident triggered a review of training of all maintenance trades for this unique fleet (small fleet, single squadron, limited formal training), and an audit of second line facilities was conducted to ensure CFTOs are used in all support activities.

Furthermore, the CFTO for the lap belt was amended to improve the clarity and flow of the relevant maintenance procedures and instructions. The X-Ray inspection was added as a routine step in the maintenance procedure to perform the functional tests. ◆

Photo: MCpl Robert Bottrill

Epilogue

TYPE: Single F-16 & Pair of CT155

LOCATION: 4 Wing Cold Lake, Alberta

DATE: 18 June 2010

The near miss occurred when a single F-16 from a visiting force flew over the inner runway, where a CT155 formation was completing an "in stream" touch and go. The F-16 pilot requested a battle break to the outer runway but incorrectly aligned his aircraft over the inner runway. During the run-in he inadvertently exceeded the maximum speed of his aircraft. ATC had cleared the F-16 pilot for a battle break to the outer runway even though battle breaks were not authorized for single aircraft. The F-16, now moving at 580 knots, flew 200' above the number two CT155, which had just lifted off the runway from a touch and go. Midway down the runway, the F-16 pilot was surprised to sight the lead CT155 aircraft airborne and in his flight path. To avoid the lead CT155 aircraft, the F-16 pilot entered a hard right climbing turn, resulting in a 'g' limit exceedance to his aircraft. Once clear of the conflict, he rejoined to the outer runway, where he further over stressed his aircraft while extending the landing gear.

The F-16 pilot was a qualified wingman at the end of his first week on the exercise. He had never flown a battle break before nor had he received any additional instruction on how to complete the manoeuvre. The F-16 pilot mistakenly believed the battle break was to be flown over the inner runway for a break to the outer runway. In addition, he intended to fly his aircraft as fast and as low as limits would allow.

During the pilot's in-briefing, 4 Wing personnel verbally described a battle break and encouraged the visiting pilots to do it. The battle break was not a recognized procedure in the occurrence pilot's home country and numerous questions were asked regarding the procedure during the briefing. The briefing did not depict any diagrams of the battle break because aircrew had previously critiqued the ATC briefing for being too lengthy. As well, the In-Flight-Guide issued to the visiting pilots did not provide any details of the battle break, although pilots were directed to consult the local flying orders.

To prevent the likelihood of a re-occurrence, a number of administrative changes were made by 4 Wing and the visiting force. Fundamentally, however, the occurrence was a result of the F-16 pilot's misplaced aggressiveness and sole reliance on his recall of how to perform the manoeuvre. The pilot has subsequently reflected on the constant requirement to exercise superior judgement and to maintain air discipline. ◆

Epilogue

TYPE: Glider Schweizer 2-33 (C-FBJH)

LOCATION: Debert, Nova Scotia

DATE: 9 May 2010

A Schweizer SGS 2-33 Glider incurred very serious damage after a hard landing during an Air Cadet familiarization flight. The aircraft was crewed by a qualified Cadet Organizations Administration and Training Services (COATS) glider pilot in the back seat and an Air Cadet passenger in the front seat. The day involved numerous familiarization glider flights for members of a local Air Cadet squadron. Launches were conducted via auto-tow procedures using an F-150 pickup truck. The occurrence happened on the last planned flight as the weather began to deteriorate with isolated rain showers.

As the glider began its take-off roll, the wing walker holding up the left and into-wind wing, inadvertently dropped the wing after a few paces. Although the outer wing wheel contacted the ground, the glider pilot was able to level the wings before the glider became airborne. Correcting for the left crosswind, the glider pilot allowed the aircraft to drift left of the runway, just over the grass. The initial left wing drop, followed by the left drift, gave the Observer in the auto-tow vehicle the impression that the launch profile was unsafe, prompting a decision to abort the launch by releasing the tow rope. The consequences of releasing the glider at a low altitude were not considered and the assumption was made that the pilot would simply land straight ahead. However, at that altitude there was no time for the pilot to recover the aircraft into a gliding attitude. The combination of a nose high pitch attitude, low altitude and sudden loss of forward speed caused the glider to stall and land hard on its main wheel and nose skid. The glider pilot sustained minor injuries and the cadet passenger, in the front seat, sustained serious injuries.

The investigation revealed that although all Air Cadet personnel are encouraged to call a "stop launch" when they observe a situation that may pose a hazard, within their training there was no delineation between ground or air hazards. Although the observer acted in accordance with standard procedures in reacting to a perceived risk, the decision to release at that critical point of flight left no time for the pilot to recover safely. It was clear that once an aircraft is airborne, only the pilot is in a position to determine the controllability and safety of the aircraft and whether continuing a launch poses a greater risk than aborting.

Recommendations were therefore made to enhance the training provided to cadets with clear direction and set limitations on when ground personnel can decide that a launch should be aborted. ◆

ATASC XIII

ON TARGET

SÉCURITÉ DES VOLS FLIGHT SAFETY

The next Air to Air Safety Conference (ATASC) is scheduled for 20-23 June 2011 in Ottawa, Canada. The theme of this year's event will be "Modern Technologies Supporting Accident Investigation and Flight Safety."

The ATASC is a biennial event first held in 1991, and concentrates on four primary categories: mishap investigation, human factors, operations and maintenance, and ground safety. It fosters the exchange of safety information and provides opportunities to improve interoperability between the participating international safety organizations. This year, the Canadian Air Force will be hosting the event, and inviting technological safety innovators to present information on their projects.

DFS will also release a special technology-focussed edition of *On Target* magazine, to reflect and complement the issues presented at the conference. *On Target* is a focus magazine produced once per year by the Directorate of Flight Safety. The objective of *On Target* is to educate Air Force operators on a single subject of interest in a user friendly, yet thorough fashion. Past issues have been dedicated to Night Operations, Human Factors, and Ground Icing.

Individual presentations at the seminar have not yet been finalized, but will be grouped into functional categories such as Flight Data Recorders, Investigations, Analysis, Visualization, and Prevention. Some of the issues that will be presented include: RPV/UAV Operational Safety; advances in metallurgical and fractographic analysis; laser scanning technology and capabilities; photogrammetric analysis of aircraft in flight; portable FDRs and other flight path sources; advanced visualization for investigation; automated FS trend detection; bird strike prevention radar; and snowball/sandball spatial disorientation.

Anyone who has other relevant topics of interest, and would like to contribute to the *On Target* issue and/or ATASC, is asked to contact DFS at **dfs.dsv@forces.gc.ca**. ◆