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ISSUE 3, 2017

Flight Comment

LESSONS LEARNED

Watch your Head

CHECK SIX

The Door to Accidents is Never Shut

VIEWS ON FLIGHT SAFETY

Director of Flight Safety

Canada

Cover – A CH149 Cormorant Helicopter, on standby for search and rescue, receives a dusting of snow as winter weather passes through the Comox Valley, British Columbia, on January 5, 2016.

Photo: Major Jean-Francois Dupont



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Flight Comment

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THE CANADIAN ARMED FORCES FLIGHT SAFETY MAGAZINE

Flight Comment is produced up to four times a year by the Directorate of Flight Safety. The contents do not necessarily reflect official policy and, unless otherwise stated, should not be construed as regulations, orders or directives. Contributions, comments and criticism are welcome. Contributions become the property of *Flight Comment* and may be edited for content, length or format.

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Views on Flight Safety

by Colonel John Alexander, Director of Flight Safety

I am very proud to assume the Director of Flight Safety responsibilities. The Flight Safety program of the RCAF is a mature program of prevention and investigation that has advanced and evolved since its inception in the latter years of the Second World War. Almost immediately after its implementation, accident rates began to decline. Years later, our adoption of a *Just Culture*, which supports the open reporting of incidents that are the result of honest mistakes without fear of recrimination, further reduced accident rates.

The lessons learned through the Flight Safety program continue to reduce accident rates and inform our aircraft operations and ground maintenance practices. However, is the only role of Flight Safety to reduce accident rates? Not so many years ago, this would have been the belief. Many, including myself, now believe that Flight Safety must have a broader focus. Flight Safety must be an effective tool in the identification of risks during the operational planning process and must inform and be informed by that process.

Shortly after taking command, Lieutenant-General Hood stated in this publication: "For any airpower operation, risk awareness is key; we must always assess risks, mitigate them as much as possible, refer higher risk up the chain as necessary, to ensure we make risk-aware decisions to execute action when the mission demands." I believe it is *Just Culture* that enables the clear identification of the risks of

aviation – risks that have not yet resulted in accidents – which the operational commander can effectively use towards mission planning.

As the current operational pace continues, I believe we can capitalize on our strong Flight Safety program of prevention to assist personnel at all levels to identify and understand the risks. This knowledge will serve to establish stronger operational processes so that we can improve our ability to prevent accidents. James Reason's *Swiss Cheese Model*, well known by many, is now being adapted towards the early identification of risks and the creation of such processes. Rather than reflect upon what went wrong, as has traditionally been done using Reason's model, new models seek to understand *what could go wrong* and then proactively evaluate the measures in place to mitigate, reduce or eliminate those risks. These predictive models don't just reinforce the Flight Safety/Leadership relationship, they propel them forward.

Under the stewardship of Colonel Steve Charpentier over the last four years, Flight Safety has developed a Crash Scene Hazard Matrix for the identification of hazards and proper risk analysis when responding to accidents. This matrix reduces the risk to first responders and to those tasked to recover a site afterwards. As a sign of the value and effectiveness of this model, it is now being borrowed by other nations and the wider aviation industry around the world. Another

development championed by Flight Safety has been the Fatigue Risk Management System (FRMS). It will take us away from simply counting the hours of rest between duty periods, to considering other factors such as the quality of the rest one receives; the natural effects of the circadian cycle upon the individual; and, the effects of caffeine and energy drinks. This is now being rolled out across the RCAF.

I wish to sincerely thank Colonel Steve Charpentier for his last four years at the helm of Flight Safety and his 36+ years in uniform. As he transitions into civilian life, we are fortunate that he is remaining within the Directorate of Flight Safety as our Chief of Promotion and Information.

I am eager to take on the responsibilities of Director of Flight Safety on your behalf and I look forward to the opportunity of meeting you in the coming months. ✦

The Editor's Corner

Welcome to the third issue of *Flight Comment* for 2017.

I am now firmly seated in the Editor's chair. From an outsider's perspective, the job seemed quite straightforward, but now that I am the Editor, the reality is quite different! I have learned a few key lessons. Notably, last minute corrections to the final layout are costly and I need to plan ahead and keep a bank of 'ready to go' writings in case an article is pulled at the last minute. I have also learned that one person's vision doesn't always directly translate into another person's understanding. Case in point, I was asked to help coordinate the production of a flight safety "poster" that would be "just like the Brit's version." I confirmed that we had permission to reproduce the poster and I had it translated into French so that it would be bilingual. The poster went to print and it was distributed to your units. Great! The problem? Well, my understanding of the instruction "just like the Brit's version" applied to both the content and dimension of the original document. I had not confirmed what was meant by "poster" in terms of size. I made an assumption and the end result was jarring to the initiator of the request. It turns out that we here in Canada like to go large whereas the Brits are much more judicious when it comes to their use of real estate. Whoops.

Have any of you made assumptions only to find out that your understanding of the situation was different than the requestor's vision? Unfortunately, the above example was not a first for me. I have also made assumptions as a pilot that have caused me grief. Once, when seated in the left seat and hovering a Griffon helicopter over a bog somewhere in Labrador,

I was told by my Aircraft Captain (AC) to "Steady right, there's a snag." To me, a snag was a technical issue. I shot a quick glance at the caution panel and master caution light to try to identify the source of the mechanical glitch, but all lights were reassuringly unlit. Clearly, I was still drifting because I then received a stern "Steady Right! There's a SNAG!" After correcting my drift, I asked my AC to explain the term snag and I was kindly told that it meant an old tree stump. Both the AC and I are "Newfies" and so we should have been speaking the same form of English language. The reality was that our communication was not very effective and our grasp of the situation was being undermined by the use and understanding of our terms of language. Ah, the joys of communication and assumptions, a common theme for our Lessons Learned articles.

On a personal note, I would like to congratulate Captain (Retd) John Dixon who, at the age of 61, left Vancouver in July and rode his bike 6,000+ kilometers across the country to arrive in Halifax at the end of September 2017. He accomplished this feat to raise awareness and funds for Wounded Warriors Canada whose programs help women, men and their families cope with life after service to their country. John was a pilot in the RCAF and was once the editor of *Flight Comment*. Ever the wordsmith, John chronicled his adventure on his website (<https://pedalpilot.net>). My Editor's hat and flying helmet are doffed in your honour, John. You have set the retirement bar very high!

It's important to point out that the Royal Canadian Air Force Accident Investigation Bureau was formed on March 1st, 1942, making 2017 the Directorate of Flight Safety's



75th year in business. I believe my earlier statement that "from an outsider's perspective, the job seemed quite straightforward" can also be applied to the world of flight safety. As a junior pilot, the flight safety role seemed quite self-explanatory and totally intrinsic to our day to day flight line operations. Yet this wasn't always the case. We have come a long way in 75 years and the downward trend in our air and ground aircraft accident statistics is proof of all of our combined efforts. As an insider now of the flight safety world, I know that this role is never straightforward and that we must all remain vigilant in our pursuit of risk identification and hazard management. Who knows what a century in the flight safety role will bring but I know that the cause is worthy. We are all part of the team that can celebrate this important milestone! Happy 75th birthday!! 🎉

Major Claire Maxwell

DIRECTORATE OF FLIGHT SAFETY'S



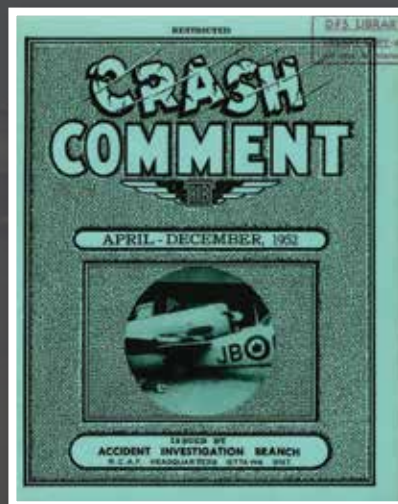
1942

1949

1952

1962

1972



75TH ANNIVERSARY



1982

1992

2002

2012

2017



Good Show

For Excellence in Flight Safety

Major Scott Frost, Captain Thomas Doelman, Master Warrant Officer George Lake and Sergeant Barry Martin



From left to right: Master Warrant Officer George Lake, Major Scott Frost, Captain Thom Doelman and Sergeant Barry Martin.

On 21 February 2012 after the completion of an air-to-air refuelling sortie, Major Scott Frost was conducting an annual check ride on Captain Thomas Doelman in Hercules aircraft CC130342. A touch and go was planned at Naval Air Station Key West in Florida with Captain Doelman at the controls. The landing went as planned; however, during the take-off roll, Load Master MWO George Lake heard an electrical buzzing sound and saw a bright orange jet-like flame shoot across the floor from the auxiliary hydraulic pump area. As he unbuckled and reached for the fire extinguisher, MWO Lake was engulfed in an expansive fireball. Concurrent with the V1 rotate call on the flight deck, MWO Lake made an urgent call over the intercom that there was a “fire in the back!”

As the aircraft became airborne, Capt Doelman made a split second decision that the situation was urgent, assessed the runway as adequate and landed straight ahead. Maj Frost immediately and fully supported the decision to abort and started communication with ATC. Load Master Sgt Barry Martin guarded the crew door handle to prevent egress while the aircraft was still moving and to initiate immediate evacuation when the aircraft stopped.

The aircraft came to a stop with 1,500 feet of runway remaining and within 27 seconds of the outbreak of the fire. By that time, intense heat and thick black smoke had filled the cargo compartment. Shortly after egress was complete, flames breached the roof of the fuselage above the rear ramp. Airfield Crash Fire Rescue services responded immediately and extinguished the fire within four minutes. In that time, the flight control cables to the rudder and elevator were found to have been severed as a result of the fire. Had the take-off continued, a loss of aircraft control would almost certainly have resulted.

Standard training protocol dictates that multi engine aircraft continue take-off following a V1 rotate call. However, in this case the decision to abort was a textbook example of exerting superior judgment to deal with an exceptional circumstance. The Flight Safety investigation concluded that there was no doubt the urgent alert of MWO Lake, outstanding egress awareness of Sgt Martin, and the quick reaction and exceptional crew resource management between Capt Doelman and Major Frost during this non-standard emergency prevented a catastrophic accident, saving the lives of all nine crew members. 🙏

Editor's Note: Sergeant Barry Martin has retired since the production of this article.

Good Show

For Excellence in Flight Safety

Captains Andrew Lindsay and Dylan Wightman

On 29 March 2016, Capt Dylan Wightman, an air traffic controller and Capt Andrew Lindsay, a terminal airspace controller were working a night shift at 19 Wing Comox. Capt Lindsay was providing radar services to a pilot of a civilian Cessna 152 that was flying under visual flight rules but had requested flight following. The Cessna was approximately six nautical miles south of 19 Wing airport, enroute to Campbell River Airport, British Columbia.

The pilot of the Cessna advised that his engine was starting to run roughly and requested to land at 19 Wing. According to 19 Wing flying orders, civilian aircraft without a prior permission request (PPR) authorization number are not allowed to land unless they are declaring an emergency. Capt Lindsay asked the pilot of the Cessna if it was his intention to declare an emergency; the pilot replied no, and continued flying towards the Campbell River airport.

Capt Lindsay informed Capt Wightman in the tower of the situation and the two controllers discussed alternatives to landing the Cessna at 19 Wing. The options considered were either a landing at Courtenay Regional Airport or allow the aircraft to continue on to Campbell River. Both controllers agreed the safest course of action was to bring the aircraft into 19 Wing. The decision was then made to declare an emergency on behalf of the pilot. Capt Lindsay proceeded to get the required information from the pilot and instructed him to proceed into the control zone for a landing on runway 12. Shortly thereafter the Cessna's engine failed. Because of their actions, the aircraft was in a position close enough to 19 Wing to land in one piece. Had the aircraft elected to turn towards Courtenay or been allowed to continue towards Campbell River, the aircraft



Photo: MCpl Jo-Anne Verreault



Photo: Cpl Mathan Spence

would not have made either airport. The pilot would certainly have had to carry out an emergency forced landing in the area surrounding Courtenay or in a rural treed area towards Campbell River. Conceivably this emergency landing could have led to a crash, involving injury or loss of life to the pilot and/ or those on the ground.

Each of these controllers are commended for their tenacity and professionalism, when they both went above and beyond their normal scope of duties to ensure this struggling aircraft and its occupant landed safe and sound at 19 Wing. They are both highly deserving of this Good Show award. 🇨🇦

Editor's Note: Captain Andrew Lindsay has retired since the production of this article.

Good Show

For Excellence in Flight Safety

Corporal Sébastien Poirier



On 5 March 2017, Cpl Sébastien Poirier, a 405 Squadron air weapons system technician was tasked as an aircraft brakeman on a CP140 Aurora that was being towed at 14 Wing Greenwood. As the tow crew approached the apron, the mule suddenly came to an abrupt stop. The tow member in-charge (IC), who was riding on the tractor with the other crew members, struck the rear view mirror and was thrown from the mule. This knocked the air out of his lungs to the extent that he was unable to call for the application of brakes.

Cpl Poirier, sensing something was wrong and unable to see the tow tractor over the nose of aircraft or hear any command from the IC, instinctively applied the brakes bringing the aircraft to a rapid stop. Despite Cpl Poirier's rapid braking action, the tow bar collapsed due to the inertia of the 48,000 kg aircraft. The aircraft

sustained minor damage from making contact with the rear of the tractor. One of the members of the tow crew who was in the back of the tow tractor was barely able to jump out of the way, while the other member could not egress in time and sustained minor injuries when he was struck by the aircraft's radome.

Cpl Poirier's focus and quick reaction prevented the aircraft from contacting the mule with full force allowing one tow crew member time to escape and unquestionably minimized the risk of fatal injury to the other. For his actions, Cpl Poirier is highly deserving of this Good Show award. 🇨🇦

Good Show

For Excellence in Flight Safety

Mr. Mark Edwards



Photo: Avr Jerome Lessard

On 5 March 2017, a Royal Canadian Air Force CC150T Polaris aircraft conducted a high-speed rejected take-off. Due to the extreme braking energy from deceleration of an aircraft at take-off weight, the aircraft's braking system temperatures quickly exceeded 700 degrees Celsius on the taxi back to the tarmac. This excessive heat eventually deflated all the main tires and generated a brake fire at both of the main landing gear.

As a civilian-contracted employee of L-3 Military Aviation Services, Mr. Mark Edwards was part of the ground crew responsible for CC150 Polaris maintenance operations. Seeing that the aircraft was taxiing back to the parking area, the ground crew immediately returned to the aircraft parking location. As the aircraft neared its normal parking position they noticed the two front right main tires were deflated. During the aircraft's last turn to parking the remaining six main tires deflated. Mere seconds after the aircraft stopped, smoke was seen emanating from both sides of the main landing gear tires and small flames were seen between the left hand main tires, to which the L-3 Site Manager immediately requested

firefighter support. In short sequence, a large flame erupted from between the right hand main tires. Without hesitation Mr. Edwards retrieved the nearest fire extinguisher at an adjacent parking spot and attacked the fire. His initiative to quickly react and attend to the emergency scenario and outstanding leadership of directing others was paramount in keeping the fire down, as it was erupting every few seconds. Without these efforts, the flames had a high probability of spreading to further aircraft components.

The fire endured for approximately 15 minutes without firefighter assistance due to poor communication within the foreign airport's emergency response program. Mr. Edwards and L-3 colleagues kept the fire under control the entire time and because of this, they were able to secure a dangerous situation that conveyed the potential for serious injury and the loss of precious aerospace resources. Mr. Edwards clearly demonstrated an extremely high degree of professionalism and leadership in the conduct of his duties and is most deserving of this Good Show award. 🔥

For Professionalism

For commendable performance in flight safety

Captain Adam Schellinck

On 25 October 2016, Capt Adam Schellinck, a pilot at 427 Special Operations Aviation Squadron, was conducting a pre-flight walk around of a CH-146 Griffon helicopter prior to a Maintenance Test Flight (MTF) when he discovered an unattached bolt in the space between the cabin and tail boom joint. As it is not standard practice to check this space with a flashlight, Capt Schellinck demonstrated a level of thoroughness and attention to detail that averted a potential critical system failure.

Upon further inspection, all four transmission cooler bolts were found to be unattached, leaving the transmission oil cooler to be held in place by the oil lines and fairing. The transmission oil cooler is a critical component

and had it fallen out of place and failed there was the distinct potential for a catastrophic incident. This danger, combined with that posed by Foreign Object Debris, was removed

by the dutiful actions of Capt Schellinck, and he is therefore fully deserving of this For Professionalism award. 🇩🇪



MWO Perry S. Stadler

On 19 February 16, MWO Perry Stadler, an AESOP with 423 Sqn, demonstrated a high level of professionalism and superior judgement when he identified a significant hazard with a Sea King helicopter that was scheduled to launch for a zero clearance test flight.

MWO Stadler was returning to the hangar with two of his crew members and was in the vicinity of aircraft CH12430 as it was preparing to taxi. Unaffected by the distractions of the noisy and cold environment, and from a distance, MWO Stadler noticed an abnormal condition with the main landing gear. Acting on his suspicions, he took immediate steps to ensure the Aircraft Captain was made aware of the potential problem. Through his prompt actions, it was confirmed by maintenance

personnel that both right hand main landing gear tires were flat; a condition not obvious to the casual observer.

MWO Stadler's actions were especially significant as the aircraft had already been released from maintenance control and the aircrew had just completed their pre-taxi checks and were about to taxi for take-off. His attention to detail allowed him to note an estimated 1/3 to 1/4 decrease in the normal space between the tire rim and the ground, as compared to a properly inflated tire. If this condition had gone undetected it is likely that any sort of hover or run on landing could have caused serious damage to the aircraft and endangered the crew.

MWO Stadler is to be commended for his keen observation abilities and highly professional conduct. To recognize a hazardous condition



that could have had disastrous consequences, he is to be congratulated for a job very well done and is most deserving of this For Professionalism Award. 🇩🇪

Sergeant Ian Daniels

On 21 March 2017, Sgt Ian Daniels, a Flight Engineer with 403 Helicopter Operational Training Squadron, found an unserviceability with the Fuel Dump Valve on a CH146 Griffon helicopter while conducting a pre-flight walk around. Using his superior skill and judgement, Sgt Daniels determined that the flow divider jam nut was not torqued, which in turn allowed the fuel drain fitting to turn freely and possibly leak fuel. Sgt Daniels immediately reported his findings to servicing and carried on to pre-flight another aircraft where he noticed the same condition.

Sgt Daniels' attention to detail allowed for a unit wide Special Inspection that identified four other aircraft having the same condition.



Photo: DND

This local inspection then became a fleet-wide inspection that identified multiple other similar configurations.

Sgt Daniels' exceptional attention to detail, determination and drive to ensure all

abnormalities were thoroughly investigated led to the discovery of this potentially hazardous condition. It is his proven application of these professional attributes that make him very deserving of this For Professionalism award. 🏆

Corporal Brian Busey

On 10 March 2016, while working on C130J Hercules, Cpl Busey noted a small, seemingly benign patch of oil underneath the no. 1 engine. Concerned that this could be coming from the engine oil system, Cpl Busey started investigating the engine oil and drain system for a possible oil leak however, no oil leaks were found.

Instead of discarding the original oil patch as a possible unrelated event, he pushed his investigation further and decided to carry out a full oil system check, including visual confirmation of the engine oil shut-off valve, which is not a step listed in the job guide. He discovered that although the valve could be closed and open manually, it remained in the

open position even when commanded to close with the fire handle, as in case of an engine fire. With further troubleshooting, he discovered the cause to be two reversed wires on a control relay. It was determined that this condition had been overlooked through multiple inspections over years of maintenance checks. Failure to notice this problem could have resulted in oil migrating over time to high speed rotating parts like the torque shaft and bearings causing severe unbalance and eventually self-destruction. Additionally, in the event of an engine fire, the oil flow would not have been shut off by pulling the fire handle and would have kept feeding the fire, greatly increasing risk to life.



Photo: Cpl Richard Lessard

Cpl Busey's attention to detail, concern for safety and tenacity are commendable. His diligent actions have prevented possible catastrophic damage to the aircraft or injury to personnel. He is truly deserving of this For Professionalism Award. 🏆

For Professionalism

For commendable performance in flight safety

Corporal Bryan Hollohan

While preparing for an early morning launch of a CP140 Aurora aircraft on 26 March 2016, Cpl Hollohan, a propulsion technician, noticed fluid on the tarmac under the aircraft's no.4 engine. Although the aircraft 'before' check and flight engineer pre-flight inspections were completed and that often, tarmacs can be beset with fluid stains, Cpl Hollohan nevertheless took the time to investigate further. Determining it to be an engine fuel leak, he immediately alerted the aircraft flight crew and his supervisor of the hazardous situation. Together, they registered the aircraft as unserviceable and diagnosed the source of the leak to be coming from one of the two engine-mounted, low-pressure fuel filters and aptly rectified the problem. The aircraft was declared serviceable and the crew was able to launch on the scheduled mission with minimal delay.

Because of the area in which they were operating, the outer engines, which included the no. 4 engine, were to be started on the runway just prior to takeoff in order to prevent foreign objects from damaging the engines during taxi. It would have been likely that with the no.4 engine only started just prior to takeoff, the aircraft and crew would have departed on the mission with it leaking fuel into the engine compartment and nobody on the ground would have been around to notice it.

Cpl Hollohan's attention to detail and going the extra mile to investigate the source of the fluid on the tarmac prevented what could have evolved into a very serious airborne emergency. Cpl Hollohan is thereby commended for his dedication to flight safety and the exemplary

professionalism exhibited in preventing what could have been a serious incident. He is most deserving of the For Professionalism award. ✦



Corporal Alexandra Lampard

On 24 April 2017, Cpl Lampard, an aviation technician was carrying out an inspection of a CF188 Hornet that was being prepared as the CF188 Air Show Demonstration jet. During her walk around, she inspected the afterburner section and noticed a very subtle but larger-than-normal gap between the Variable Exhaust Nozzle (VEN) primary and secondary seals. Cpl Lampard immediately raised a CF349 to initiate troubleshooting of the VEN section which revealed some alarming results.

It was discovered that the 9 and 10 o'clock primary flaps, two secondary flaps and one outer flap had all sustained significant



damage which could render the VEN inoperable. If the aircraft had flown the air show routine in that condition, the differential thrust

created by a malfunctioning VEN could have led to an accident similar in nature to that involving another Air Show Demonstration jet which occurred in 2010.

Cpl Lampard's attention to detail pointed out damage that was missed by multiple technicians and prevented further damage to the VEN. The rectification of the snag averted any possible catastrophic damage to the whole aircraft and Cpl Lampard is therefore highly deserving of this For Professionalism award. ✦

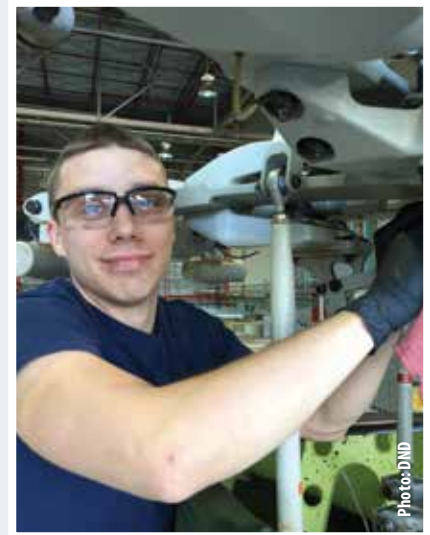
Corporal Travis Turcotte

On 31 January 2017, Cpl Travis Turcotte, an aviation technician with 403 Helicopter Operational Training Squadron found a major maintenance deviation while completing a 25-hour inspection. Using his superior skill and judgement, Cpl Turcotte determined that seven of eight damper bushings on the main rotor dampers were installed incorrectly. He confirmed his finding by referencing the applicable maintenance orders and reported it to Flight Safety.

Further investigation found that this configuration has been missed on numerous inspections for over a year. Structural investigation of the

dampers found that enough damage had been created to render the spindle assembly unserviceable. Had this condition been allowed to continue it could have resulted in severe airframe damage and controllability issues in flight.

Cpl Turcotte's keen awareness and observation helped prevent further damage, costly repairs and maintenance action. Cpl Turcotte's actions are certainly deserving of this For Professionalism award. 🏆



Aviator Tyler Rolfe

Avr Rolfe is a newly arrived technician in 3 Air Maintenance Squadron's delivery systems workshop at Bagotville. He was recently qualified as an air weapons systems journeyman technician and he is currently training on delivery systems. On 7 December 2016, Avr Rolfe was working under supervision while setting up an aircraft wing pylon for the CF188 Hornet. While installing the bomb rack (BRU-32) to complete the assembly before sending the piece of equipment to first-line operations, he noticed that two pins and two washers were missing from the serviceably marked BRU-32. These pins and washers hold the studs that assist with the proper rotation of the hooks that are used to eject bombs or stations during operations or in-flight emergencies.



His judgement as an airman is outstanding. After checking the technical orders of the system in question, he immediately spoke with the qualified corporal, advising them of

what he had discovered. His mechanical skills and judgement made it possible to avoid installing a non-serviceable part that could have had serious repercussions if a normal or emergency release had taken place in flight. Following his discovery, he suggested that all of the BRU-32s at CFB Bagotville be checked to ensure that all parts were properly installed.

He has a very quiet and calm demeanour, and he ensures that his tasks are carried out correctly. His attention to detail, professionalism and understanding of how important it is to follow basic airworthiness rules make him a role model for his peers. Avr Rolfe is most deserving of this For Professionalism award. 🏆



From the Front Lines: Trialing Caffeine "Chew Pod" to Mitigate Fatigue

by Lieutenant(Navy) Sebastian Vuong, Flight Surgeon

Fatigue continues to be a major area of interest for the Flight Surgeon community. In the Royal Canadian Air Force (RCAF), fatigue is a known threat that degrades operational effectiveness, Flight Safety, and the retention of trained personnel. Managing fatigue requires a multi-layered approach from all levels of command. Under Air Force Order 8008-0¹, the RCAF Commander has given direction to implement a Fatigue Risk Management System

(FRMS) which is a standardized framework that enables RCAF communities to develop fatigue risk control measures. This guidance addresses six layers of defence as described in [figure 1](#).

On OP IMPACT, Flight Surgeons have been trialing caffeine "Chew Pod" ([figure 2](#)) as a pharmacological fatigue counter measure (PFCM) which tackles the alertness



Figure 2. Caffeine Chew Pod.

Education	Through fatigue training and culture building tools.
Scheduling	Through scheduling practices and fatigue prediction tools to optimize workload-personnel balance and sleep opportunities.
Sleep Quality	Through sleep hygiene training, judicious use of pharmacological fatigue counter measures (PFCMs), treatment of sleep disorders, and infrastructure optimized for sleep.
Workplace/ Mission Design	Through appropriately risk managed workplace infrastructure and mission design optimized for maintaining alertness.
Alertness Maintenance	Through fatigue monitoring practices and the use of fatigue countermeasures, including standard fatigue counter measures and PFCMs.
Reporting and Feedback	Through ongoing data collection and analysis to drive continuous program improvement.

Figure 1. FRMS layers of defence. Reproduced from AFO 8008-0.

maintenance layer of defence. Though only one part of the broader implementation of the FRMS, this trial has yielded positive feedback amongst participants deployed on operations.

What is it?

The main active ingredient is caffeine and the tablet is coated with a mint flavouring to mask the bitterness of the caffeine. The recommended dose is two chewable tablets (100 milligrams (mg) of caffeine total) which is about the amount of caffeine in a cup of coffee. See [figure 3](#) for an approximation of caffeine equivalencies².



	Product	Serving Size	Caffeine (mg)
COFFEE	Brewed	8 oz (237 ml or 1 cup)	135
	Roasted and ground, percolated	8 oz	118
	Roasted and ground, filter drip	8 oz	179
	Roasted and ground, decaffeinated	8 oz	3
	Instant	8 oz	76-106
	Instant decaffeinated	8 oz	5
TEA	Average blend	8 oz	43
	Green	8 oz	30
	Instant	8 oz	15
	Leaf or bag	8 oz	50
	Decaffeinated	8 oz	0
COLA	Regular	12 oz (355 ml or 1 can)	36-46
	Diet	12 oz	39-50

Figure 3. Comparison of caffeinated beverages. Adapted from Health Canada.

How are they used?

Because the tablets are chewed, the caffeine is absorbed through the buccal mucosa (the inside lining of the cheeks and floor of the mouth) allowing for a relatively quick entry (between 5-10 minutes) into systemic circulation³. In comparison, when taken in the form of coffee, caffeine absorbed through an empty stomach takes between 15-30 minutes or an hour longer if taken with a meal.

The RCAF Surgeon has authorized that each trial participant can receive four packages of four doses each, or sixteen doses per month.

A dose of Chew Pod is taken one to four times a day as needed. It is important to note that caffeine merely “shifts” fatigue and is not an appropriate substitute for sufficient quantity and quality of sleep supported by good sleep hygiene. [Figure 4](#) summarizes sleep hygiene principles that everyone should follow to optimize sleep health⁴.

Who is using it?

OP IMPACT has been selected as the trial site given the operational tempo of the air-to-air refueling (AAR), long range patrol, tactical airlift and tactical aviation detachments deployed in

Kuwait and Iraq. Initially, the Chew Pod was only available to aircrew but, with the positive results collected thus far, the RCAF Surgeon has expanded the trial to include ground crew.

Why are we trialing this?

Fatigue remains the largest preventative cause of accidents in safety sensitive operations worldwide^{5,6}. According to the National Transportation Safety Board, fatigue is a factor in nearly 20% of major accident investigations⁷. As described above, the RCAF has identified fatigue as a threat that degrades operational capability, flight safety, and the

Continued on next page

Be consistent with timings.	Go to bed at the same time every night and get up at the same time each morning, including on weekends. Depending on operations, this may not always be possible. At the very least, ensure you get “anchor sleep” where you maintain the same four hours of sleep during the same time each day.
Optimize sleep quarters.	Make sure your sleeping quarters are relaxing, dark, quiet and of an optimal temperature. Remove or minimize use of electronic devices such as TV’s, computers and smart phones in your sleeping quarters.
Time your meals.	Avoid large meals before bedtime.
Time your exercise.	Being physically active during the day can assist with falling asleep at night. Avoid exercising right before bed.
Avoid stimulants or alcohol before bed.	Avoid coffee, tea, energy drinks or alcohol within 6 hours of going to bed.

Figure 4. Sleep hygiene principles. Adapted from the Centers for Disease Control and Prevention.

retention of trained personnel. For the individual, fatigue reduces alertness and performance in the short-term and impacts health and well-being in the long-term⁸. Since it is known that caffeine can increase alertness up to four to five hours⁹, the RCAF Commander’s direction to implement the FRMS has enabled the Flight Surgeon community to trial this product. This trial studies whether the effects of fatigue can be mitigated by providing a convenient, portable, measurable and rapid dose of caffeine.

What have we found?

Data was collected from participants through usage of questionnaires. Using the United States Air Force School of Aerospace Medicine (USAFSAM) (Samn Perelli) mental fatigue scale¹⁰, self-reported measurements were used to capture fatigue levels. **Figure 5** represents the scale with the summed average responses of 14 participants between June to August of 2017.

The tablets were taken by aircrew when they felt it was necessary. Mental fatigue was scored before and after taking a dose. These results demonstrate an average 1.7 point

increase in alertness using this scale. Subjective responses were largely positive and spoke to:

- Noticeable improvements in alertness and cognitive capability,
- A quick method of caffeine delivery and effect (~5 minutes),
- Portability and ease of storage, and
- A decreased fluid load compared with drinking coffee or energy drinks which meant less trips to the lavatory.

A few participants were not entirely satisfied with the taste but there were otherwise no negative comments.

Flight Surgeons who have joined the AAR crew on flying missions observed two instances where caffeine Chew Pod proved more convenient and accessible than caffeinated beverages for aircrew:

- During mid-flight when aircrew were occupied with radio communications, and

USAFSAM MENTAL FATIGUE SCALE	
When you are asked to “Rate your average mental fatigue (1-7),” fill in the number that is your best estimate of your average mental fatigue across the work period.	
Use this scale:	
Avg after 2.6 →	1. Fully alert. Wide awake. Extremely peppy. 2. Very lively. Responsive, but not at peak. 3. Okay. Somewhat fresh.
Avg before 4.3 →	4. A little tired. Less than fresh. 5. Moderately tired. Let down.
	6. Extremely tired. Very difficult to concentrate. 7. Completely exhausted. Unable to function effectively. Ready to drop.

Figure 5. USAFSAM mental fatigue scale.

- During the critical phase of descent and landing when pilots were often more fatigued after long missions.

How does this fit in the big picture?

Flight Surgeons will continue to trial caffeine Chew Pod on OP IMPACT personnel to collect more data to support RCAF FRMS implementation. With the continued momentum of positive results, this PFCM may soon become further integrated for use in the RCAF. By addressing one of the many layers of FRMS defence, the Flight Surgeon community aims to provide an effective tool to mitigate the threats of fatigue. 🔥

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The Door to Accidents is Never Shut

by Colonel (Retired) Chris Shelley, C.D.

Chris Shelley joined the Canadian Forces in 1973. After graduation from Royal Military College he trained as a pilot, flying some 3800 hours with 424 Squadron and 408 Squadron on CH135 and CH146 aircraft. He flew on operational deployments in Central America (1990) and Bosnia (2001). He commanded 408 Squadron and 1 Wing before serving as Director of Flight Safety from 2006 to 2008. Retired since 2008, Chris retains a lively interest in aviation history and flight safety.

This article describes an accident from the 1950s. While it may be tempting to dismiss it as ancient history, we can still learn from the bad old days when serious accidents were commonplace. Today's RCAF enjoys a low accident rate. Flagrant violations of rules and plain incompetence are scarce. One reason for this happy state is that we did indeed learn from our past mistakes, and the proof is a hefty set of orders and standard operating procedures at every level of command.

Then, as now, the RCAF was far from indifferent to accidents and struggled mightily to create a safety culture that would reduce expensive and unnecessary loss of aviation resources. The Cold-War RCAF expanded rapidly, striving to absorb growth, new technology and new procedures. Today's RCAF faces similar challenges. New personnel, new aircraft and new technology must all be integrated into the RCAF while preserving mission effectiveness and safe operations. Plenty of things can, and will, go wrong, but if the appropriate defences are in place, accidental losses can be avoided. As you read this story, think about what could possibly go wrong in your corner of the air force. Are the correct defences in place? Is there a deficiency, known but not addressed, that is waiting to bite you when you least expect it? Are the

holes in your swiss-cheese lining up? When something does happen, do you look at all practical options, or do you let tunnel vision dictate your response? This is the story of one occurrence where the defences against an accident either failed or were non-existent. It resulted in the death of a pilot and the loss of an aircraft. Have we truly locked the door against a recurrence?

"As you read this story, think about what could possibly go wrong in your corner of the air force."

The story begins on 2 April 1956 at RCAF Station Gimli, Manitoba. The incident pilot, an instructor, had just returned from a cross-country trip to Calgary in a T-33 Silver Star. On arrival at Gimli, he found a telegram informing him of the death of his grandmother in Hamilton, Ontario. The pilot sought out the Deputy Chief Flying Instructor (D/CFI) and asked permission to fly a T-33 to Hamilton the next day for the funeral. Perhaps to better his chances, he made up an "alternate fact:" he told the D/CFI that it was his mother who had passed, not his grandmother. The D/CFI agreed to the request, but imposed two conditions.

First, since the instructor had a restricted instrument rating (known then as a white ticket), he would have to find another instructor with an unrestricted rating (green ticket) to go with him. Second, he would have to return the T-33 back to Gimli that same night, 3 April 1956. This meant flying back immediately after the funeral! Remember, it was allegedly the pilot's mother who had died; apparently, the RCAF did not have much of a compassionate leave policy back then. The pilot accepted the terms and the D/CFI entered the mission into the flying program. At this point the supervisory level considered its job done – it was now up to a junior pilot in a highly charged emotional state to find a green ticket instructor to fly with him from Gimli to Hamilton, attend a family funeral, and get back to base in a single day. No pressure there!

Things did not start very well the next morning. The volunteer green ticket instructor checked the Hamilton weather and found it was below limits. In fact, the weather all over southern Ontario was bad, with low clouds and fog. The instructor refused to go, leaving the pilot no way, apparently, to get to Hamilton in time for the funeral. That should have been the end of the matter. But, as the green ticket instructor did not inform the D/CFI of the situation, the junior pilot decided to self-authorize and proceed with the trip regardless.



The pilot filed a flight plan with Toronto (Malton) as destination, with Montreal as the alternate. In 1956 at Gimli, instructors could self-authorize trips that were on the flying schedule, so he duly signed out T33 21457 and took off solo at 1517Z. It is unclear whether anyone knew what he intended, but what is certain is that air traffic control saw the trip on the schedule and granted clearance when the pilot requested take-off. (This self-authorization procedure remained current in the air force until the late 1980s).

In the mid 1950s, high level Canadian airspace was military-controlled. The RCAF and the United States Air Force were virtually the only ones flying jets at high altitudes in those days, and military Ground-Controlled Intercept (GCI) radars controlled high-level traffic. The various air defence radar sectors handled jets until close to destination, when they were handed off to the civilian or military airport in question. RCAF air defence radar controllers could vector jets enroute, and assist with penetrations through cloud to lower altitudes where visual flight rules conditions might exist.

The flight was uneventful until the pilot overflew Wiarton where he received the updated Toronto weather. It was very bad: 300 feet overcast with one-quarter of a mile visibility in fog. As the T33 was not equipped with an Instrument Landing System (ILS), the most suitable approach for Malton was the 'Jet Range,' which was essentially a Hi-Non-Directional Beacon (NDB) approach, with limits of 500 feet and one and one-half mile visibility. As a white ticket (restricted), the pilot's limits for the Jet Range approach were 1,300 feet and two miles visibility. The pilot's best option at this point would have been to request vectors immediately for Montreal, his alternate airport. Instead, he requested an ILS approach at Toronto, perhaps intending to fly the Jet Range down to ILS limits. Not surprisingly, the aircraft never broke out of the clouds and was forced to overshoot.

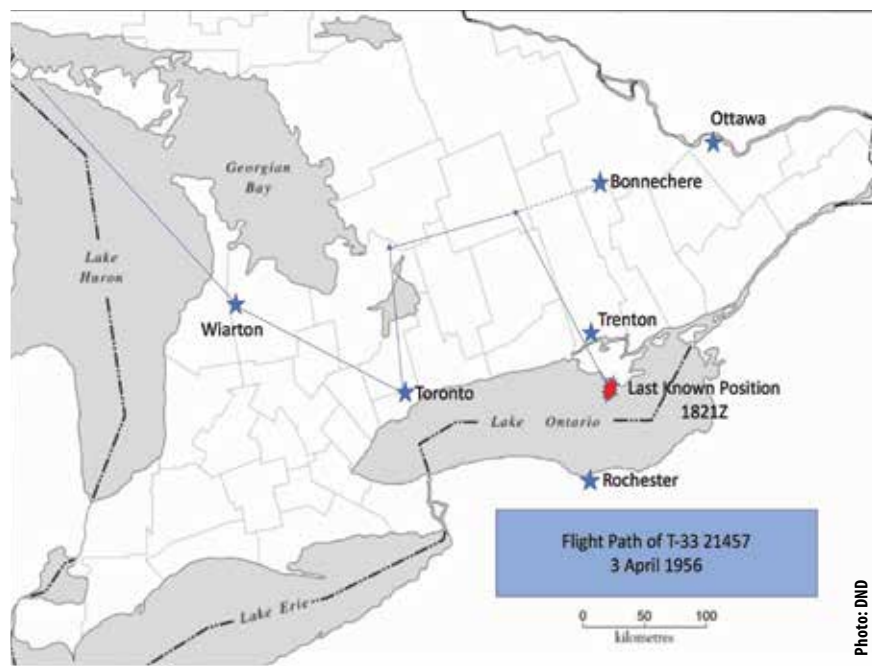


Figure 1. Flight path of T-33 21457, 3 April 1956.

Having wasted precious fuel on a non-effective approach, the pilot was now in a dire situation. He became quite confused on the overshoot, because 15 minutes and many miles passed before the pilot contacted the sector station (CUPID) at RCAF Station Edgar. He was then on top of cloud at 40,000 feet, 70 nautical miles

"Things had not gone terribly well so far, but they were about to get much worse, as everyone involved developed a severe case of tunnel-vision."

north of Toronto. On contact, the pilot stated that the radio compass was unserviceable. Since he now lacked the fuel to make Montreal he requested vectors to Ottawa where the weather was reported to be 500 feet and five

miles visibility and where a Ground Controlled Approach (GCA) would be possible with the Precision Approach Radar (PAR) there.

Investigators were unsure why the T33 flew so far north of Toronto, but they had a theory. Both the Kleinburg NDB north of Toronto and the Ottawa NDB operated on 236 kilohertz. In April 1956, Kleinburg was yet unpublished, and was probably unknown to the pilot. As the T33 flew north of Toronto he likely selected 236 KHz for the Ottawa beacon to prepare for the next leg. However, the Automatic Direction Finder (ADF) needle in the cockpit would have pointed to six o'clock instead of the expected two o'clock since Kleinberg was already behind him but still very close. The pilot lost precious minutes trying to figure out this anomaly and this explains why he declared his radio compass to be unreliable when contacting CUPID.

Continued on next page



CHECK SIX

Things had not gone terribly well so far, but they were about to get much worse, as everyone involved developed a severe case of tunnel-vision. CUPID queried the T33's fuel state. Hearing it was only 76 gallons, the controller incorrectly advised the pilot that he lacked the fuel to make Ottawa and offered vectors to Trenton. Since Trenton was closer, the pilot accepted the vectors; yet, the T33 could have made Ottawa, where better weather prevailed. The controller never passed the Trenton weather to the pilot, nor was it requested. It was terrible: 300 feet ceiling and one-eighth of a mile visibility, clearly out of limits. The controller had offered, and the pilot had accepted, vectors to an airport where there was no chance of a successful landing.

Alternatives existed, but the controller failed to seek them out. CUPID had no status boards for any local airfields, so vital information about weather and condition was difficult to obtain. The Duty Controller attempted to contact North Bay for information, but was unsuccessful. The neighbouring sector, controlled by RCAF Station Foymount, was monitoring the situation and advised CUPID that the strip at Bonnechere had VFR weather. However, CUPID confused Bonnechere with Killaloe, a strip they knew to be closed, and was unaware of any approach for Bonnechere. In fact, Foymount controllers had a "Pipeline 4" high procedure for Bonnechere (which had a 6,600-foot-long runway) that they practiced frequently. But, since CUPID was controlling the aircraft, Foymount remained silent. Finally, CUPID failed to ask the adjacent American Air Defense Sector if Rochester, New York, was open. Only a few minutes flying time south of Trenton, Rochester had VFR conditions and was in range. Instead, CUPID focused solely on vectoring the T33 into Trenton where a safe landing was near to impossible.

40 miles short of Bonnechere, the T33 turned south towards Trenton at 41,000 feet, its pilot hopeful that he could recover using a precision

radar approach. Had things been going his way, he might have made it, despite the bad weather. But, nothing went his way that day.

CUPID advised Trenton tower of the inbound T33 and its desperate situation. However, Trenton Flying Control was having its own problems that day. The main radios in the tower were unserviceable. Incredibly, the Duty Flying Control Officer (air traffic controller) had no idea how to use the back up radios. Worse, he was unqualified for controlling aircraft in Instrument Flight Rules (IFR) conditions. Further, the automatic direction finding (ADF) equipment was also unserviceable, so it was not even possible for the controller to take a bearing on the T33's radio transmissions. The controller's solution was to request Trenton GCA radar to contact the aircraft and bring it in. The GCA controller agreed to try. However, the GCA equipment at Trenton was obsolete and ill-suited for controlling fast jets such as the T33, and quite incapable of picking up a high-altitude target.

The T33 arrived overhead Trenton at 1803Z with 50 gallons of fuel remaining. The GCA controller vectored the T33 to establish a radar square pattern for Runway 24, but since positive radar contact was never established he was unable to position the aircraft on a GCA final to the runway. In fact, the T33 flew miles south of the airbase and the vectors given by GCA were simply guess work. The aircraft never even came close to the approach course for the runway. Finally, with fuel remaining at nine gallons, the pilot decided to abandon the aircraft under control before it flamed out, and advised GCA.

GCA requested bailout instructions from Flying Control, but received none. Bizarrely, Trenton had no published bail out procedures at the time. GCA's best idea was to give the T33 a vector of 240 degrees, which pretty much ensured the pilot would eject over Lake Ontario. Shortly after, a resident near Point Petre at the

southern tip of Prince Edward County heard the T33 pass overhead. No further trace of the aircraft or pilot was ever found. Estimated time of the bailout was 1821Z.

GCA informed Flying Control of the bailout, and Flying Control alerted the Rescue Coordination Centre (RCC) Trenton. CUPID had continued to track the jet with its radar, and was able to pass on the last known position to RCC. An H21 rescue helicopter launched towards the lake, but landed short of Picton due to fog. Rescue boats sped out from Trenton and Rochester. However, the last in a long line of mistakes rendered these efforts futile.

"Is the RCAF prepared for the challenges posed by increasing automation, new technology, information management, inexperienced personnel and constant deployments? Are there safety issues waiting in the wings that are not being addressed because of time constraints or cost? Are drills and procedures in place to handle likely (or even unlikely) contingencies?"

CUPID had provided a last known position to RCC. But, GCI radar used a GEOREF (GEOgraphical REference) system for orientation, which RCC had to convert into latitude and longitude coordinates for the rescue boats. Tragically, the RCC controller made the conversion incorrectly, and sent the rescue boats 10 miles to the east of the aircraft's last known position, to search a direction opposite to the aircraft's last known heading.

It hardly mattered. RCAF Station Gimli was still on winter flying routine, there was no life raft in the aircraft seat pack, and the pilot was not wearing a mae-west (personal flotation device



designed for aircrew). The estimated survival time in the frigid water of Lake Ontario was a mere 15 minutes. By the time RCC redirected the search boats, there was no hope for the pilot. The search was called off the next day. An extensive shoreline search revealed no wreckage and no trace of the aircraft or the pilot has ever been found.

The Board of Inquiry found fault at every level, from the callous handling of the pilot's request to attend a family funeral, to the lax flight authorization procedures, to the aircraft's incompetent handling by the various air traffic control agencies to the final dismal attempts at search and rescue. The pilot was not faulted for contravening the direction of the D/CFI. The Board found that, "the flight was duly authorized and approved within existing regulations," and that "staff pilots may sign themselves out on the F17 for long range cross-country flights once approval has been obtained." Various levels of review took great issue with this finding, one reviewer even asserting that the aircraft had been "stolen" and that the occurrence was not an "accident" but rather a criminal act. Nonetheless, the consensus was that the occurrence pilot had exploited a loophole (the failure of the supervisor to ensure the conditions were met before authorizing the flight by putting it on the

schedule) and that it was flight authorization procedures that needed to be addressed. The pilot and the controlling agencies were found to have shared responsibility for the accident.

The first recommendation of the Board was that "Commanding Officers specifically delegate officers filling designated supervisory positions to sign the Flight Authorization form F17 of all pilots prior to take off on long range cross country flights to ensure that flight is within the pilot's capability." The marginal note beside this recommendation reads, "no." In 1956, the RCAF leadership would not accept the necessity for more rigorous oversight, despite numerous accidents in which supervision was found lacking. It would not be until after the disastrous Hercules mid-air in Edmonton in 1985 that further levels of authorization were imposed for scheduled flights. Even so, in 1985 that direction was greeted with dismay by most aircrew. They perceived it as evidence of a shocking distrust of aircrew professionalism, and even as a punishment for the shortcomings of a few. Moreover, aircrew doubted the practicality of the change, in that authorizing officers would be overwhelmed if they fulfilled the letter of their duties. Perhaps the same feeling prevailed in 1956?

The Board made many other recommendations related to the handling of aircraft by control agencies and preparations for airborne emergencies. Most, such as stations maintaining standard bail-out procedures, were implemented. Several reviewers expressed frustration at the lack of foresight of the agencies involved to make even basic preparations for the situation faced by this pilot. In the words of one exasperated senior reviewer, "the door has now been well and truly shut!"

But we all know that the door to accidents is never shut. A full decade into the jet age, this occurrence showed that the RCAF was not yet capable of handling the exigencies of high-flying, fast jet aircraft equipped with ejection seats. What about today? Is the RCAF prepared for the challenges posed by increasing automation, new technology, information management, inexperienced personnel and constant deployments? Are there safety issues waiting in the wings that are not being addressed because of time constraints or cost? Are drills and procedures in place to handle likely (or even unlikely) contingencies? Sometimes a glance in our 'rear view mirror' helps us to think about what might lie in wait on the road ahead! ✨

ON TRACK

Cold Weather Altimetry Corrections

This article is the next instalment of a continuous *Flight Comment* contribution from the Royal Canadian Air Force (RCAF) Instrument Check Pilot (ICP) School. With each “On Track” article, an ICP School instructor will reply to a question that the school received from students or from other aviation professionals in the RCAF. If you would like your question featured in a future “On Track” article, please contact the ICP School at: +AF_Stds_APF@AFStds@Winnipeg.

This edition of On Track will address a topic that will soon be near and dear to our hearts once again: Cold Weather Altimetry Corrections. The answer comes from Captain Diana Dillard, ICP School Commander.

When flying IFR, it is necessary to trust our flight instruments; however, there are inherent errors that we must be aware of to ensure we do not put ourselves in an unsafe situation. Today we will discuss altimeter errors, specifically regarding colder than standard temperatures.

All altimeters are calibrated to indicate true altitude above sea level when operating within the standard parameters of pressure and temperature (29.92 and 15 degrees Celsius (°C)). It is simple to adjust for nonstandard pressure by using the correct local altimeter setting, and with enough practice and knowledge, it can be simple to adjust for nonstandard temperatures as well. To better understand how to apply these principles, it helps to understand what is actually happening when there are temperature changes. As shown in Figure 1, when the aircraft is flying in warmer than standard weather, the air is less dense, meaning the air molecules (and the

pressure levels) are further apart; in this case, if your altimeter shows you at 5,000 feet ('), the pressure level is higher than normal, and so is your aircraft. On the contrary, if the temperature is colder than standard, the air molecules and pressure levels are closer together (more dense); therefore, if your altimeter reads 5,000', your true altitude will be lower than displayed.

When flying under near-standard or warmer than standard conditions, this atmospheric phenomenon is not a cause for concern. All aircraft flying within range of one another will be under similar influences, therefore traffic is not a factor.

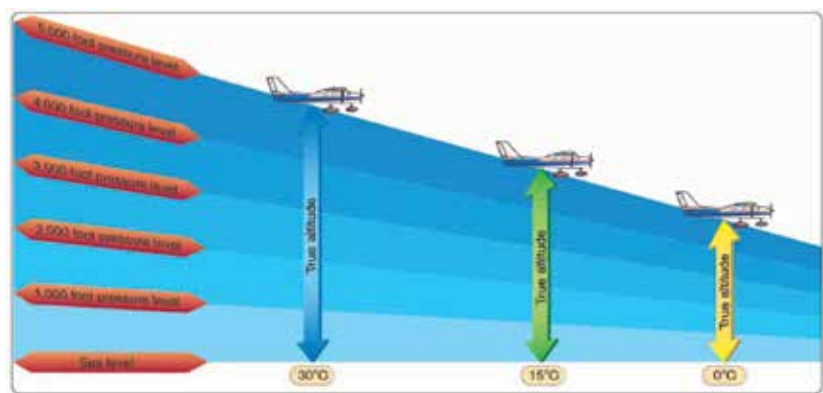


Figure 1. Influence of Temperature on True Altitude (FAA-H-8083-15B Figure 5-6)



However, once you put an aircraft at a lower altitude near terrain or obstacles, we start to see a potential conflict. For this reason, cold weather temperature corrections have been implemented and an International Civil Aviation Organization (ICAO) Cold Temperature Error Correction formula has been created. If you want to be very specific, you can correct by using this formula: add 4 feet per thousand feet for each degree Celsius different from the standard temperature. If you choose to use this method, you must convert the reported temperature based on the adiabatic lapse rate and airport elevation. Keep in mind that ICAO document 8168 (Part III, 4.3.1) states that using this calculation is "safe for all altimeter setting source altitudes for temperatures above -15C." For temperatures colder than that, the chart must be used to provide an appropriate safety margin. Here is an example using a Final Approach Fix (FAF) description:

- FAF height above aerodrome (reporting station): 1,120' (2,100' listed on plate, with 980' as the airport elevation)
- Temperature at reporting station: -20°C
- Standard Adiabatic Lapse Rate: 1.98°C/1,000' ~ 2°C/1,000'
- Standard temperature at sea level: 15°C

- Standard temp at aerodrome: $15^{\circ}\text{C} - 2^{\circ}\text{C}/1,000' \times 980' = 13^{\circ}\text{C}$
- Temp difference from standard: $13^{\circ}\text{C} - (-20^{\circ}\text{C}) = 33$
- Ratio of thousands in feet: $1,120'/1,000' = 1.12$
- Altitude correction: $1.12 \times 4' \times 33 = 147.84'$
- Cold weather corrected FAF altitude: $148' + 2,100' = 2,248'$

You can simplify this process further by assuming the aerodrome is at sea level and by either interpolating or rounding the FAF up to the nearest thousand feet. The result is then obtained from the ICAO chart (Figure 2). To demonstrate this simplification, the same example of the FAF is used:

- FAF height above aerodrome (reporting station): ~1,100' (2,100' listed on plate, with 980' as the airport elevation)
- Temperature at reporting station: -20°C
- Using -20°C and interpolating for the altitude (1,100')
- Cold weather corrected FAF altitude: $154' + 2,100' = 2,254'$

In Canada, per the GPH204 (Canadian and North Atlantic Procedures), RCAir crew are to adjust all altitudes inside the FAF, including decision heights, decision altitudes, minimum descent altitudes, and step-down fixes when the temperature is 0°C or less. All altitudes in the procedure (including MSAs, ESAs, Missed Approach altitudes, etc.) must be corrected when the temperature is -30°C or less, when the

Continued on next page

		Height Above Airport In Feet													
		200	300	400	500	600	700	800	900	1,000	1,500	2,000	3,000	4,000	5,000
Reported Temp C	+10	10	10	10	10	20	20	20	20	20	30	40	60	80	90
	0	20	20	30	30	40	40	50	50	60	90	120	170	230	280
	-10	20	30	40	50	60	70	80	90	100	150	200	290	390	490
	-20	30	50	60	70	90	100	120	130	140	210	280	420	570	710
	-30	40	60	80	100	120	130	150	170	190	280	380	570	760	950
	-40	50	80	100	120	150	170	190	220	240	360	480	720	970	1,210
	-50	60	90	120	150	180	210	240	270	300	450	590	890	1,190	1,500

Figure 2. ICAO Temperature Correction Chart

Procedure Turn/Intermediate Approach Altitude heights above touchdown (HATs) are 3,000' or more above the altimeter setting source (often an issue when using off-airfield altimeter and weather reports), or when flying in designated mountainous regions with a temperature of 0°C or less. The correction table can be found in the GPH200.

In the United States, the Department of Defense rules are nearly identical to those of the RCAF, and include a correction chart in the Flight Information Handbook (FIH) on page D-15. The Federal Aviation Administration, on the other hand, put out a NOTAM in compliance with 14 CFR Part 97 that can be found in the Notices to Airmen Publication (NTAP). This document lists procedures as well as a compilation of airfields having greater than 2,500' of runway where cold weather corrections are required (Cold Temperature Restricted Airports, or CTRA). This NTAP goes along with the snowflake symbol that can now be found on approach plates of the listed airports. The FAA dictates that crews flying into these locations MUST apply cold weather corrections to the listed approach segments. Crews MAY make corrections to all segments if they prefer. In addition, the airfields listed are not limiting; you may make corrections to approaches at airfields not listed if you feel that it is necessary. To comply with RCAF rules, it may be necessary to make these corrections, because the FAA does not address many of the instances where temperature corrections are required for military crews, such as mountainous terrain and excessive HAT situations. The next example shows what may be seen at one of these FAA-designated airfields.

At PACE (Central, Alaska) (Figure 3), the top left of the approach plate shows a snowflake with -25°C printed next to it. When the reported temperature is equal to

or colder than the temperature published next to the snowflake, corrections must be made to the prescribed segments. From here, we can reference the listing of

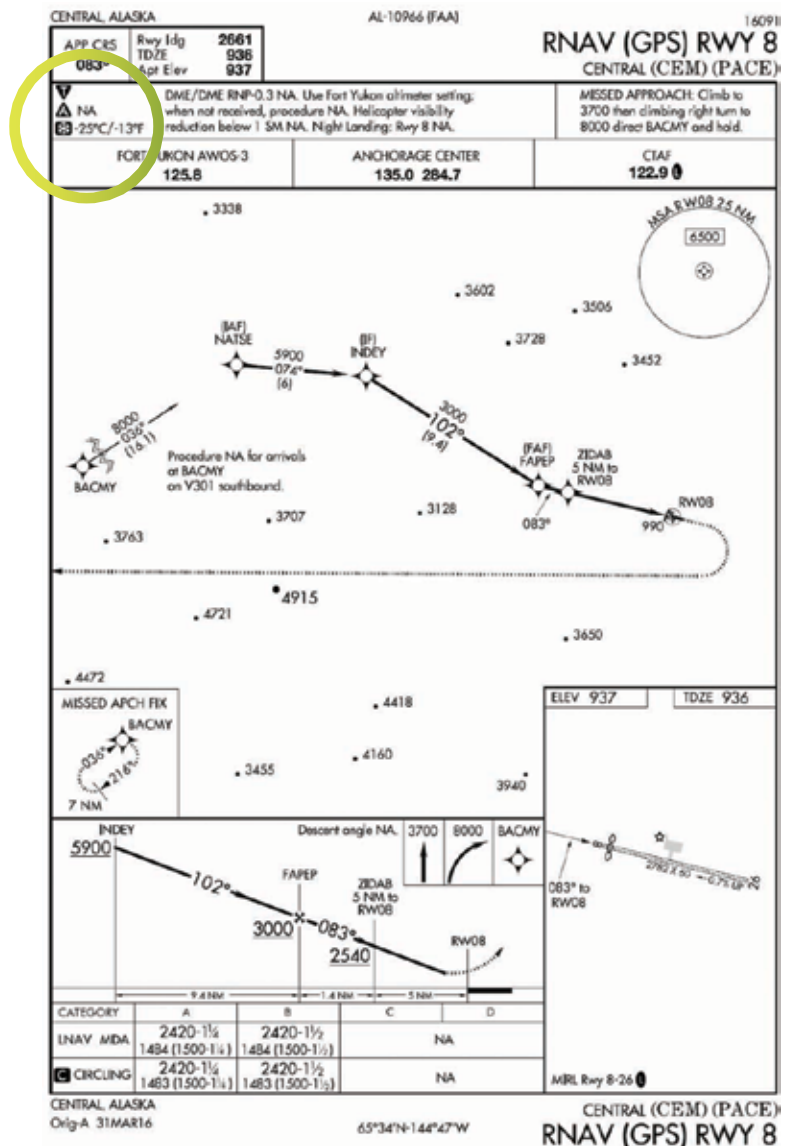


Figure 3.



airports (Figure 4). The listing indicates that the altitudes in the Intermediate and Final Segments of the approach must be temperature corrected. Using the ICAO corrections chart (Figure 2), we can make temperature corrections to ensure safety. Although aircrew should advise Air Traffic Control (ATC) of any corrections in excess of 80' in Canada, in the United States, ATC must be informed of any temperature corrections applied to charted altitudes, regardless of amount.

Different companies, militaries, and aviation regulators have their own version of rules regarding when these corrections are to be applied, but in general, they all have the same purpose: adjust your indicated altitude to ensure that your true altitude provides adequate obstacle clearance. While temperature corrections are not be applied to Departure Procedures, Terminal Arrivals, or ATC-assigned altitudes, if you feel that you do not have adequate obstacle clearance, you can always request

higher. These procedures are to be applied by RCAF crews worldwide; despite the fact that the RCAF regulations are listed in the GPH204, these rules are not only specific to Canadian airspace. If there is ever any doubt as to which country or service's rules to follow, the most conservative rule will always be the safest choice. ⚡

Cold Temperature Restricted Airports: Airports are listed by ICAO code, Airport Name, Temperature Restriction in Celsius. The temperature will be indicated on Airport IAPs next to a snowflake symbol ❄-XX°C, in the United States Terminal Procedure Publication (TTP).

Identifier	Airport Name	Temperature	Affected segment		
			Intermediate	Final	Missed Appr
ALASKA					
PABL	Buckland	-36C	X		
PABR	Wiley Post-Will Rogers	-42C	X		
PABT	Bettles	-37C	X	X	
PACE	Central	-25C	X	X	

Figure 4. FAA NTAP – October 12, 2017 Publication Cycle



Photo: Cpl Daisy Robin

MANAGING THE RISKS in Flight Test Operations

by Major Catherine Blais, Aerospace Engineering Test Establishment, Cold Lake

As the Flight Safety Officer at the Aerospace Engineering Establishment (AETE), I was recently asked to conduct an airworthiness/flight safety investigation on reported unauthorized flight testing activities conducted by several Department of National Defence (DND) organizations. I quickly realized that the conduct of these flight test events were often motivated by a desire to help technical agencies bring new equipment and technologies to the fleet and fueled by the ‘can

do attitude’ that is often a desired trait of operational squadrons. Unfortunately, this desire to help is often misguided due to a poor understanding of the flight test activity process. By extension, the technical and operational risk management associated with flight testing and data gathering in flights is also not well understood. In comparison, across the Royal Canadian Air Force there is a good knowledge and familiarity with all aspects of Maintenance Test Flights, and there

is a tendency to extend that knowledge to other types of test activities involving Developmental Test and Evaluation (DT&E) and Engineering Test and Evaluation (ET&E). In reality, these test activities are very different.

Before we get into how risks are managed in flight test activities, we need to define what constitutes a flight test and DT&E and ET&E activities. The *Canadian Forces Flight Test Orders* (CFFTOs) is the document that lays out policies and procedures for the conduct of

flight testing. The CFFTOs defines flight testing as any flight with a purpose to “gather quantitative and qualitative data that cannot be collected by any other practical means, to validate a computer based model or simulation or make recommendations based on the evaluation of that data regarding the airworthiness or other relevant characteristics of the article under test”. DT&E refers to testing that assists in design and development and ET&E refers to testing with the goal to show compliance or conformance or for validation and data collection purposes. Understanding what tasks constitute DT&E and ET&E is the key to making sure that risks are managed properly during flight test operations.

Units may be asked by an external or internal technical agency to conduct a flight in support of a project such as a survey or certification effort without being aware that these missions may not be part of their mandate, or that they may not have the authority to approve the conduct of such a flight. For example, a governmental agency approaches your unit to gather environmental data and they ask whether they can install standalone passive equipment consisting of a battery, laptop and data processing hardware into your aircraft. The whole installation is small and can easily fit on the cabin floor without impeding aircrew movement. The requested flight pattern consists of a mostly straight and level flight at a safe height. Can your unit go ahead and accept this mission? Although, the scenario seems very benign and safe, your unit will have to refuse because your unit cannot install equipment onboard their aircraft or conduct a flight to gather data without having the appropriate flight test authority’s approval.

Let’s look at another example. A DND agency approaches your unit to gather data on your aircraft. Even though sensors will be installed on major aircraft components, the flight will

follow Maintenance Test Flight (MTF) procedures as laid out in the relevant Canadian Forces Technical Order (CFTO) and will be executed by a MTF qualified crew as defined in the CFFTOs. Can your unit go ahead and approve the conduct of this mission? The answer is again no because, due to the installation of the instrumentation on the components, the aircraft will not be configured as per its type certificate. In other words, modification to the aircraft components means the aircraft is no longer certified to fly. These are two examples of hundreds of possible scenarios.

It is also important to mention that testing does not only apply to activities in flights. Testing is also conducted on devices used for training aircrew (simulators and survival training aids), unmanned aerial vehicles (UAVs) and on their systems and weapons systems. A frequent assumption is that if the aim is not part of an airworthiness effort, it is not testing. However, an activity may also have an ET&E component such as an initial assessment for an acquisition project. The best way to know whether you are dealing with a test activity is to ask an authorized and accredited agency. These agencies include AETE, your fleet Operational Test and Evaluation (OT&E) flight, the Weapons System Manager (WSM) office, fleet Staff Officers at the 1 Canadian Air Division Headquarters and the Air Force Test and Evaluation Coordination office in Ottawa.

Who then can approve the conduct of DT&E and ET&E activities and accept flight test risks? The answer can also be found in the CFFTOs and it is the Flight Test Authority (FTA) which is delegated to the Commanding Officer (CO) of AETE.

As stated in the CFFTOs, “the FTA is responsible for the safe conduct of DT&E and ET&E involving personnel from DND and the CAF and oversight of DT&E and ET&E conducted by

other organizations on behalf of DND and the CAF”. When flight test activities are required beyond the Operational Airworthiness Authority delegations, the FTA is also assigned Operational Airworthiness (OA) responsibility and includes AETE and supporting aircrew. This means that CO AETE, as the FTA, is responsible for: the qualifications and standards of all aircrew who support DND DT&E and ET&E flight test activities; the OA aspects of modification of AETE aircraft in support of testing activities; the OA aspects of the temporary modification and use of equipment on non-AETE aircraft in support of DT&E and ET&E operations; as well as the oversight of all Production Acceptance Test and Evaluation (PAT&E) pilots. So what does this mean? Well, it means that CO AETE is responsible for the assessment and acceptance of all operational risk for DT&E and ET&E activities.

The assessment and acceptance of DT&E and ET&E operational risk is done through a rigorous risk assessment process and is part of the planning phase for all projects. Operational flying units usually have a defined scope of flight operations which can be found in Aircraft or Flight Manuals, and their risks vary based on operational, environmental and human factors. On the other hand, flight test agencies must conduct an exhaustive risk assessment for every test project or event that is based on weather, crew composition, equipment and instrumentation installed, aircraft limits and flight procedures employed. All these factors will vary from project to project and, in the case of a new aircraft system, guidance for the operator may not always exist. Also, to fulfill test objectives, weather requirements, aircraft limits and flight procedures may contradict or exceed those included in the Flight Operation Manual (FOM), aircraft manual or flight manual. In this case, scrutiny becomes even more crucial. All factors influencing a project’s

Continued on next page



risk level must be included in the project test plan, either within the main document or in an annex in the form of a risk assessment matrix. All test plans must be presented to the Safety Review Board (SRB) which is chaired by CO AETE and then approved by CO AETE or their delegate. If required, external members, such as COs of units where testing will occur, are invited to attend the SRB to ensure that the safety measures put into place are appropriate and acceptable.

Crew composition is another aspect of flight testing that is often misunderstood. Normally DT&E and ET&E projects are executed with at least one AETE Qualified Test Pilot (QTP) on board. However, if appropriate, execution of projects may be delegated to other units. It is important to know, however, that, even in these cases, CO AETE's oversight applies. This means that the unit is accountable to CO AETE for efficient and safe execution of test flights in accordance with established orders and/or the test plan. PAT&E activity is a good example of

testing that is often delegated to operational units to perform. Due to the limited number of QTPs at AETE, AETE does not have the personnel to perform all PAT&E flight for all RCAF platforms. By giving Acceptance Test Pilot delegation to selected operational pilots and conducting PAT&E according to an FTA approved plan, CO AETE can ensure an acceptable rate of aircraft delivery to support fleet operations.

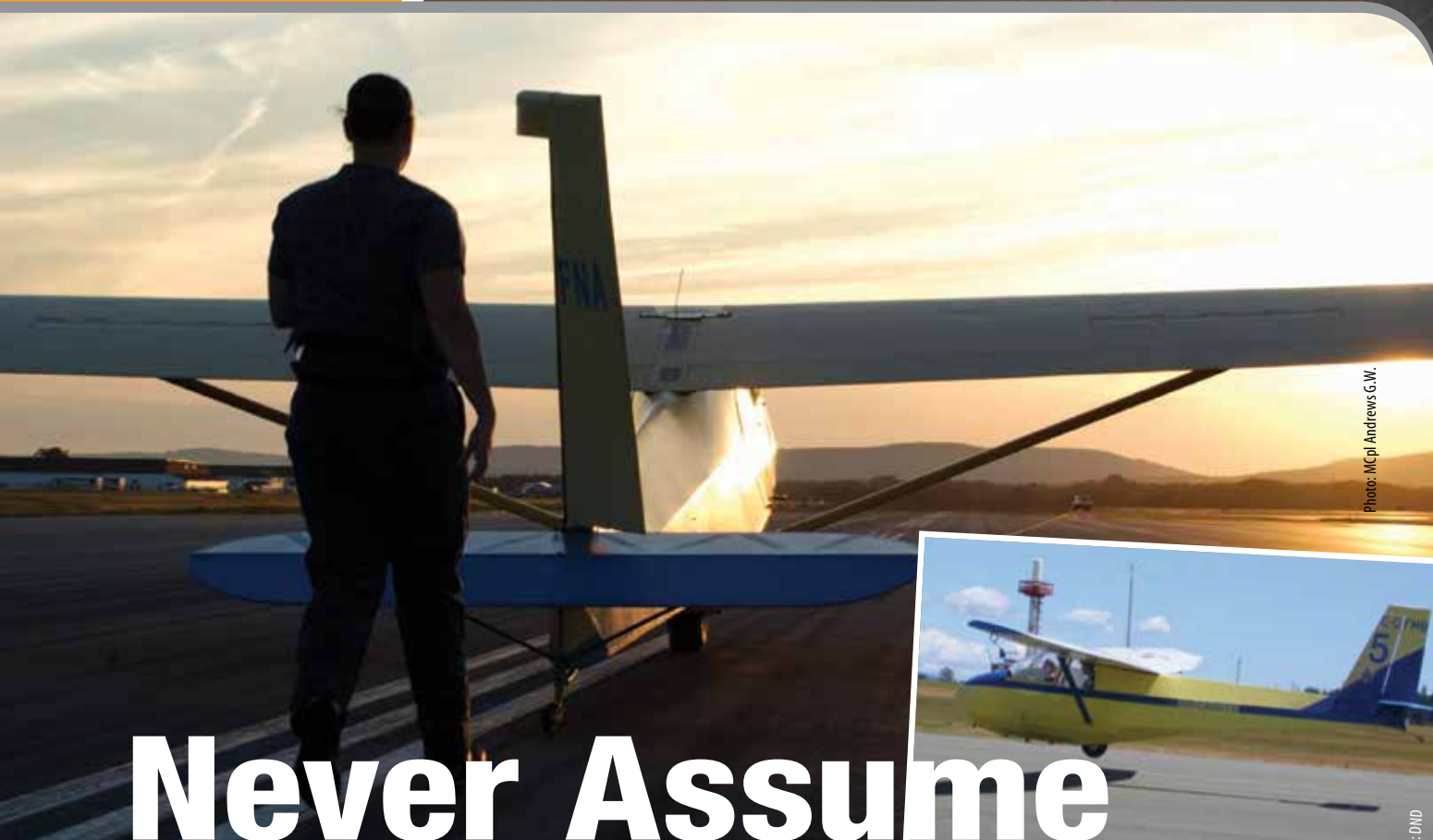
I briefly introduced technical risks in the opening paragraph of this article. Operational flight test risks, which are under the OA delegation of the FTA, are not the only flight test risks that must be addressed by the appropriate authority. Technical risks are also important. Even though I will not go into detail here, it is important to know that technical risks during flight test activities must be addressed by the Technical Airworthiness Authority (TAA) or delegate. You will know that this has been done if you have a Special Purpose Flight Permit (SPFP) or an

Experimental Flight Permit (EFP). The WSM office for your fleet is a good place to start if you want to inquire about the requirement for an SPFP or EFP.

The aim of this article was to give members of the RCAF an appreciation of flight test risk management and why it is important to respect this process. There is still a lot more to be said on the subject, but I hope that this little bit of information will help members recognize when they encounter possible flight test activities and when they need to reach out to the appropriate DND organization. Flight test risk assessment, and by extension flight safety, is paramount to testing operations. I hope that with the help of all RCAF members we will be able to continue the prioritization of safety and the application of a sound risk management process to ensure proper oversight and accountability in flight test activities. ✈

Photo: Cpl Green

LESSONS LEARNED



Never Assume

by Lieutenant Paul Wyckhuyse, Tow Pilot, Regional Cadet Support Unit (Pacific)

A new day of gliding operations had commenced at our 19 Wing Comox gliding site and all staff were energized with the prospect of providing familiarization glider flights to cadets from a local Air Cadet Squadron. Nothing was amiss, with all staff having completed their required training earlier in the year and all aircraft were operational. As a gliding site, we routinely provided these familiarization flights and today should have been no different than any other time.

The gliding day got off to a normal start, with the staff and cadets settling into a routine. Several hours into the day, a group of cadets was escorted by a staff member to the nearby restrooms located 100m away. A short while later, a lone cadet approached me and asked if he could go to the restroom. As the earlier group had just returned, I directed him to walk straight to the restroom and back. I could see his destination and it was only a stone's throw

away. I thought nothing further of this activity, until a few minutes later when we received a phone call from a Tower Controller advising us that one of our personnel had walked across an active runway without clearance. The aforementioned lone cadet had seen a portable washroom in the general direction of the restroom to which he was heading. Believing that to be his destination, the cadet had walked directly to the portable washroom and, in the process, walked past the original destination, across an active runway and ended up over 600m away. Upon discovering this, the cadet's return to our site was uneventful.

Runway incursions are nothing new in the world of aviation, but this was definitely a preventable occurrence. As staff members, we have a duty to care for the personnel under our control. Regardless of whether they are cadets, military members or civilians, we must always be cognizant of their abilities and knowledge.

Most of the cadets visiting that day had never been to an airfield, let alone visited the more complex military airport we were operating out of that day. As the supervising staff, we should have recognized this lack of knowledge and ensured that the cadets were escorted by an experienced staff member at all times. Rather, we assumed that the lone cadet would follow the path taken by the previously escorted group. Only the keen eye of the Tower Controller prevented what could have been a serious flight safety occurrence. Had we been operating at an uncontrolled aerodrome, it is possible that the cadet may have completed his journey without anyone knowing anything was amiss, or worse, crossed when an aircraft was landing or taking off. This experience was a learning one for staff and showcased how an assumption can open the door for an incident or accident to occur. ✈

LESSONS LEARNED



Photo: M/Cpl Maggie Gosse

CAUTION with Automation

by Captain Robert Gillespie, Cadet Flying Site, Wingham

Everyone knows that when you're riding a bike uphill, you can't stop pedaling. If you do, you'll stop or slide back down. Using automation in aviation is the same way. There is no point where you can coast in your monitoring. It's often subtle events that remind me of this.

When I was an active pilot, I was a first officer flying on a twin engine turboprop. Our route was from Pittsburgh to Toronto. We would hand fly the aircraft to 10,000 feet, and then engage our autopilot. At this time, we were operating in pitch and navigation mode. We'd been asked to intercept an airway and then proceed on course. The way to do this was to input a heading into the flight management system. If the heading would work, the FMS

would then ask us if we wanted to intercept the airway. Only when the geometry worked would this option be available. The heading we were assigned met the criteria, and we selected the intercept command.

It wasn't a busy climb out from Pittsburgh so the captain and I were able to chat about something else. A short time passed when I noticed the course deviation indicator had a full scale deflection. How could that happen with the navigation mode engaged? We were both confused and did not understand until we looked at the map mode and saw that we hadn't made the first programmed turn. Thirty seconds later ATC asked if we were heading to the next fix.

It seemed the automation had failed us, but actually it did what we asked. The FMS should have intercepted the airway, but the wind changed with altitude causing our intercept to move beyond the first turn. The system didn't capture the track and so it simply held the initial heading. The alarm for this situation relies on flight crew awareness, but we didn't think to look for this situation because neither of us had seen it before.

The consequences were minor because of our situation, but what if it were an approach to minimums, or at night? Should we ever be trusting of automation? Minor events like this have helped me to remember to stay alert and never completely trust the autopilot. You should adopt practices in your flying to do the same. ✈

Managing Pressures

by Captain Christopher Gallinger, 439 Squadron, Bagotville

A concept that has often come up during my training as an aviator has been managing perceived and actual pressures when making decisions about a mission. We all know that these pressures can often lead an individual or a crew into making an incorrect decision, which is why it is so important to recognize and mitigate these pressures. One instance where these pressures were successfully managed as a crew occurred during my first tour as a First Officer at a Combat Support (CS) Squadron flying the mighty Griffon helicopter. As a CS pilot you become used to packaging different tasks into a single flight in order to maximize the training value for the crew. Which is why, one Thursday afternoon, combining parachute operations and an Instrument Rating Test (IRT) seemed like an ordinary event.

Some stage-setting is required in order to appreciate our mindset that afternoon. The week was uncharacteristically busy for the end of March as we had two crews trading places in Iqaluit to round out the last segment of our northern trainer. The unit was simultaneously hosting a representative from the Transport and Rescue Standards and Evaluation Team (TRSET) in order to conduct annual proficiency checks (APCs) and IRTs on some of our aircraft commanders (ACs). The chaos was amplified mid-week when a 12.5 hour inspection

detected small cracks in the tail rotor of our only serviceable helicopter. Thanks to the quick thinking of maintenance personnel, the tail rotor from a helicopter undergoing a 300 hour inspection was switched with ours and our snagged bird was put back on the line to finish the week with three IRT flights to accomplish.

“The AC made the call to return to base with the old adage ‘you have two engines but only one transmission’ echoing in our ears.”

That Thursday, with pre-flight briefings complete, we departed on the first IRT and, at the top of our climb, we were greeted with a flickering caution panel transmission chip light. Despite the uncertainty regarding the indication, we ran the checklist and the AC made the call to return to base with the old adage ‘you have two engines but only one transmission’ echoing in our ears. To make matters more ambiguous, the light extinguished enroute but we landed back at base and the

maintenance technicians immediately went to work investigating the cause of the light. A short time later our technicians were satisfied that the light was flickering because of normal debris and not because of excessive wear on components and they signed off the helicopter as serviceable. Due to the interruption and loss of time, the first IRT was scrubbed and so the second IRT was on deck with some value added training tacked on to the flight.

The second IRT was for our standards and training pilot who is a reservist. Due to this pilot’s specific availability, there was a decent amount of pressure to complete this flight while TRSET was present. The addendum to the mission was a parachute jump for one of our Search and Rescue (SAR) Technicians (Techs), also a reservist, who was needing one more jump by the end of the month to meet quarterly minimum currency requirements. If the SAR Tech did not complete his jump, he would lose his currency and be required to catch up with supplemental jumps in the following three month period.

We piled into the chopper once more and, as I completed our pre-take-off checks, the transmission chip illuminated yet again. Given that we were on the ground and there were no secondary indications to cause concern, we started to discuss the situation as a crew.

Continued on next page

LESSONS LEARNED

Managing Pressures ...Continued

The flight engineer advised that we should turn the electrical power off then back on to reset the chip detection system. The flight engineer's rationale was that the light could be caused by an electrical fault, or that the fuzzer burner could run through its routine and clear the chip that was causing the light to illuminate. We carried out the reset and the light cleared. However, despite the pressure of needing to complete the parachute jump and IRT flight, because we couldn't be sure

that the light would remain off or the reason behind its intermittency, we decided to shut down and call it quits for the day.

In both cases, the crews elected to follow the checklist response despite the ambiguous indications and the pressure to complete currencies for multiple members. This highlights the level of professionalism that is shown by our crews. Due to a combination of being familiar with our aircraft and being accustomed to generally good serviceability, it would have

been very easy to allow complacency to set in and attribute an indication of a problem to something benign. By being able to recognize the perceived and actual pressures affecting our mission, our crew determined that the over-riding concern was not knowing why the transmission light was illuminating. Making the decision to cancel the flight mitigated that concern, properly put all the other pressures in context and allowed for the safest decision to be made. 4



Photo: Cpl Gary Calvé

Photo: Cpl Ariane Montambeault

LESSONS LEARNED



The **IMPORTANT** of Not Rushing

by Sergeant Michael Leudy, National Defence Quality Assurance Representative Enfield, Halifax

I was deployed for seven months to Afghanistan with the CU161 Sperwer Tactical Unmanned Aerial Vehicle (TUAV). The Sperwer aircraft had a unique way of landing. On recovery over the landing area, the aircraft power would be shut off, de-energising a solenoid resulting in the release of a parachute door. This door release resulted in the deployment of a parachute which then activated the inflation of several airbags. These airbags protected the aircraft when it fell to the ground and essentially allowed the aircraft to have a cushioned landing.

The TUAV team had numerous successful flights with no issues providing surveillance as well as supporting troops in contact. I was a member of one of the two maintenance crews and we worked long shifts consisting of 16 hours on and 16 hours off. Of the many maintenance tasks for which we were responsible, one was packing the parachute and another was removing the parachute safety pin before flight. The removal

of the parachute safety pin was a first line task that required A level authorization but did not require an independent check by our supervisor.

One night, the battle group encountered enemy fire and requested support from the TUAV section. The crew scrambled to get the aircraft ready to deploy. Everything went normally until the aircraft returned to the recovery area. When the aircraft power was shut down, the parachute door opened but the parachute failed to deploy. This failure also resulted in the airbags not being inflated and caused the loss of the aircraft and a very expensive and important piece of mission equipment when the un-cushioned aircraft contacted the ground.

Upon recovery of the aircraft, the investigation revealed that the parachute safety pin had not been removed prior to the aircraft's launch and this is what prevented the deployment of the

parachute and activation of the airbags when the parachute door was opened. With all the excitement and sense of urgency that night, the error was attributed to a technician forgetting to remove the parachute pin before the aircraft was loaded on the launcher. Even though we were able to assist the battle group by providing an enhanced tactical advantage, we failed our mission by losing the aircraft and the valuable piece of mission equipment.

After that accident we implemented an independent launch check by our supervisor and this situation was not repeated. The lesson I learned from this accident was that no matter how important the mission, one must always ensure that the job is done right. Take the necessary time and always follow procedure. Do it right always! 🇨🇦

Watch Your Head

by Sergeant William Westwater, 402 Squadron, Winnipeg

Are you busy?" It is pretty common in day to day work life to have to multitask. Extensive budget cuts and manning issues are only a few of the key problems that lead to this on a daily basis.

Personally, I never knew my limit of dealing with workload until I had a close call. It was a cold windy February morning on the ramp at 17 Wing, Winnipeg. After working tirelessly to fix a leaky auxiliary power unit, I began closing out the paperwork so the aircraft could return to service. During this time I was responsible for prepping and maintaining the squadron de-icer truck and ensuring the daily readings

were serviceable and ready for pre-flight de-icing. I was young, keen and my brain was going a mile a minute to ensure the paperwork was correct and nothing was missed.

"Before I knew it the wind had increased and it was so intense it blew my hood back and startled me. To my surprise, I had just walked right up the back of a running Dash-8 and was only 10 feet from the running propeller."

My supervisor at the time asked, "If you aren't busy, could you go and take a look at a ramp snag before the flight?" "Sure thing, I got this," I replied. I dropped everything, threw on my parka and ear defenders and headed out into the cold. I couldn't see much due to the early morning darkness. My mind was still occupied with my other two jobs. I glanced up quickly and saw two Dash-8s on the flight line. I tucked my head back down and continued to walk out on the ramp not knowing which plane was broken. Before I knew it the wind had increased and it was so intense it blew my hood back and startled me.



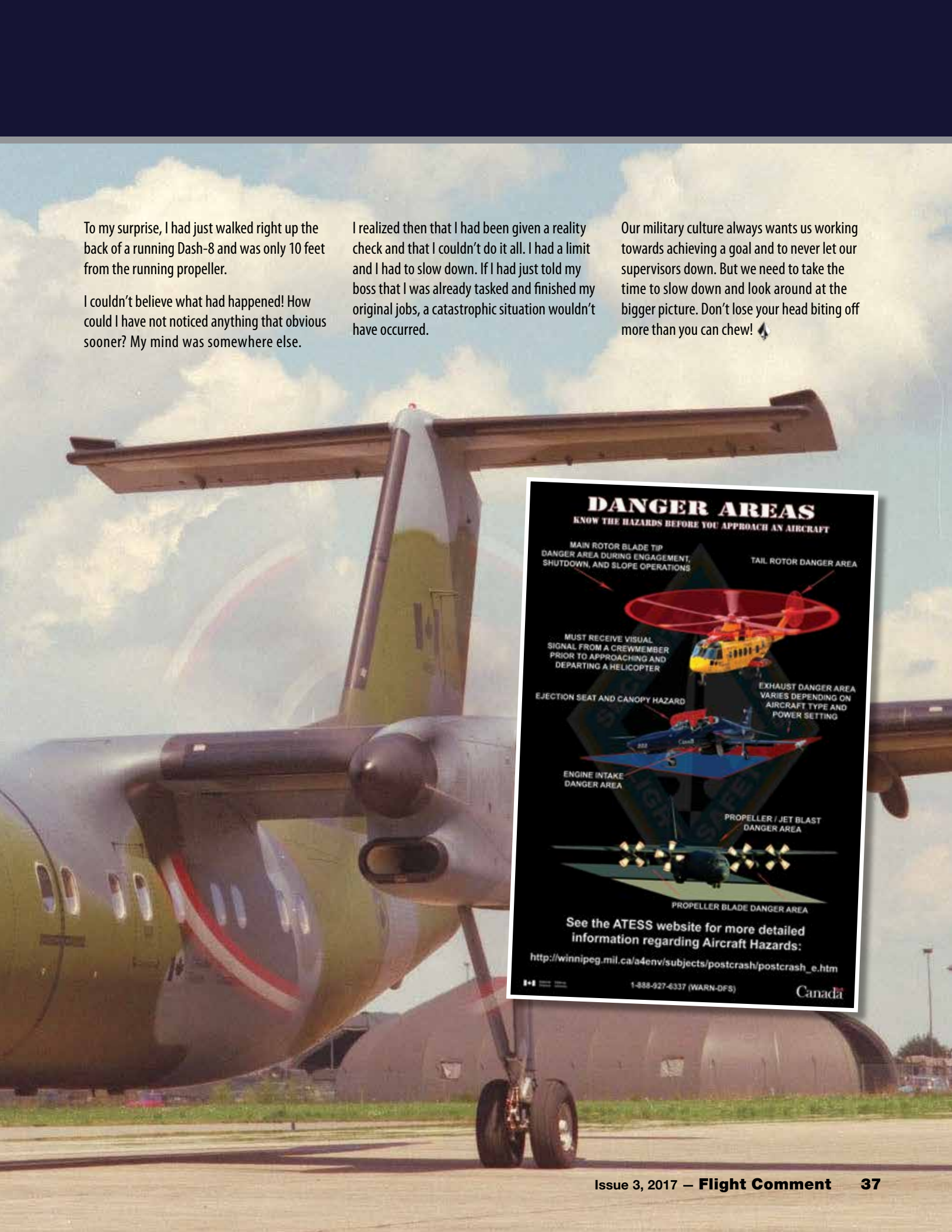
Photo: DND

To my surprise, I had just walked right up the back of a running Dash-8 and was only 10 feet from the running propeller.

I couldn't believe what had happened! How could I have not noticed anything that obvious sooner? My mind was somewhere else.

I realized then that I had been given a reality check and that I couldn't do it all. I had a limit and I had to slow down. If I had just told my boss that I was already tasked and finished my original jobs, a catastrophic situation wouldn't have occurred.

Our military culture always wants us working towards achieving a goal and to never let our supervisors down. But we need to take the time to slow down and look around at the bigger picture. Don't lose your head biting off more than you can chew! 🍷



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- EJECTION SEAT AND CANOPY HAZARD
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Canada

FATIGUE

by Lieutenant Sally Riendeau, 21 Aerospace Control & Warning Squadron, North Bay

Working at a facility that operates 24 hours a day, 365 days a year provides many challenges. At the Canadian Air Defense Sector (CADS) in North Bay, the winters are long and bitter. Not only does the weather range from -40 degrees Celsius to -3 degrees Celsius within a week but, because the sun is only up from 0900 to 1630, it is possible to go the whole day without seeing the sun, affecting your mood and fatigue levels. Fatigue risk management becomes an important part of working shift work at CADS.

Early in December, I was in my 8th month as a trained weapons controller. I was on a second night shift working from 1900 to 0700. The night shifts are typically uneventful and great to catch up on any residual paperwork. This particular night shift felt worse than the others; I hadn't slept well during the day and coffee wasn't doing the job anymore. Although we are permitted to take 40 minute naps if required on night shifts, I was stubborn and felt that I could hack staying awake. As the night turned into morning, I struggled to keep my head up and eyes awake.

When the new morning crew arrived, they mentioned that the weather was very bad outside. Strong winds and heavy snowfall during the night were a recipe for poor driving conditions. Upon hearing this, I had a serious decision to make. On a clear day, I would struggle driving home in my condition but knowing that the drive home required more situational awareness than I had worried me. However, the idea of being home in my warm bed away from the blizzard outside was enough to motivate me to make the drive. The drive was difficult to

say the least. With my window open, music on, and driving the speed of cold molasses, I made it home. It usually takes 10 minutes to get home tops, this day it took 25 minutes.

After waking up from my shift, I reflected on the danger I put myself and others in by driving home so tired. I realized that I was in no condition to drive and I was not willing to risk the safety of myself and others in this way again. Returning to work a few days later, I was talking to some of the other members about the weather over the last few days. I had told them my story about the drive back to my house and how risky it was.

One of my crew-mates told me that on that very same drive home to his house he totaled his truck in a snowbank because he nodded off. Astonished, I ensured that he and his family were alright. He reassured me that he was fine and that, because his six month old son was sick, he failed to get adequate sleep the day before his shift. Although night shifts are usually pretty slow for most, on this particular night shift he had been very busy and didn't have much time to take a rest. Also, although his commute home is usually a 30 minute drive due to the weather it took much longer. All of these things contributed to his accident.

I reflected on this and realized that I was very lucky to have made it home safely. What if I nodded off for one second and missed a



brake or a red light? After talking to some more members of my crew, I found that many of them had similar experiences to mine. I then realized that the new policy surrounding naps on night shifts was put in place for this very reason. Not only does it increase the safety of its members but should an operational event happen, members are more vigilant and coherent to handle the situation. It is clear that there needs to be a cultural change to accept naps rather than trying to 'power through.' Many shift work jobs like air traffic controllers and firefighters accept naps as the norm because they work long, irregular hours. We need to adopt this mindset so that we're ready for operations and to protect our own safety. 🚧

From the Investigator

TYPE: CF188796 Hornet

LOCATION: Cold Lake, AB

DATE: 20 June 2017

Two CF188 pilots (call signs Mig-1 and Mig-6) completed individual Maple Flag missions uneventfully in the Cold Lake Air Weapons Range and returned to base together as a two-ship formation. Mig-1 led and Mig-6 was the wingman. In order to deconflict with the other aircraft returning to base Mig-1 and Mig-6 maintained a higher airspeed to the airport.

Overhead Cold Lake aerodrome runway 13R at 1500 ft above ground level and a speed of 470 knots, Mig-1 entered the overhead break in a right hand turn followed three seconds later by Mig-6. During the overhead break Mig-6 set the throttles to idle, initially set the bank angle to 81 degrees, and pulled up to 6.8g in order to slow the aircraft in preparation for turning final with gear down and locked.

Mig-6 did not perform the anti-g straining maneuver, and was flying with a loose fitting g-suit with comfort zippers undone. Two seconds into the overhead break and at 6.8g, Mig-6 almost lost consciousness. Mig-6 experienced short term (approximately 5 seconds) impairment of cognitive and motor functions, and the aircraft began descending towards the ground. Mig-6 heard the audible warning from the Terrain Alert



Photo: Cpl J.F. Lauze

Warning System, and with improved cognitive and motor functions, Mig-6 pulled 7.0g and avoided the ground by 270 ft.

Mig-6 climbed away from the ground and now fully recovered, advised Mig-1 of the need for assistance and the desire to land. Mig-1 notified air traffic control to give them priority to land and calmly assisted Mig-6 to a safe landing. Mig-6 was met by first responders and taken to the 4 Wing base hospital for evaluation.



Photo: DND

The investigation is continuing to examine human and technical factors that may have played a role in this incident. 🚫



Photo: Sgt Robert Bottrill

From the Investigator

TYPE: Cessna 172 (C-GAYE)

LOCATION: Sainte-Marie, QC

DATE: 2 August 2017

The accident flight was part of the Air Cadet Power Scholarship Program and flown under contract by a civilian flight training unit. The purpose of this flight was to conduct pilot training. An instructor and a cadet pilot took-off from the Saint-Frédéric aerodrome (CSZ4) and conducted IFR training prior to carrying out two forced landing exercises. The first forced landing exercise was uneventful and the aircraft was set-up for a second attempt. The instructor reduced the

throttle to simulate an engine failure and the initial actions were carried out by the cadet pilot. A forced landing circuit was flown to a field with significant upslope terrain adjacent to the Chaudière River. Once it was evident the aircraft would safely reach the intended landing point, an overshoot was initiated. Full power was applied and a climb was established. The aircraft could not outclimb the rising terrain and settled on the field before impacting trees at the end.

The aircraft sustained very serious damage and both pilots received minor injuries.

The investigation did not reveal any evidence of technical issues with the aircraft and is now focusing on human factors and crew resource management. ✈



From the Investigator

TYPE: Schweizer SGS 2-33A
Glider, C-GCLE

LOCATION: Gimli, MB

DATE: 21 August 2017

The accident took place during the summer Air Cadet Gliding Program at the Gimli Cadet Flying Training Center located at the Gimli Industrial Park Airport in Manitoba. The accident flight was the cadet student pilot's eighth solo air lesson and fourth flight of the day.

The winds were 240 degrees at 8 knots and the operation was conducting right hand circuits to the grass primary landing area adjacent to runway 15. After an uneventful downwind leg, the student pilot turned right onto the base leg and lowered the nose to establish the glider at the pre-calculated final approach speed. At approximately 300 feet above ground level, the student pilot was overshooting the extended centerline of the primary landing area. A late turn to final was initiated but the wings were quickly levelled to terminate the turn and the plan to land at the primary landing area was abandoned. Now on an extended base leg, the student pilot continued straight ahead, aimed to land on the apron with the intent to bring the glider to a stop prior to impacting the hangar directly on the flight path, but not knowing if there was sufficient landing distance available.



Photo: DND

The student pilot maintained a nose low attitude and made use of full spoilers to descend quickly. The glider impacted the apron in a level attitude, bounced and covered a distance of 233 feet. The glider bounced a second time covering a further distance of 12 feet. After the third contact on the apron, the glider rolled forward onto the grass in front of the hangar. The student pilot initiated a right rudder turn away from the hangar but the glider came to an abrupt stop when it impacted the steel bollard surrounding a fire hydrant located 24 feet from the hangar.

The student pilot was transported to the local hospital via ambulance, treated for minor injuries and later transferred to a medical facility in Winnipeg. The student pilot was released the following afternoon. The glider sustained very serious damage.

The investigation is focusing on human factors, pilot training, flight standards and organizational influence. 🔥



Photo: DND

Epilogue

TYPE: CH12428 Sea King
LOCATION: Strait of Juan de Fuca,
South of Victoria, BC.
DATE: 11 May 2015

The CH124 Sea King was operating from 443 Squadron, in Pat Bay, BC, with a crew of four. The crew, consisting of an Aircraft Captain (AC), Maintenance Test Pilot (MTP) Trainee, Air Combat Systems Officer and an Airborne Electronic Sensor Operator, were conducting an MTP training sortie. The crew flew from Pat Bay to Canadian Military Advisory Area 102, south of Victoria, BC, over the Strait of Juan de Fuca while conducting MTP Training.

During the conduct of the number one engine manual throttle topping check, the MTP Trainee inadvertently bumped the manual throttle slightly forward and had to re-establish hand

position on the manual throttle lever. The investigation determined that the AC misinterpreted the motion of the MTP Trainee gaining a better grip on the manual throttle control lever as the MTP Trainee closing the manual throttle. This perception error led to a cascade of subsequent events, which began with the act of lowering the collective and resulted in engine failure.

Fatigue was identified as a significant contributing factor leading to the perception error. The Royal Canadian Air Force (RCAF) is currently in the process of implementing a Fatigue Risk Management System (FRMS),

which will be a multi-layered approach to preventing fatigue and managing fatigue-related risk. Full implementation of the RCAF FRMS is anticipated for mid-2017. Fatigue-modelling capability and FRMS are being developed as components of the RCAF Mission Acceptance / Launch Authorization (MALA) risk management tool.

Although not directly causal to this occurrence, collateral findings and recommendations were also made regarding Aircraft Operating Instruction procedures and cautions for operating the manual throttle. ⚡



Epilogue

TYPE: CH146497 Griffon
LOCATION: 1 nautical mile south east of the Bell Helicopter facility at Mirabel Airport
DATE: 5 August 2015



The mission consisted of bringing a CH146 Griffon helicopter from 438 Tactical Helicopter Squadron in Saint-Hubert (CYHU) to the Bell Textron facility located at the Mirabel airport (CYMX) in order to conduct armoured seat fitment trials. The departure was planned for the morning of 5 August 2015. The crew prepared for the mission the day prior, with a confirmatory brief the morning of the mission prior to departure. The weather was better in Saint-Hubert than Mirabel, with the latter being marginal and the crew flew according to Special Visual Flight Rules (SVFR) in the Control Zone. Enroute to their destination, the crew purposefully flew over a known set of high tension power lines that was marked on the Montreal VFR Terminal Area Chart (VTA) and then unexpectedly came across a second

set of high tension power lines that was not marked on the map. The crew flew in the 39 foot gap between the top grounding wire and a lower set of wires. There was no contact with the wires and a post occurrence inspection confirmed that there was no damage caused to the aircraft. There were no injuries. Due to the potential for severe damage and injuries, the safety of flight compromise level was assessed as high.

The investigation concluded that there was a breach of orders while the crew was flying in deteriorating weather and that there was likely some confusion amongst the crew with regards to the practical application of Special VFR. The investigation brought to light deficiencies in the CH146 Radalt setting

procedures. It was also concluded that there is likely a cultural mentality within the RCAF helicopter communities, particularly within the Griffon community, that reinforces and normalizes the behavior of pushing the weather (flying below minimums) to avoid poor weather in order to accomplish a mission.

The preventive measures include recommendations to improve the current radar altimeter procedures to facilitate crew decision making as well as better Human Performance in Military Aviation (HPMA) training. There are also recommendations to liaise with Transport Canada and Nav Canada in order to document the presence of the second set of high tension power lines. 4

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